

ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

For

M.Tech,COMPUTER SCIENCE AND ENGINEERING
(Applicable for batches admitted from 2018-2019)



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SRI VASAVI ENGINEERING COLLEGE (Autonomous)

(Sponsored by Sri Vasavi Educational Society)

(Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada)

(Accredited by NAAC with 'A' Grade ,Recognized by UGC under section 2(f) & 12(B))

Pedatadepalli, **TADEPALLIGUDEM – 534 101. W.G.Dist. (A.P)**

Academic Rules and Regulations for M.Tech Programme

The M.Tech Degree of Sri Vasavi Engineering College (Autonomous), Pedatadepalli, Tadepalligudem, under Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the programme and fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above programme shall be made subject to eligibility criteria, qualification and specialization as prescribed from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the Qualifying Examination/Entrance Test conducted by the University/Government or on the basis of any other order of merit as approved by the University/ Government subject to reservations as laid down by the Govt. from time to time.

1.1 ADMISSIONS UNDER SPECIAL CASES:

These may arise in the following situations.

1. When a student gets detained due to academic regulations and re-joins the college to complete the programme in a new regulation.
2. When a student discontinues for some time and re-joins the college to complete the programme in a new regulation.
3. When a student seeks transfer from other colleges to SVEC and intends to pursue M.Tech programme in the eligible branch of study.

These admissions may be permitted by the College Academic Council as per the norms stipulated by the statutory bodies and the Government of Andhra Pradesh from time-to-time.

In all such cases for admission if necessary permissions from the statutory bodies are to be obtained and the programme of study at the college will be governed by the transitory regulations stipulated in **12.0**.

An under taking from the students is to be taken at the time of admission stating that they would abide by the transitory regulations specified by the authorities if there is any change in the regulations.

2.0 AWARD OF M.Tech DEGREE:

- i. A student shall be declared eligible for the award of the M. Tech Degree, if he pursues programme of study in not less than two and not more than four academic years.
- ii. The student shall register for all 70 credits and secure all the 70 credits.
- iii. The duration of each semester including examinations is 21 weeks.

3.0 SPECIALIZATION:

The following specializations are offered at present for the M. Tech programme

- a) M.Tech- Structural Engineering
- b) M.Tech- Power System Control & Automation
- c) M.Tech- Machine Design
- d) M.Tech- VLSI & Embedded Systems
- e) M.Tech- Computer Science & Engineering

4.0 ATTENDANCE:

A student is eligible to write the semester end examinations (SEE) if he/she acquires a minimum of 75% of attendance in aggregate of all the courses of that semester put together.

- 4.1** Condonation of shortage of attendance in aggregate up to 10% (65% and above **but** below 75%) in a given semester may be granted by the College Academic Committee on medical grounds provided the student has submitted the application for medical leave along with medical certificate from a Registered medical practitioner within three days from reporting to the class work after the expiry of the medical leave. However, a student can avail this concession on medical grounds for not more than once during entire duration of the programme.
- 4.2** A student representing the college in approved extracurricular activities such as sports, games, cultural meets, seminars, workshops and conferences shall be considered as on duty provided he/she has obtained prior written permission from the head of the department concerned and also submitted the certification of participation from the organizer of the event within three days after the completion of the event. However, this period of absence shall be counted as present for the purpose of computation of attendance only.
- 4.3** A stipulated fee shall be payable towards condonation of shortage of attendance.
- 4.4** Attendance below 65% in aggregate shall not be condoned under any circumstances.
- 4.5** Students whose shortage of attendance is not condoned in any semester are not eligible to write their semester end examinations.
- 4.6** A student who is in short of attendance in a semester may seek re-admission into that semester when offered again, within 1 week from the date of the commencement of class work.
- 4.7** A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester.
- 4.8** If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

5.0 EVALUATION:

The performance of the candidate in each semester shall be evaluated course-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation (IE) and End Semester Examination.

Theory Courses:

- i. For the theory courses 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction.
- ii. Each Mid-term examination shall be conducted for 30 marks and duration of 120 minutes with 3 questions (without choice), each question for 10 marks.

The balance 10 marks is earmarked for alternate assessment tool like assignments etc.,

Internal Evaluation= Average of two mid examinations (30)+AAT (10)

End Semester Examination shall be conducted for 60 marks.

There will be 5 questions with internal choice covering the entire syllabus. The student has to answer all the questions.

Practical Courses:

For practical course, 60 marks shall be awarded based on the performance in the End Semester Examination (Conducted by External Examiner and Internal Examiner) and 40 marks shall be awarded based on the day-to-day performance and an Internal Test as Internal Evaluation.

Seminar:

There shall be two seminar presentations one in I semester and another in II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before a Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation for 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

MOOCS Courses:

Every student has to register for a MOOCs course in 1st semester itself as approved by the Departmental Committee and complete it on self study basis and submit the certificate of successful completion before the end of 3rd semester.

Comprehensive Viva:

Every Student has to appear for a comprehensive Viva-Voce at the end of III Semester. The performance will be assessed by a committee for 50 marks.

5.1 Minimum Academic requirement:

- i. A candidate shall be deemed to have secured the minimum academic requirement in a course if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- ii. In case the candidate does not secure the minimum academic requirement in any course (as specified in 5.1(i)) he has to reappear for the End Semester Examination in that course.
- iii. A candidate shall be given one chance to re-register for each course provided the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the course(s) and secure the required minimum attendance. The candidate's attendance in the re-registered course(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those course(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stands cancelled.
- iv. For re-registration the candidates have to apply to the Dean Academics by paying the requisite fees and get approval from the College before the start of the Semester in which re-registration is required.

In case the candidate secures less than the required attendance in any re-registered course(s), he shall not be permitted to write the End Examination in that course. He shall again re-register the course when next offered.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK:

The project duration is two semesters. Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- i. A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members along with project supervisor.
- ii. The total project work is evaluated at the end of 4th semester for a total of 100 marks out of which 50 marks are awarded by an internal committee (PRC) and 50 marks are awarded by an external examiner.

6.1 Registration of Project Work:

The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters.

A candidate is permitted to register for the project work after satisfying the attendance

requirement of all the courses, both theory and practical.

The student has to submit, in consultation with his project supervisor, the title, expected outcomes and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

At a later stage if a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.2 Project Evaluation:

- i. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC, not earlier than 40 weeks from the date of registration of the project work.
- ii. Three copies of the Project Thesis certified by the supervisor shall be submitted to the department.
- iii. The thesis shall be adjudicated by an External Examiner approved by the Principal from a panel of 4 Examiners, eminent in the field, submitted by the Department.
- iv. If the report of the examiner is not favorable, the candidate shall revise and re-submit the Thesis in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the competent authority.
- v. If the report of the examiner is favorable, Viva-Voce examination shall be conducted by the external examiner who adjudicated the thesis. The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.
- vi. The total project work is evaluated at the end of 4th semester for a total of 100 marks out of which 50 marks are awarded by the internal committee (PRC) and 50 marks are awarded by the external examiner and the performance is graded as per the grading system given in 7.0. If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the College.

7.0 GRADING SYSTEM:

Based on the students performance in different courses of a semester **letter grades** will be awarded at the end of the semester for each course. The letter grades and the corresponding **grade points** are as given in the following table.

Grade	Grade Points	% of marks
S	10	≥ 90
A	9	$\geq 80 - < 90$
B	8	$\geq 70 - < 80$
C	7	$\geq 60 - < 70$
D	6	$\geq 50 - < 60$
F	0 (Failed)	< 50

8.0 GRADE POINT AVERAGE:**Computation of SGPA and CGPA:**

The following is the procedure to compute the Semester Grade Point Average (SGPA) for each semester and Cumulative Grade Point Average (CGPA) for all four semesters of the programme:

- i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$\text{SGPA (Si)} = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

- ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal places and reported in the transcripts.

Illustration for Computation of SGPA and CGPA:**Computation of SGPA at the end of 1st semester****Illustration No.1:**

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	9	3 x 9 = 27
Course 2	3	C	7	3 x 7 = 21
Course 3	3	B	8	3 x 8 = 24
Course 4	3	S	10	3 x 10 = 30
Course 5	3	D	6	3 x 6 = 18
Course 6	3	C	7	3 x 7 = 21
Course 7	2	A	9	2 x 9 = 18
Total	20			159

Thus, SGPA at the end of 1st Semester= $159/20=7.95$

Illustration No.2 (with one failure)

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	9	3 x 9 = 27
Course 2	3	C	7	3 x 7 = 21
Course 3	3	B	8	3 x 8 = 24
Course 4	3	S	10	3 x 10 = 30
Course 5	3	F	0	3 x 0 = 00
Course 6	3	C	7	3 x 7 = 21
Course 7	2	A	9	2 x 9 = 18
Total	20			141

Thus, SGPA at the end of 1st Semester= $141/20=7.05$

Illustration No.2 (a)

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 5	3	D	6	3 x 6 = 18
Total Credits of the Semester	20			Ci(First Attempt)141 +Ci (subsequent attempt) 18= 159

Thus, SGPA= $159/20=7.95$

Illustration No.3**Second Semester performance:**

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	9	3 x 9 = 27
Course 2	3	C	7	3 x 7 = 21
Course 3	3	B	8	3 x 8 = 24
Course 4	3	Ex	10	3 x 10 = 30
Course 5	3	A	9	3 x 9 = 27
Course 6	3	C	7	3 x 7 = 21
Course 7	2	A	9	2 x 9 = 18
Total	20			168

Thus, SGPA of 2nd Semester = $168/20=8.4$

CGPA at the end of 2nd Semester: $CGPA = \frac{20 \times 7.95 + 20 \times 8.4}{40} = 8.175$

<i>Sem-1</i>	<i>Sem-2</i>	<i>Sem-3</i>	<i>Sem-4</i>
Credit : 20	Credit: 20	Credit : 10	Credit : 20
SGPA: 7	SGPA: 8.5	SGPA: 9.2	SGPA: 6.86

CGPA after Final Semester:

Thus, CGPA = $\frac{20 \times 7 + 20 \times 8.5 + 10 \times 9.2 + 20 \times 6.86}{70} = 7.70$

AWARD OF CLASS:

A candidate who becomes eligible for the award of M.Tech degree shall be placed in one of the following classes based on CGPA.

TABLE: CGPA Required for Award of Class

Distinction	$\geq 7.75^*$
First Class	≥ 6.75
Second Class	≥ 6.0

*In addition to the required CGPA of 7.75, the student must have necessarily passed all the courses of each semester in the first attempt.

9.0 MALPRACTICES:

The Principal shall refer the cases of malpractices in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to an Enquiry Committee constituted by him. The committee will submit a report on the malpractice allegedly committed by the student to the Principal.

Rules pertaining to the punishments in the case of Malpractice are given in Annex-I

10.0 ADDITIONAL ACADEMIC REGULATIONS:

Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his performance in all courses taken in that semester and also indicating the grades and SGPA.

Transcripts: After successful completion of the total programme of study, a Transcript containing performance of all academic years will be issued as a final record. Candidates shall be permitted to apply for recounting/revaluation within the stipulated period with payment of prescribed fee. The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

11.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the **college** or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

12.0 TRANSITORY REGULATIONS:

For students admitted under special cases (mentioned in 1.1) these transitory regulations will provide the modus operandi.

At the time of such admission, based on the programme pursued (case by case):

1. Equivalent courses completed by the student are established by the BOS concerned.
2. Marks/Credits are transferred for all such equivalent courses and treated as successfully cleared in the Programme of study prescribed by SVEC.
3. A Programme chart of residual courses not cleared will be derived and a Programme of study with duration specified will be prescribed for pursuit at SVEC.
4. Marks obtained in the previous system if the case be, are converted to grades and CGPA is calculated accordingly.
- 5.

All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom such a candidate is included into.

Regarding the students who were admitted under JNTU, Kakinada regulations for affiliated colleges:

If they happen to join and study along with their juniors at SVEC, the transitory regulations to be specified by JNTU, Kakinada for such students have to be followed.

13.0 GENERAL:

- i. Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- ii. The academic regulation should be read as a whole for the purpose of any interpretation.
- iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.
- iv. The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Annexure-I**MALPRACTICES**

S.No	Nature of Malpractices/Improper Conduct	Punishment
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.

3.	Impersonates any other candidate in connection with the examination	The candidate who has impersonated shall be expelled From examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the Examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in the subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat .
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges In any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment	

M.Tech CSE Programme Course Structure

(With effect from 2018-19 Admitted Batch onwards)

I-SEMESTER

S.No.	Course Code	Course	L	T	P	C
1	V18CTT01	Object Oriented Software Engineering	3	-	-	3
2	V18CTT02	NOSQL Database	3	-	-	3
3	V18CTT03	Advanced Computer Architecture	3	-	-	3
4	V18CTT04	Advanced Operating Systems	3	-	-	3
5	V18CTT05	Advanced Data Structures and Algorithm Analysis	3	-	-	3
6	V18CTT06	Machine Learning	3	-	-	3
7	V18CTL01	NOSQL Database Lab	-	-	2	1
8	V18CTL02	Advanced Data Structures and Algorithm Analysis Lab	-	-	2	1
9	V18CTT41	Seminar-I	-	2	-	2
Total Credits			18	2	4	22

**L = Lecture, T = Tutorial, P = Practical & C = Credits*

Total Contact Hours=24

II-SEMESTER

S.No.	Course Code	Course	L	T	P	C
1	V18CTT07	Data Science	3	-	-	3
2	V18CTT08	Advanced Web Technologies	3	-	-	3
3	V18CTT09	Cloud Computing	3	-	-	3
4	V18CTT10	Internet of Things	3	-	-	3
5	Elective-I		3	-	-	3
	V18CTT11	1) Cyber Security				
	V18CTT12	2) Artificial Intelligence				
	V18CTT13	3) Bioinformatics				
V18CTT14	4) Wireless Sensor Networks					
6	Elective-II		3	-	-	3
	V18CTT15	1) Image Processing				
	V18CTT16	2) Parallel Algorithms				
	V18CTT17	3) Mobile Computing				
V18CTT18	4) Grid Computing					
7	V18CTL03	Data Science Lab	-	-	2	1
8	V18CTL04	Advanced Web Technologies Lab	-	-	2	1
9	V18CTT42	Seminar-II	-	2	-	2
Total Credits			18	2	4	22

**L = Lecture, T = Tutorial, P = Practical & C = Credits*

Total Contact Hours=24

M.Tech CSE Programme Course Structure

(With effect from 2018-19 Admitted Batch onwards)

III-SEMESTER

S.No.	Course Code	Course	L	T	P	C
1	V18CTT43	MOOCS Course	-	-	-	MNC
2	V18CTT44	Comprehensive Viva Voce	-	-	-	2
3	V18CTL05	Project Work	-	-	-	-
Total Credits						2

**L = Lecture, T = Tutorial, P = Practical & C = Credits*

IV-SEMESTER

S.No.	Course Code	Course	L	T	P	C
1	V18CTL05	Project Work(Continued)	-	-	-	24
Total Credits						24

L = Lecture, T = Tutorial, P = Practical & C = Credits

Total Credits (for all sems) = 70

I-I	OBJECT ORIENTED SOFTWARE	L	T	P	C
		3	0	0	3

Course Outcomes:**After completion of this course the students will be able to:**

1. Describe Software development life cycle for Object-Oriented solutions of Real-world problems.
2. Discuss Planning, Estimation and CASE tools.
3. Apply OO concepts along with their applicability contexts.
4. Demonstrate object oriented analysis and design.
5. Describe Implementation, Integration and Maintenance phases.

UNIT I: Introduction to Classical software Engineering: Historical, Economic and Maintenance aspects. Introduction to OO Paradigm. Different phases in structured paradigm and OO Paradigm. Software Process and different life cycle models and corresponding strengths and weaknesses.

UNIT II: Planning and Estimation: Estimation of Duration and Cost, COCOMO components of software. Project Management plan. Planning Object-Oriented Projects. **Tools for step wise refinement:** Cost - Benefit analysis, Introduction to software metrics and CASE tools. Taxonomy and scope of CASE tools.

UNIT III: Modules to objects: Cohesion and Coupling, Data Encapsulation and Information hiding aspects of Objects. Inheritance, Polymorphism and Dynamic Binding aspects. Cohesion and coupling of objects. Reusability, Portability and Interoperability aspects.

Introduction to testing, with focus on Utility, Reliability, Robustness, Performance, Correctness.

UNIT IV: Requirement phase: Rapid Prototyping method, Specification phase, Specification Document, Formal methods of developing specification document, Examples of other semi - formal methods of using Finite-State- Machines, Petri nets and E- Language.

Analysis phase: Use case Modeling, Class Modeling, Dynamic Modeling, Testing during OO Analysis.

UNIT V: Design phase: Data oriented design, Object Oriented design, and Formal techniques for detailed design. Challenges in design phase.**IIM Phases:** Implementation, Integration and maintenance phases, OOSE aspects in these phases.

TEXT BOOKS:

1. Object oriented and Classical Software Engineering, **7/e**, Stephen R. Schach, TMH
2. Object oriented and classical software Engineering, Timothy Lethbridge, Robert Laganieri, TMH, **Second Edition**.

REFERENCE BOOKS:

1. Component-based software engineering: 7th international symposium, **CBSE 2004**, Ivica Crnkovic, Springer.

I-I	NOSQL Database	L	T	P	C
		3	0	0	3

Course Outcomes:

- After successful completion of the course students should be able to:
- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data
- Performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases.

UNIT I: Introduction: Overview and History of NoSQL Databases Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points, Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases.

UNIT II: Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III: NoSQL Key/Value databases using MongoDB, Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV: Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use

UNIT V: NoSQL Key/Value databases using Riak, Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Graph NoSQL databases using Neo4j, NoSQL database development tools and programming languages, Graph Databases, What Is a Graph Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use

TEXT BOOKS:

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , **1st Edition, 2012.**
Authors: Sadalage, P. & Fowler, Publication: Pearson Education.
2. The Definitive Guide to MongoDB: A complete guide to dealing with Big Data using MongoDB, **3rd Edition, December, 2015.** Authors: Eelco Plegge, David Hows, Peter Membrey, Tim Hawkins, Apress Publishers

REFERENCE BOOKS:

1. Redmond, E. ,Wilson, Perkins: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition: **2nd Edition,2018,** O'Reilly Publishers.

I-I	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

Course Outcomes

After completion of this course, student will be able to:

1. Identify different types of parallel computer models
2. Describe various processor and memory organizations.
3. Explain Pipelining, Multiprocessors and Multicomputers concepts.
4. Explain Multivector, SIMD Computers and Multithreaded, Dataflow Architectures.
5. Illustrate the parallel programming models and instruction level parallelism.

UNIT – I: Parallel computer models: The state of computing, Multiprocessors and Multicomputers, Multivector and SIMD computers. **Program and network properties:** Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms.

UNIT – II: Processors: Advanced Processor Technology, Superscalar Processors and Vector Processors. **Memory Hierarchy, Cache and Shared Memory:** Memory Hierarchy Technology, Virtual Memory Technology, Cache Memory Organizations, Shared-Memory Organizations.

UNIT – III: Pipelining: Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design. **Multiprocessors and Multicomputers:** Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message Passing Mechanisms.

UNIT – IV: Multivector and SIMD Computers: Vector Processing Principles, Compound Vector Processing. **Scalable, Multithreaded, Dataflow Architectures:** Latency-Hiding Techniques, Principles of Multithreading.

UNIT – V: Parallel Models, Languages: Parallel Programming Models, Parallel Languages and Compilers. **Instruction Level Parallelism:** Problem Definition, Model of a Typical Processor, Compiler- detected Instruction Level Parallelism, Operand Forwarding, Reorder Buffer, Register Renaming, Tomasulo's Algorithm, Branch Prediction.

TEXT BOOKS:

Advanced Computer Architecture: Parallelism, Scalability, Programmability, Kai Hwang, Naresh Jotwani, **Second Edition**, Tata McGraw Hill Education

REFERENCE BOOKS:

1. Computer Organization and Design, David A. Patterson and John. L. Hennessy, **Fifth Edition**, Morgan Kaufmann Series.
2. Computer Architecture and Organization, John P. Hayes, **Third Edition**, McGraw Hill Education.
3. Computer Architecture and Organization: Design Principles and Applications, B. Govindarajulu, **Second Edition**, McGraw Hill Education.

I-I	ADVANCED OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of this course, the student will be able to:

- Define, Explain, and Apply Distributed Operating System Concepts: Architectures of Distributed Systems, Distributed Mutual Exclusion, Issues and its Inherent Limitations.
- Describe the concepts of Distributed Resource Management, Dead lock Detection and Resolution
- Explain the concepts of Distributed Shared Memory, Distributed Scheduling, Failure Recovery and Fault tolerance
- Describe the concepts of Cryptography and Data Security in Distributed System
- Describe Multiprocessor Operating System and Database Operating System: Concepts, Architecture and Design issues

UNIT - I: Architectures of Distributed Systems - System Architecture types - issues in distributed operating systems - communication networks - communication primitives. Theoretical Foundations – inherent limitations of a distributed system - lamp ports logical clocks - vector clocks - casual ordering of messages - global state - cuts of a distributed computation - termination detection. Distributed Mutual Exclusion - introduction - the classification of mutual exclusion and associated algorithms – a comparative performance analysis.

UNIT-II: Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms - hierarchical deadlock detection algorithms. Agreement protocols - introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture - mechanism for building distributed file systems - design issues - log structured file systems.

UNIT-III: Distributed shared memory-Architecture- algorithms for implementing DSM - memory coherence and protocols - design issues. Distributed Scheduling - introduction - issues in load distributing - components of a load distributing algorithm - stability - load distributing algorithm – performance comparison - selecting a suitable load sharing algorithm - requirements for load distributing –task migration and associated issues. Failure Recovery and Fault tolerance: introduction- basic concepts - classification of failures - backward and forward error recovery, backward error recovery- recovery in concurrent systems - consistent set of check points - synchronous and asynchronous check pointing and recovery - check pointing for distributed database systems- recovery in replicated distributed databases.

UNIT-IV: Protection and security -preliminaries, the access matrix model and its implementations.-safety in matrix model- advanced models of protection. Data security - cryptography: Model of cryptography, conventional cryptography- modern cryptography, private key cryptography, data encryption standard public key cryptography - multiple encryption - authentication in distributed systems.

UNIT-V: Multiprocessor Operating Systems - basic multiprocessor system architectures - inter connection networks for multiprocessor systems - caching - hypercube architecture. Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling. Database Operating systems :Introduction- requirements of a database operating system Concurrency control : theoretical aspects - introduction, database systems - a concurrency control model of database systems- the problem of concurrency control - serializability theory- distributed database systems, concurrency control algorithms - introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms - concurrency control algorithms, data replication.

TEXT BOOKS:

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", **TMH, 2001**

REFERENCE BOOKS:

1. Andrew S.Tanenbaum, "Modern operating system", **PHI, 2003**

2. Pradeep K.Sinha, "Distributed operating system-Concepts and design", **PHI, 2003**.

3. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, **2003**.

I-I	ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Build Linear data structures using static and dynamic memory allocation.
- Construct different types of trees.
- Implement different types of graph algorithms.
- Analyze algorithms and to determine correctness and time efficiency of algorithm.
- Implement dynamic programming for different types of problems.

UNIT – I: Performance analysis, asymptotic notation, performance measurement. Linear Data Structures-Abstract Data Types, Linked list - Single, double and Circular linked list, Skip list. Stacks and Queues implement using Array representation and Linked list representation, Circular Queues, applications of stacks and queues.

UNIT – II: Trees – Introduction to trees, Binary tree, Threaded Binary tree, Binary Search Tree, AVL Trees, Red Black Trees, Splay tree. Multi way trees: B- Trees , B* Tress, B⁺ Trees , prefix B⁺ Tress, 2-3 trees, tree traversal techniques, tries.

UNIT – III: Graphs – Introduction to Graphs, Graph representation(array and linked list), Graph traversing algorithms, complexity analysis of BFS and DFS, Spanning trees, Shortest path calculation, topological sort and graph applications.

UNIT – IV: Algorithm analysis – Introduction, Greedy Method and its applications (I/o Knapsack Problem and topological sort). Divide and conquer and its applications (Merge sort and quick sort).

UNIT – V: Dynamic programming and its applications (I/o Knapsack problem and all pairs shortest path), Back Tracking and its applications (I/o Knapsack problem, travelling sales person). Branch and bound and its applications (I/o Knapsack problem, travelling sales person).

TEXT BOOKS:

1. “Data Structures, Algorithms and Applications in C++ “, ,Sartaj Sahni, University Press **Second Edition**.
2. “Data Structures and algorithms in JAVA”, Adam Drozdek, Thomson Course Technology, Indian edition, **second edition**.

REFERENCE BOOKS:

1. Data Structures, A Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage **Second Edition**.
2. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
3. Classic Data Structures, **2/e**, Debasis, Samanta, PHI,**2009**.

I-I	MACHINE LEARNING	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of this course, the student will be able to:

- Recognize the characteristics of machine learning that make it useful to real-world Problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- Have heard of a few machine learning toolboxes.
- Be able to use support vector machines.
- Be able to use regularized regression algorithms.

UNIT - I: The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, **Models:** the output of machine learning, **Features,** the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation.

UNIT-II: Beyond binary Classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning:** The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts.

UNIT-III: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:** Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT-IV: Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods. **Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT-V: Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables. **Features:** Kinds of feature, Feature transformations, Feature construction and selection. **Model ensembles:** Bagging and random forests, Boosting

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge, 2012.
2. Machine Learning, Tom M. Mitchell, MGH, 2017.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge, 2014.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

I-I	NOSQL Database Laboratory	L	T	P	C
		0	0	2	1

Course Outcomes

After successful completion of the course students should be able to:

1. Install and run MongoDB
2. Identify differences between relational and NoSQL database systems
3. Execute various operations in Mongo DB
4. Apply Mapreduce for problem solving
5. Know Column oriented databases

LIST OF EXPERIMENTS

1. Introduction to MongoDB and its Installation on Windows & Linux
2. Description of mongo Shell, Create database and show database
3. Commands for MongoDB and To study operations in MongoDB – Insert, Query, Update, Delete and Projection
4. Where Clause equivalent in MongoDB
5. To study operations in MongoDB – AND in MongoDB, OR in MongoDB, Limit Records and Sort Records. To study operations in MongoDB – Indexing, Advanced Indexing, Aggregation and Map Reduce.
6. Practice with ' macdonalds ' collection data for document oriented database. Import restaurants collection and apply some queries to get specified output.
7. Simple Querying using simple select(row and column) and Hive functions
8. Advanced querying using table joins, sampling in hive and subqueries
9. Define an external Hive table and review the results
10. Column oriented databases study, queries and practices

I-I	ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS LAB	L	T	P	C
		0	0	2	1

Course Outcomes:

After completion of this course, student will be able to:

- Design and analyze simple linear and non linear data structures
- Implement ADT for Data Structures
- Implement algorithms using different types of technique.
- Strengthen the ability to identify and apply the suitable data structure for the given real world problem

List of Experiments

Implement the following list of experiments using C++:

1. Write a program to implement single linked list, double linked list and circular linked list using ADT.
2. Implement stack and queue using ADT.
3. Implementation of Multi-stack in a Single Array
4. Implement evolution of expression
5. Implement AVL Trees operations and display the tree elements using any one non recursive traversing technique.
6. Construct a graph and implement BFS and DFS graph traversal techniques.
7. Construct a graph and implement Prims and Kruskals minimum spanning trees.
8. Implement single source and all pair shortest path algorithms.
9. Implement Merge sort and quick sort using divide and conquer technique
10. Implement I/o Knapsack Problem using greedy technique
11. Implement travelling sales person problem using back tracking.
12. Implement any algorithm using Branch and Bound technique.

I-II	DATA SCIENCE	L	T	P	C
		3	0	0	3

Course Outcomes:

- After completion of this course, student will be able to:
- Understand the process of data validation and its role in decision making
- Understand, create, and modify analytic and exploratory algorithms operating over data. Verify and quantify the validity of hypothesis using data analytics.
- Know the privacy and data protection legislation and the data scientist professional code and ethics.

UNIT-1: Introduction: What is Data Science? What roles exist in Data Science? Current landscape of perspectives. Define the workflow, tools and approaches data scientists use to analyze data. Define a problem and identify appropriate data sets using the data science workflow. Walkthrough the data science workflow using a case study.

UNIT-II: Statistics Fundamentals: Exploratory Data Analysis and the Data Science Process-analyze datasets using basic summary statistics: mean, median, mode, max, min, quartile, inter-quartile, range, variance, standard deviation and correlation.

UNIT-III: Data Visualization – scatter plots, scatter matrix, line graph, box blots, and histograms. Identify a normal distribution within a dataset using summary statistics and visualization. Causation vs. Correlation. Test a hypothesis within a sample case study. Validate your findings using statistical analysis.

UNIT-IV: Foundations of Data Modeling: Introduction Regression – data modelling and linear regression. Categorical variables versus Continuous variables. Build the linear regression/logistic regression model using a dataset. Fit model – regularization, bias and error metrics. Evaluate model fit using loss functions – MSE (Mean Square Error), RMSE (Root MSE), Mean Absolute Error(MAE). Apply different regression models based on fit and complexity. Evaluate model using metrics such as accuracy/error, Confusion matrix, ROC curve and Cross Validation.

UNIT-V: Dimensionality Reduction – perform dimensionality reduction using topic models such as PCA and SVD. Refine and extract data/information from sample datasets. Introduction to Classification - define classification model, apply k-NN, Naïve Classifier and Decision trees. Build the classification model using a dataset and evaluate.

TEXT BOOKS:

1. The Art of Data Science: A Guide for Anyone Who Works with Data, Roger D. Peng, Elizabeth Matsui, Lean Pub, **2015**.
2. Doing Data Science, Straight Talk from The Frontline, Cathy O'Neil and Rachel Schutt. O'Reilly. **2014**.
3. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking, Foster Provost and Tom Fawcett. **2013**
4. Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, **2009**.

REFERENCE BOOKS:

1. Mining of Massive Datasets, JureLeskovek, AnandRajaraman and Jeffrey Ullman. Cambridge University Press. **2014**.
2. Machine Learning: A Probabilistic Perspective. Kevin P. Murphy, MIT Press, **2013**.
3. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr., Cambridge University Press. **2014**.
4. R Programming for Data Science, Roger D. Peng, LeanPub, **2015**.
5. Python for Data Science for Dummies, Luca Massaron and John Paul Mueller, John Wiley and Sons, **2015**.

I-II	Advanced Web Technologies	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of the course, the student will be able to:

1. Understand the current technologies in Internet world
2. Design interactive web pages using HTML & Style Sheets and design Individual Graphical User Interfaces
3. Acquire knowledge of XML fundamentals and usage of XML technology in electronic data Interchange and creation of desktop applications using swings and beans.
4. Know the fundamentals of client side scripting such as JavaScript and apply it for data validation.
5. Design and develop web based enterprise systems for the enterprises using technologies like JSP with database.
6. Implement client side programming using java script, CSS
7. Learn and implement advanced and current technologies like AJAX, JQuery, PHP, Servlets, and JSP
8. Learn to implement web services

UNIT-I

HTML & CSS: Introduction - Elements, Tags, Attributes, Heading, Paragraph. Formatting, Link, Image, Table, List, Block, Form, Frame Layout, DHTML, Basic Web Page Development, CSS- Create Class Styles, Create ID Styles ,Span, Colors.HTML5 in brief.

JavaScript : Introduction - JavaScript in Web Pages, The Advantages of JavaScript Writing JavaScript into HTML; Building Up JavaScript Syntax; Basic Programming Techniques; Operators and Expressions in JavaScript; JavaScript Programming Constructs; Conditional Checking Functions in JavaScript, Dialog Boxes, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array. Function, Errors, Validation. The JavaScript Document Object Model-Introduction (Instance, Hierarchy); The JavaScript Assisted Style Sheets DOM; Understanding Objects in HTML (Properties of HTML objects, Methods of HTML objects); Browser Objects, Handling Events Using JavaScript

UNIT-II

Extensible Markup Language (XML):- Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation, Tree, Syntax, Elements, Attributes, Validation, and Viewing. XHTML in brief

Installing and Configuring MySQL:- Current and Future Versions of MySQL , How to Get MySQL, Installing MySQL on Windows, Trouble Shooting your Installation, Basic Security Guidelines

UNIT-III

Advanced Dynamic Web Client Side Programming: AJAX-xml Http Request object-AJAX applications-AJAX frame work -java script libraries - JQuery-basics – event handling, DOM,AJAX-effects- jQuery UI Web design Frameworks: Responsive web design-overview on Twitter bootstrap-DoJo- YahooUI-Google web toolkit libraries-Applets-overview on javaFX applets

UNIT-IV

Server Side Programming with PHP: The Building blocks of PHP, Variables, Data Types, Operators and Expressions, Constants. Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser Output.

Functions: What is function? Calling functions, Defining Functions. Variable Scope, more about arguments working with Arrays and Some Array-Related Functions.

Working with Objects: Creating Objects, Object Instance Working with Strings, Dates and Time: Formatting strings with PHP, Investigating Strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP

Working with Forms: Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, and Working with File Uploads.

Learning basic SQL Commands: Learning the MySQL Data types, Learning the Table Creation Syntax, Using Insert Command, Using SELECT Command, Using WHERE in your Queries, Selecting from Multiple Tables, Using the UPDATE command to modify records, Using the DELETE Command, Frequently used string functions in MySQL, Using Date and Time Functions in MySQL.

Interacting with MySQL using PHP: MySQL Versus MySQLi Functions, Connecting to MySQL with PHP, Working with MySQL Data.

UNIT-V

Server Side Programming With Servlets and JSP: Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues, Introduction to JSP: The Anatomy of a JSP Page. JSP Application Design with MVC , JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing Sharing Session and Application Data Memory Usage Considerations

TEXT BOOKS:

1. “*Java server programming java JavaEE5 Black Book*”, Kogent Solutions Dreamtech Press, Inc, ISBN-13 9788177228359 ISBN-10 8177228358, 2008.
2. “*AJAX black book*”, new edition, Kogent Solutions Inc, Dreamtech Press, ISBN:10-81-7722- 838-2 ISBN:13-978-81-7722-838-063. Jonathan Chaffer, Karl Swedberg, “*Learning jQuery*”, 3rd Edition , , ISBN 13: 9781849516549, 2011
3. Chris Bates, *Web Programming- building internet applications*, 2nd edition, WILEY Dreamtech, 2006
4. Patrick Naughton and Herbert Schildt, *The complete Reference Java seventhEdition*, TMH, 2007
5. Hans Bergsten, *Java Server Pages*, SPD O’Reilly, 2000
6. Robert W. Sebesta, *Programming world wide web*, Pearson Education, 4th edition, 2010
7. Marty Hall and Larry Brown, *Servlets And Java Server Pages Volume 1: CORE Technologies*, Pearson, 2003.
8. Patrick Naughton and Herbert Schildt, *The complete Reference Java 2 fifth Edition*, TMH, 1999.
9. “Internet and world wide web – How to Program”, Deitel & Deitel, Goldberg, Pearson Education, **4th Edition, 2008.**

REFERENCE BOOKS:

1. Professional Java Server Programming, S. Allamaraju and others Apress (dreamtech), J2EE 1.3ed, **2007.**
2. Java Server Programming , Ivan Bayross and others, The X Team, SPD, **2nd Edition.**
3. Web Warrior Guide to Web Programmimg-Bai/Ekedaw-Thomas , **1st Edition.**
4. Beginning Web Programming-Jon Duckett WROX, **August 2004.**
5. Java Server Pages, Pekowsky, Pearson, **2nd Edition.**
6. Java Script, D. Flanagan, O’Reilly, **6th Edition.**

I-II	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Course Outcomes are:

After completion of the course the student will be able to

1. Able to understand about Cloud Computing Platforms and Technologies.
2. Students will be aware about Architecture and Open Challenges in Cloud Computing.
3. Students will be able to monitor and manage cloud computing applications.
4. Students will be able to describe the mechanisms needed to harness Cloud Computing in their own respective endeavors.
5. Students will be able to solve case studies related to Cloud Computing.

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing

Introduction to Cloud Computing Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards

UNIT-II

Cloud Computing Architecture Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) , Platform as a Service(PaaS), Software as a Service(SaaS) Deployment Models Public cloud, Private cloud, Hybrid cloud, Community cloud.

UNIT-III

Infrastructure as a Service(IaaS) Introduction to IaaS IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization Server, Storage, Network Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) Examples Amazon EC2 Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service(PaaS) Introduction to PaaS What is PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure

Software as a Service (PaaS) Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS

UNIT-IV

Service Management in Cloud Computing Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability & Cloud Services Database & Data Stores in Cloud Large Scale Data Processing

UNIT-V

Cloud Security Infrastructure Security Network level security, Host level security, Application level security Data security and Storage Data privacy and security Issues, Jurisdictional issues raised by Data location Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

TEXT BOOKS:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, **2010**
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, **2011**.
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, **2012**.
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, **2010**.
5. Gautam Shroff, "*Enterprise Cloud Computing Technology Architecture Applications*", Cambridge University Press; 1 edition, [ISBN: 978-0521137355], **2010**.
6. Toby Velte, Anthony Velte, Robert Elsenpeter, "*Cloud Computing, A Practical Approach*" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], **2009**.
7. Dimitris N. Chorafas, "*Cloud Computing Strategies*" CRC Press; 1 edition [ISBN: 1439834539], **2010**.
8. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)

REFERENCE BOOKS:

1. Enterprise Cloud Computing by Gautam Shroff, Cambridge, **2010**.
2. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, Mastering Cloud Computing, published by McGraw Hill Publication (India) Private Limited, **2013** (ISBN 978-1-25-902995-0).
3. John W. Rittinghouse, James F. Ransome, Cloud Computing implementation, management and security, CRC Press, Taylor & Francis group, **2010**.
4. Anthony T. velte, Toby J. velte Robert Elsenpeter, Cloud computing a practical approach, Tata Mc Graw Hill edition, **2010**.

I-II	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
- Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
- Develop critical thinking skills
- Compare and contrast the threat environment based on industry and/or device type

UNIT – I: The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices

UNIT – II: Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT – III: Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT – IV: Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT – V: Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

TEXT BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education, **2017**.
2. Internet of Things, A. Bahgya and V. Madiseti, Univesity Press, **2015**.

REFERENCES

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, **2013**.
2. Getting Started with the Internet of Things Cuno Pfister , Oreilly, May **2011**.

I-II	CYBER SECURITY (Elective-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Understand the broad set of technical, social & political aspects of Cyber Security.
- Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure.
- Understand the nature of secure software development, operating systems and data base design.
- Recognized the role security management plays in cyber security defense.
- Understand the security management methods to maintain security protection.
- Understand the legal and social issues at play in developing solutions

UNIT-I: Systems Vulnerability Scanning: Overview of vulnerability scanning, Open Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe, Vulnerability examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

UNIT – II: Network Defense tools: Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs

Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of

Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection

System

UNIT – III: Web Application Tools: Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, Open SSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

UNIT – IV:Introduction to Cyber Crime and law: Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

UNIT – V:Introduction to Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking,Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.

TEXT BOOKS:

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill, **Fourth Edition,2014.**
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley, **First Edition, 2011.**

REFERENCE BOOKS:

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman,**First Edition,2007.**
2. CISSP Study Guide, **6th Edition** by James M. Stewart

I-II	ARTIFICIAL INTELLIGENCE (Elective-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of the course, the student will be able to:

- Describe Artificial Intelligence Techniques.
- Illustrate Knowledge Representation in AI
- Explain the concepts of planning and learning in AI

UNIT – I: Artificial Intelligence Introduction: The AI Problems, AI Technique, Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

UNIT –II: Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Approach, Problem Reduction, Constraint Satisfaction, Means-Ends analysis.

UNIT –III: Knowledge Representation using Predicate Logic and Rules: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.

UNIT –IV: Planning: The Blocks World Example, Components of a Planning System, Goal Stack Planning, Nonlinear planning using constraint posting, Hierarchical Planning, Reactive Systems.

UNIT –V: Learning: Rote Learning, Learning by taking advice, Learning in problem solving, Learning from examples, Explanation Based Learning, Discovery, Analogy, Formal Learning Theory.

TEXTBOOK:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair, Third Edition, Tata McGraw Hill Education Private Limited., **2009**

REFERENCES:

1. Artificial intelligence A modern Approach , **3rd Edition**, Stuart Russel, Peter Norvig, Pearson Education.
2. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier, **1st Edition, 1997.**

I-II	BIO INFORMATICS (Elective-I)	L	T	P	C
		3	0	0	3

Outcomes:

After completion of the course the student will be able to

1. **Broad Understanding of Biology:** Students will interpret relationships among living things and analyze and solve biological problems, from the molecular to ecosystem level using basic biological concepts, grounded in foundational theories."
2. **Computer Programming:** Students will create computer programs that facilitate bioinformatics.
3. The students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge
4. The students will be able to explain the major steps in pairwise and multiple sequence alignment, explain the principle for, and execute Pairwise sequence alignment by dynamic programming

UNIT-I: Basic Biology: What is life? The unity and the diversity of living things, Prokaryotes and Eukaryotes, Yeast and People, Evolutionary time and relatedness, Living parts: Tissues, cells, compartments and organelles, Central dogma of molecular biology, Concept of DNA, RNA, Protein and metabolic pathway.

Bio Informatics: Introduction, What is Bioinformatics? Recent challenges in Bioinformatics, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction

UNIT-II: Biological databases: Their needs and challenges. Example of different biological databases – sequence, structure, function, micro-array, pathway, etc, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases, Genome Information Resources DNA sequence databases, specialized genomic resources

UNIT-III : Sequence Analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases. **Theory and Tools:** - Pairwise alignment – Different local and global search alignment, Heuristic searches (like BLAST) applicable to search against database, Multiple alignment algorithms, Whole genome comparison, Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

UNIT-IV: Walk through the genome: Prediction of regulatory motifs, Operon, Gene, splices site, etc.

Markov models: Hidden Markov models – The evaluation, decoding and estimation problem and the algorithms. Application in sequence analysis

UNIT-V: Molecular phylogeny: maximum Parsimony, distance Matrix and maximum likelihood methods. Concepts of adaptive evolution. **Application of graph theory in Biology:** Biochemical Pathway, Protein-protein interaction network, Regulatory network and their analysis.

TEXT BOOKS:

1. Bioinformatics: Sequence, Structure and Databanks: A Practical Approach (The Practical Approach Series, 236), Des Higgins (Editor), Willie Taylor. **1st edition, October 2000, Oxford University Press. ISBN: 978-0199637904.**
2. Bioinformatics: Sequence and Genome Analysis, David W. Mount. **2nd edition, June 2004,** Cold spring harbor laboratory press. ISBN: 978-0879697129
3. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic acids, R. Durbin, S.R. Eddy, A. Krogh and G. Mitchison, **1st Edition.**
4. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith Addison Wesley Longman ,**1999.**
5. Bioinformatics - A Beginner's Guide by Jean-Michel Claveriw, Cerdric Notredame, WILEY dreamlech India Pvt. Ltd, **2nd Edition, 2006.**

REFERENCE BOOKS:

1. Introduction to Bioinformatics by Arthur Lesk OXFORD publishers ,**2014.**
2. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Second Edition, Andreas D. Baxevanis, B. F. Francis Ouellette. **3rd edition, October 2004,** A John Wiley & Sons, Inc., Publication. ISBN: 978-0471478782.

I-II	WIRELESS SENSOR NETWORKS (Elective-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of this course, the student will be able to:

- Identify the applications and challenges of MANETs
- Explain Ad-hoc network routing protocols
- Describe Broadcasting, Multicasting and Geocasting Routing Protocols
- Describe and Discriminate Wireless LANs, Wireless PANs & Wireless Mesh Networks

UNIT-I: Introduction: Introduction to MANETs, Applications of MANETs, Challenges

UNIT-II: Routing in Ad hoc networks: Topology-Based versus Position Based Approaches, Topology-Based routing Protocols, Position-Based Routing, Other Routing Protocols

UNIT-III: Broadcasting, Multicasting and Geocasting: The Broadcasting Storm, Broadcasting in a MANET, Multicasting, Issues in providing Multicast in a MANET, Geocasting, Geocast Routing Protocols

UNIT-IV: Wireless LANs: Why Wireless LANs, Transmission Techniques, Medium Access Control Protocol Issues, The IEEE 802.11 Standard for Wireless LANs, Enhancement to IEEE 802.11 MAC

UNIT-V: Wireless PANs & Wireless Mesh Networks: Why Wireless PANs, The Bluetooth Technology, Enhancements to Bluetooth, Wireless Mesh Network Architecture, MR Deployment, IGW Deployment, Channel Assignment

TEXT BOOK:

1. Ad hoc and Sensor Networks Theory and Applications, Carlos de Morais Cordeiro, Dharma Prakash Agarwal, Second Edition, World Scientific, **2011**

REFERENCE BOOKS:

1. Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, **2004**
2. Ad hoc Networking, Charles E.Perkins, Pearson Education, **2001**

I-II	IMAGE PROCESSING (Elective-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Understand the basics of image processing.
- Understand 2 D Transformations.
- Learn the Digital image properties.
- Acquire the knowledge of mathematical concepts for application on image morphing.
- Be able to conduct independent study and analysis of image processing problems and techniques.

UNIT-I: Introduction: Applications of Computer Graphics and Image Processing, Fundamentals on Pixel concepts, effect of Aliasing and Jaggles, Advantages of high resolution systems DDA line algorithms: Bresenham's line and circle derivations and algorithms.

UNIT-II: 2-D Transformations: Translations, Scaling, rotation, reflection and shear transformations, Homogeneous coordinates, Composite Transformations- Reflection about an arbitrary line; Windowing and clipping, viewing transformations, Cohen- Sutherland clipping algorithm.

UNIT-III: Digital Image Properties: Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, Color perceived by humans, Color Spaces, Palette Images, color Constancy Color Images: Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Frichen, Canny Edge detection.

UNIT-IV: Mathematical Morphology: Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation.

UNIT-V: Segmentation: Threshold detection methods, Optimal Thresholding, Edge based Segmentation Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Merging Region Splitting, Splitting and Merging, Watershed Segmentation. Image Data Compression: Image data Properties, Discrete Image Transformations in data compression, Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predictive Compression methods, Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG- MPEG Image Compression methods.

TEXT BOOKS:

1. Computer Graphics C Version, Donald Hearn, M Paulli Baker, Pearson Education India, **1997, Second Edition** (Unit I and Unit II)
2. Image Processing, Analysis and Machine Vision, Millan Sonka, Vaclov Halvoc, Roger Boyle, Cengage Learning, **3ed**, (Unit III, Unit IV, Unit V and Unit VI)

REFERENCE BOOKS:

1. Computer & Machine Vision, Theory, Algorithms, Practicles, E R Davies, Elsevier, **4ed**
2. Digital Image Processing with MATLAB and LABVIEW, Vipul Singh, Elsevier, **2012**.

I-II	PARALLEL ALGORITHMS (Elective-II)	L	T	P	C
		3	0	0	3

Course Outcome: At the end of this course the student be able to

- Understand the various application areas.
- Understand the Efficiency of parallel algorithms,
- Understand parallel sorting network
- Understand parallel searching algorithm,

UNIT-I: Introduction:

Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law.

UNIT-II: Scheduling:

Organizational features of Processor Arrays, Multi processors and multi-computers. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm Coffman-graham scheduling algorithm for parallel processors.

UNIT-III: Algorithms:

Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms. Matrix Multiplication algorithms on SIMD and MIMD models. Fast Fourier Transform algorithms. Implementation on Hyper cube architectures. Solving linear file -system of equations, parallelizing aspects of sequential methods back substitution and Tri diagonal.

UNIT-IV: Sorting:

Parallel sorting methods, Odd-even transposition Sorting on processor arrays, Biotonic, merge sort on shuffle - exchange ID , Array processor,2D-Mesh processor and Hypercube Processor Array. Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations. Ellis algorithm and Manber and ladner's Algorithms for dictionary operations.

UNIT-V: Searching:

Parallel algorithms for Graph searching, All Pairs shortest paths and inimum cost spanning tree. Parallelization aspects of combinatorial search algorithms with Focus on Branch and Bound Methods and Alpha-beta Search methods.

TEXTBOOKS:

1. Parallel computing theory and practice, Michel J.Quinn,**2002,Second Edition.**
2. Programming Parallel Algorithms, Guy E. Blelloch, Communications of the ACM,**1996.**

I-II	MOBILE COMPUTING (Elective-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Describe the basic concepts and principles in mobile computing.
- Understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks.
- Understand positioning techniques and location based services and applications.
- Describe the important issues and concerns on security and privacy.

UNIT-I: Introduction to Mobile Communications and Computing: Introduction to cellular concept, Frequency Reuse, Handoff, GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, Introduction to mobile computing, novel applications, limitations, and architecture.

UNIT - II: Wireless LANs: Introduction, Advantages and Disadvantages of WLANs, WLAN Topologies, Introduction to Wireless Local Area Network standard IEEE 802.11, Comparison of IEEE 802.11a, b, g and n standards, Wireless PANs, Hiper LAN, Wireless Local Loop

UNIT - III: Wireless Networking: Introduction, Various generations of wireless networks, Fixed network transmission hierarchy, Differences in wireless and fixed telephone networks, Traffic routing in wireless networks, WAN link connection technologies, X.25 protocol, Frame Relay, ATM, Virtual private networks, Wireless data services, Common channel signaling, Various networks for connecting to the internet.

UNIT - IV: Database Issues: Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations.

UNIT - V: Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

TEXT BOOKS:

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education, **First Edition, 2013.**
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", **Wiley, 2002.**

REFERENCE BOOKS:

1. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, **October 2004.**
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, **2005.**
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, **2003.**
4. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, **2003.**

I-II	GRID COMPUTING (Elective-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

After completion of this course, student will be able to:

- Understand the need for and evolution of Grids in the context of processor- and data-intensive applications
- Be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery
- Be able to design and implement Grid computing.
- Be able to justify the applicability, or non-applicability, of Grid technologies for a specific application.

UNIT - I: Introduction: Introduction to Parallel, Distributed Computing, Cluster Computing and Grid Computing, Characterization of Grids, Organizations and their Roles, Grid Computing Road Maps.

UNIT - II: Architecture: Architecture of Grid and Grid Computing, Review of Web Services-OGSA-WSRF.

UNIT - III: Grid Monitoring: Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE - JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridM **Grid Middleware:** List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.

UNIT - IV: Data Management And Grid Portals: Data Management, Categories and Origins of Structured Data, Data Management Challenges, Architectural Approaches, Collective Data Management Services, Federation Services, Grid Portals, First-Generation Grid Portals, Second Generation Grid Portals.

UNIT - V: Semantic Grid and Autonomic Computing: Meta data and Ontology in the Semantic Web, Semantic Web services, Layered structure of the Semantic Grid, Semantic Grid activities, Autonomic Computing **Grid Security and Resource Management:** Grid Security, A Brief Security Primer, PKI-X509 Certificates, Grid Security, Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF - Grid Scheduling with QoS.

TEXT BOOKS:

1. Grid Computing, Joshy Joseph and Craig Fellenstein, Pearson Education **2004**.
2. The Grid Core Technologies, Maozhen Li, Mark Baker, John Wiley and Sons, **2005**.

REFERENCE BOOKS:

1. The Grid 2 - Blueprint for a New Computing Infrastructure, Ian Foster and Carl Kesselman, Morgan Kaufman - **2004**.
2. Grid Computing: Making the Global Infrastructure a reality, Fran Berman, Geoffrey Fox, Anthony J.G. Hey, John Wiley and sons, **2003**.

I-II	DATA SCIENCE LAB	L	T	P	C
		0	0	2	1

Course Outcomes:

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

- Understand the Concepts of R and Programming.
- Understand the mathematics from a numerical point of view, including the application of these concepts root-finding, numerical integration and optimization
- Understand the purpose for random variable and expectations required to understand simulations
- Implement the Monte carlo and Stochastic Modelling
- Work effectively in teams on data science projects using R

LIST OF EXPERIMENTS

1. R Environment Setup & R as calculating environment
2. R Basic programming, Input and output
3. Programming with functions & Sophisticated Data structures
4. Better Graphics using Graphics parameters
5. Frames and environments & Object –oriented Programming
6. Numerical Accuracy and program efficiency
7. Probability & Statistics: The law of Total probability
8. Simulation: Monte Carlo Integration – Hit and miss method
9. Data Modelling: Linear and Multiple Regression Models

Case Study

Consider the data set of Ozone levels in United States for the year 2014 and do the following analysis

1. Formulate your questions
2. Read in your data
3. Check the packaging
4. Look at the top and the bottom of your data
5. Check your “n” s
6. Validate with at least one external data source
7. Make a plot
8. Follow up

TEXT BOOKS:

1. Introduction to Scientific Programming and Simulation Using R, Owen Jones, Robert Maillardet and Andrew Robinson, Second Edition, CRC Press, 2014
2. The Art of Data Science: A Guide for Anyone Who Works with Data, Roger D. Peng, Elizabeth Matsui, LeanPub, 2015.
3. Data Science for Business: What You Need to Know about Data Mining and Data - analytic Thinking, Foster Provost and Tom Fawcett. 2013
4. Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2009.

REFERENCE BOOKS:

1. Mining of Massive Datasets, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Cambridge University Press. 2014.
2. Machine Learning: A Probabilistic Perspective. Kevin P. Murphy, MIT Press, 2013.
3. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
4. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr., Cambridge University Press. 2014.
5. R Programming for Data Science, Roger D. Peng, LeanPub, 2015.
6. Python for Data Science for Dummies, Luca Massaron and John Paul Mueller, John Wiley and Sons, 2015.

I-II	ADVANCED WEB TECHNOLOGIES LAB	L	T	P	C
		0	0	2	1

List of Experiments

1. a) A Simple HTML home page provides links to move to other pages like hobbies, educational info, personal info etc.
b) A HTML program to illustrate the use of frame and frameset tags of HTML.
c) A HTML Program which use a HTML controls to create a student information form to collect student's information like name, address, phone, email, sex, birth date, hobbies etc.
2. a) Create a webpage which displays "Hello World" with font size 20 pixels, bold format, in "Times New Roman" font and green in colour using inline CSS, embedded CSS and external CSS.
b) Create a webpage which displays the class time table and apply the following effects on the table:
 - ➔ For the table header apply *blue* as the background colour and *white* for the colour of the text in the table header.
 - ➔ Display *day names* (Mon, Tue etc...) in bold format with the first letter in the day name in uppercase.
 - ➔ Display *lunch* slightly in bigger font other than the remaining text.
c) Create a webpage to manage personal details like name, class, qualifications, photo, address etc., using tables and other suitable HTML tags. Apply the following style information:
 - ➔ Display the heading of the page in *Times New Roman* font and with 24px size.
 - ➔ Align all the field names like Name, Class, Photo etc to *right* in the table.
 - ➔ Apply *light blue* as background colour for the left side cells in the table which contains field names like Name, Class etc...
 - ➔ Also display your college logo as background image in the top right position of the web page.
d) Create a web page containing two images, where one image overlaps another image by using the *z-index* CSS property.
3. a) A HTML Program which demonstrates loops like for loop, do while, while in java script.
b) A HTML Program which demonstrates the use of functions in java script.
c) A HTML Program which demonstrates various events like onclick, ondblclick, onfocus, onblur, onchange, onmouseover, onmouseover, window event, onload, onunload event.
d) A HTML Program to create various functions and sub routines to validate the data entered by user in form.

4.
 - a) Create a program to illustrate the concept of associative array in PHP.
 - b) Create PHP program to implement the concept of Session management.
 - c) Create a PHP program to display student information in webpage. Student's data is stored in My SQL database.
 - d) Create a PHP program to insert student information from HTML form. Student's data is stored in My SQL database.
5.
 - a) Create a well-formed XML document.
 - b) Create a valid XML document using DTD.
 - c) Create a valid XML document using XML Schema.
 - d) Create a XML document which contains details of cars and display the same as a table using XSLT.
 - e) Write a Java program to parse the XML document containing car details using SAX API.
6.
 - a) Create a servlet to display "Hello World" in the browser.
 - b) Create a servlet to store email-id as an initialization parameter and print the same email-id by reading the initialization parameter from the web.xml file.
 - c) Create a servlet to retrieve name and branch details from a html page and print the same using the servlet.
 - e) Create a HTML page which accepts book id, book name and book price and a submit button. When the user clicks the submit button, all the values assigned to the previous text fields must be stored in a session object and the control forwards to another servlet where the values stored in the session are retrieved and displayed.
7.
 - a) Create a JSP page to display "Hello World" in the browser.
 - b) Create a JSP page to store email-id as an initialization parameter and print the same email-id by reading the initialization parameter from the web.xml file.
 - c) Create a JSP page to retrieve name and branch details from a html page and print the same using a servlet.
 - d) Create a HTML page which accepts book id, book name and book price and a submit button. When the user clicks the submit button, all the values assigned to the previous text fields must be stored in a session object and the control forwards to a JSP page where the values stored in the session are retrieved and displayed.
8. Create a HTML page which accepts student regd.no. and prints the results of that student by retrieving the results from the database. Use AJAX to display the "please wait..." while the server is processing the request and print the result of the student when the server returns the result. Server resource can be either servlet or JSP or PHP

Reference Books:

6. "*Java server programming java JavaEE5 Black Book*", Kogent Solutions Dreamtech Press, Inc, ISBN-13 9788177228359 ISBN-10 8177228358, 2008.
7. "*AJAX black book*", new edition, Kogent Solutions Inc, Dreamtech Press, ISBN:10-81-7722-838-2 ISBN:13-978-81-7722-838-0 6

3. Jonathan Chaffer, Karl Swedberg, "*Learning jQuery*", 3rd Edition , , ISBN 13: 9781849516549, 2011
8. Chris Bates,*Web Programming- building internet applications*, 2nd edition, WILEY Dreamtech, 2006
9. Patrick Naughton and Herbert Schildt, *The complete Reference Java seventhEdition*,TMH, 2007
10. Hans Bergsten, *Java Server Pages*, SPD O'Reilly, 2000
11. *Java Server Programming* ,Ivan Bayross and others,The X Team,SPD
12. *Web Warrior Guide to Web Programmimg*-Bai/Ekedaw-Thomas
13. *Begining Web Programming*-Jon Duckett WROX.
14. *Java Server Pages*, Pekowsky, Pearson.
15. *Java Script*,D.Flanagan,O'Reilly, SPD.