



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

An Autonomous Institution

(Sponsored by Lavu Educational Society)

[Affiliated to JNTUH, Hyderabad & Approved by AICTE, New Delhi]



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING BOARD OF STUDIES

S. No.	Name of the Member	Designation	Organization	Role
1	Dr. B. Phijik	Associate Professor & HoD	VMTW, Hyderabad.	Chairman
2	Dr. E. Hemalatha	Associate Professor	UCE, JNTUH	Member (JNTUH Nominee)
3	Dr. G. Madhu Sree	Principal	University College for Women, KU Warangal.	Member (Academician)
4	Dr. M. Jithender Reddy	Assistant Professor	Vasavi College of Engineering, Hyd.	Member (Academician)
5	Dr. M. Ramesh Babu	Project Manager, Cognizant	Cognizant, Hyd.	Member (Industry)
6	Ms. K. Lasya Priya	Software Engineer, TCS	TCS, Hyderabad.	Member (Alumni)
7	Dr.S.Ranga Swamy	Associate Professor & Dean IT Service	VMTW, Hyderabad.	Member
8	Mrs.M.Parimala	Associate Professor & Coordinator Academics	VMTW, Hyderabad.	Member
9	Mr.K.Bharath Reddy	Associate Professor	VMTW, Hyderabad.	Member
10	Dr. G. Rajesh	Associate Professor & CoE	VMTW, Hyderabad.	Member
11	Dr. P. Rajendra Prasad	Associate Professor & Dean IQAC	VMTW, Hyderabad.	Member
12	Mrs. G. Anitha	Sr. Assistant Professor	VMTW, Hyderabad.	Member
13	Mrs. P. Rupa	Sr. Assistant Professor	VMTW, Hyderabad.	Member
14	Mrs. B. Geetha	Sr. Assistant Professor	VMTW, Hyderabad.	Member
15	Mrs. Amulya Rachana	Assistant Professor	VMTW, Hyderabad.	Member
16	Mrs. M.Swathi	Assistant Professor	VMTW, Hyderabad.	Member



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Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



Department of Computer Science and Engineering

3rd BoS Meeting on 1st November- 2025

AGENDA

Item No.	Agenda Item
1.0	Review and Confirmation of Items
1.1	Review and confirmation of the Minutes of Meeting of the 2nd BoS held on 19 th August 2025.
1.2	Review and Confirmation of M.Tech Academic Regulations(VR25) from the Academic Year : 2025-26.
1.3	Review and Confirmation of M.Tech CSE Academic Calendar (VR25) for the Academic Year : 2025-26.
1.4	Review and Confirmation of M.Tech CSE Course Structure (VR25) from the Academic Year : 2025-26.
2.0	Approval Items
2.1	Approval of M.Tech CSE Syllabus (VR25) for I and II years from the Academic Year: 2025-26.
3.0	Any other items with permission of Chair


Chairman-BoS



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Department of Computer Science and Engineering

3rd BoS Meeting on 1st November-2025

Members:

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1	Dr. B. Phijik	Associate Professor & HoD	VMTW, Hyderabad.	Chairman	
2	Dr. E. Hemalatha	Associate Professor	UCE, JNTUH	Member (JNTUH)	
3	Dr. G. Madhu Sree	Principal	University College for Women, KU	Member (Academician)	
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5	Dr. M. Ramesh Babu	Project Manager, Cognizant	Cognizant, Hyd.	Member (Industry)	
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9	Dr. P. Rajendra Prasad	Associate Professor & Dean IQAC	VMTW, Hyderabad.	Member	
10	Dr. G. Rajesh	Associate Professor & CoE	VMTW, Hyderabad.	Member	
11	Mr.K.Bharath Reddy	Associate Professor	VMTW, Hyderabad.	Member	
12	Mrs. G. Anitha	Sr. Assistant Professor	VMTW, Hyderabad.	Member	
13	Mrs. P. Rupa	Sr. Assistant Professor	VMTW, Hyderabad.	Member	
14	Mrs. B. Geetha	Sr. Assistant Professor	VMTW, Hyderabad.	Member	
15	Mrs. Amulya Rachana	Assistant Professor	VMTW, Hyderabad.	Member	
16	Mrs. M.Swathi	Assistant Professor	VMTW, Hyderabad.	Member	

MINUTES BOOK

Vignan's Institute of Management & Technology for Women

(An Autonomous Institutions& Accredited by NBA & NAAC)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Minutes of the 3rd Board of Studies (BoS) meeting held on 1st November 2025, 2.30pm
Conference Hall, VMTW

The Quorum (minimum 40%) was satisfied.

The Chairman-BOS, Dr. B. Phijik introduced the following members to the Board.

S.No.	Name of the Member	Designation	Organization	Role
1	Dr. B. Phijik	Associate Professor & HoD	VMTW, Hyderabad.	Chairman
2	Dr. E. Hemalatha	Associate Professor	UCE, JNTUH	Member (JNTUH Nominee)
3	Dr. G. Madhu Sree	Principal	University College for Women, KU Warangal.	Member (Academician)
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5	Dr. M. Ramesh Babu	Project Manager, Cognizant	Cognizant, Hyd.	Member (Industry)
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14	Mrs. B. Geetha	Sr. Assistant Professor	VMTW, Hyderabad.	Member
15	Mrs. Amulya Rachana	Assistant Professor	VMTW, Hyderabad.	Member
16	Mrs. M.Swathi	Assistant Professor	VMTW, Hyderabad.	Member

The Following members were present:

- 1 Dr. B. Phijik
- 2 Dr. E. Hemalatha
- 3 Dr. G. Madhu Sree
- 4 Dr. M. Jithender Reddy
- 5 Dr. M. Ramesh Babu
- 6 Ms. K. Lasya Priya
- 7 Dr.S.Ranga Swamy
- 8 Mrs.M.Parimala
- 9 Mr.K.Bharath Reddy
- 10 Dr. G. Rajesh
- 11 Dr. P. Rajendra Prasad
- 12 Mrs. G. Anitha
- 13 Mrs. P. Rupa
- 14 Mrs. B. Geetha
- 15 Mrs. Amulya Rachana
- 16 Mrs. M.Swathi

The Chairman-BOS welcomed all the members to the meeting of the Board of Studies.

Proceedings of the meeting of the Board of Studies.

1.0 Review and Confirmation of Items.

1.1 Review and confirmation of the Minutes of Meeting of the 2nd BoS held on 19th August 2025

BoS- Chaiman – Presented the Minutes of Meeting of the 2nd BOS Meeting held on 19th August 2025.

The Board noted the points from the Minutes of the Meeting.

1.2 Review and Confirmation of M. Tech Academic Regulations (VR25) from the Academic Year : 2025-26

The Chairman-BoS presented the M. Tech Academic Regulations (VR25) from the Academic Year 2025-26 (attached here with Annexure -I) to the Members.

The Board has reviewed and noted the Academic Regulations (VR25).

1.3 Review and Confirmation of M. Tech CSE Academic Calendar (VR25) for the Academic Year: 2025-26

The Chairman-BoS presented the M Tech CSE Academic Calendar (VR25) for the Academic Year 2025-26 (attached here with Annexure - II) to the members.

The Board has reviewed and noted the Academic Calendar.

1.4 Review and Confirmation of M. Tech CSE Course Structure (VR25) from the Academic Year: 2025-26

The Chairman-BoS presented the adopted M Tech CSE Course Structure (VR25) from the Academic Year 2025-26 (attached here with Annexure - III) to the members.

The Board has reviewed and confirmed the Course Structure.

2.0 Approval Items.

2.1 Approval of M. Tech CSE Syllabus (VR25) for I and II years from the Academic Year: 2025-26.

The Chairman-BoS presented the adopted M. Tech CSE Syllabus (VR25) from the Academic Year 2025-26 (attached here with Annexure - IV) to the members.

The Board has approved Syllabi.

3.0 Any other item with the permission of the Chair

1. Dr. M. Ramesh Babu suggested to introduce project based learning from 1st semester onwards.
2. Dr. M. Jithender Reddy suggested conducting workshops, hackathons, case studies, mini-projects, guest lecturers from industry.

The Board suggested that the Chairman-BOS to maintain academic quality and update the syllabus to uphold the institution's standards.

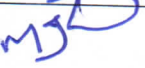
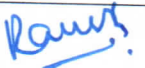
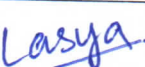
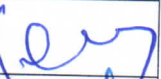
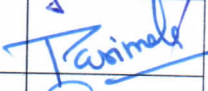
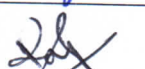
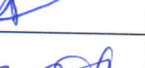
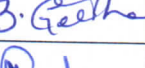
Dr.B.Phijik
Chairman-BOS

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Minutes of the 3rd Board of Studies (BoS) meeting held on 1st November 2025, 2.30pm at Conference Hall, VMTW

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ANNEXURE-I



VR25 M.Tech (Regular) w.e.f. AY: 2025-26

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Academic Regulations (VR25) for M.Tech (Regular) Programme

- 1.0 **Post-Graduate Degree Programmes in Engineering & Technology (PGP in E & T)** Jawaharlal Nehru Technological University Hyderabad (JNTUH) offers **Two Years (Four Semesters)** full-time Master of Technology (M. Tech.) Degree programmes, under Choice Based Credit System (CBCS) at its constituent (non-autonomous) and affiliated colleges in different branches of Engineering and Technology with different specializations.
- 2.0 **Eligibility for Admissions**
- 2.1 Admission to the PGPs shall be made subject to eligibility, qualification and specializations prescribed by the University from time to time, for each specialization under each M. Tech programme.
- 2.2 Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGECET) for M. Tech. programmes / an entrance test conducted by JNTUH/ on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.
- 2.3 The medium of instructions for all PG Programmes will be **ENGLISH** only.
- 3.0 **M. Tech. Programme (PGP in E & T) Structure**
- 3.1 The M. Tech. Programs in E & T of JNTUH are of Semester pattern, with **Four Semesters** consisting of **Two** academic years, each academic year having **Two Semesters** (First/Odd and Second/Even Semesters). Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.
- 3.2 The two-year M. Tech. program consists of **68** credits and the student has to register for all **68** credits and earn all **68** credits for the award of M. Tech. degree. There is **NO** exemption of credits in any case.
- 3.3 The student shall not take more than four academic years to fulfill all the academic requirements for the award of M. Tech. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M. Tech. programme.
- 3.4 **UGC/AICTE** specified definitions/descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:
 - 3.4.1 **Semester Scheme**
Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester

End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

3.4.2 Credit Courses

All subjects/courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/course in an L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure based on the following general pattern:

- One credit for one hour/week/semester for theory/lecture (L) courses
- One credit for two hours/ week/semester for laboratory/ practical (P) courses or tutorials (T)

Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations and mandatory courses (*Non-credit Audit Courses*) will not carry any credits.

3.4.3 Subject Course Classification

All subjects/courses offered for the Post-Graduate Programme in E & T (M. Tech. Degree Programme) are broadly classified as follows. The University has followed in general the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Core Courses (CoC)	PC- Professional Core	Includes subjects related to the parent discipline/department/branch of Engineering
		Dissertation	M. Tech. Project or PG Project or Major Project
		Mini Project with Seminar	Seminar based on core contents related to Parent Discipline/ Department/ Branch of Engineering
2	Elective Courses (EiE)	PE- Professional Electives	Includes elective subjects related to the parent discipline/department/branch of Engineering
		OE-Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/department/ branch of Engineering
3	<i>Mandatory Courses</i>	--	<i>Non-Credit Audit Courses</i>

4.0 Course Registration

- 4.1 A 'Faculty Advisor or Counselor' shall be assigned to each specialization, who will advise on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

- 4.2 The Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.
- 4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).
- 4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.
- 4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices also will not be considered. However, if the Subject/ Course that has already been listed for Registration by the University in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate choice either for a new Subject, if it is offered, or for another existing Subject (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.
- 5.0 **Attendance Requirements**
The programmes are offered based on a unit system with each subject being considered a unit. Attendance is calculated separately for each subject.
- 5.1 Attendance in all classes (Lectures/Laboratories) is compulsory. The minimum required attendance in each theory subject (*also mandatory Audit Courses*) including the attendance of mid-term examination / Laboratory etc. is 75%. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. *This attendance should also be included in the attendance uploaded every fortnight in the University Website. The attendance of mandatory Audit Courses should be uploaded separately to the University.* A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75%.
- 5.2 A student's Seminar report and presentation on Mini Project shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar presentation classes on Mini Project during that Semester.
- 5.3 **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject (Theory/Lab/Mini Project with

Seminar) of a semester shall be granted by the College Academic Committee on genuine reasons.

- 5.4 A prescribed fee per subject shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.
- 5.5 Shortage of Attendance below 65% in any subject shall in **no case be condoned**.
- 5.6 A Student, whose shortage of attendance is not condoned in any Subject(s) (Theory/Lab/Mini Project with Seminar) in any Semester, is considered as 'Detained in that Subject(s), and is not eligible to write Semester End Examination(s) of such Subject(s), (in case of Mini Project with Seminar, his/her Mini Project with Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek re-registration for those Subject(s) in subsequent Semesters, and attend the same as and when offered.
- 5.7 A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.
- 5.8 a) A student shall put in a minimum required attendance in at least **three theory subjects (excluding mandatory (non-credit audit) course)** in first Year I semester for promotion to first Year II Semester.
b) A student shall put in a minimum required attendance in at least **three theory subjects (excluding mandatory (non-credit audit) course)** in first Year II semester for promotion to second Year I Semester.

6.0 Academic Requirements

The following academic requirements must be satisfied, in addition to the attendance requirements mentioned in item no. 5. The performance of the candidate in each semester shall be evaluated subject- wise, with a maximum of 100 marks per subject / course (theory / practical), based on Internal Evaluation and Semester End Examination.

- 6.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if he secures not less than:
40% of Marks (24 out of 60 marks) in the Semester End Examination;
 - 40% of Marks in the internal examinations (16 out of 40 marks allotted for CIE); and
 - A minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades this implies securing '**B**' Grade or above in a subject.
- 6.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini Project with seminar, if student secures not less than 50% marks (i.e. 50 out of 100 allotted marks). The student would be treated as failed, if student (i) does not submit a seminar report on Mini Project or does not make a presentation of the same before the evaluation committee as per schedule or

(ii) secures less than 50% marks in Mini Project with seminar evaluation. The failed student shall reappear for the above evaluation when the notification for supplementary examination is issued.

- 6.3** A student shall register for all subjects for total of **68** credits as specified and listed in the course structure for the chosen specialization, put in the required attendance and fulfill the academic requirements for securing **68** credits obtaining a minimum of '**B**' Grade or above in each subject, and all **68** credits securing Semester Grade Point Average (**SGPA**) ≥ 6.0 (in each semester) and final Cumulative Grade Point Average (**CGPA**) (i.e., CGPA at the end of PGP) ≥ 6.0 , and shall *pass all the mandatory Audit Courses* to complete the PGP successfully.

Note: (1) The SGPA will be computed and printed on the marks memo only if the candidate passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the candidate passes in all the subjects offered in all the semesters

- 6.4** Marks and Letter Grades obtained in all those subjects covering the above specified **68** credits alone shall be considered for the calculation of final CGPA, which will be indicated in the Grade Card /Marks Memo of second year second semester.
- 6.5** If a student registers for extra subject(s) (in the parent department or other departments/ branches of Engineering) other than those listed subjects totaling to **68** credits as specified in the course structure, the performance in extra subject(s) (although evaluated and graded using the same procedure as that of the required **68** credits) will not be considered while calculating the SGPA and CGPA. For such extra subject(s) registered, percentage of marks and Letter Grade alone will be indicated in the Grade Card/Marks Memo, as a performance measure, subject to completion of the attendance and academic requirements as stated in items 5 and 6.1 - 6.3.
- 6.6** When a student is detained due to shortage of attendance in any subject(s) in any semester, no Grade allotment will be made for such subject(s). However, he is eligible for re-registration of such subject(s) in the subsequent semester(s), as and when next offered, with the academic regulations of the batch into which he is re-registered, by paying the prescribed fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of internal marks and Semester End Examination marks for performance evaluation in such subject(s), and SGPA/CGPA calculations.
- 6.7** A student eligible to appear for the Semester End Examination in any subject, but absent from it or failed (failing to secure '**B**' Grade or above), may reappear for that subject at the supplementary examination as and when conducted. In such cases, his Internal Marks assessed earlier for that subject will be carried over, and added to the marks secured in the supplementary examination, for the purpose of evaluating his performance in that subject.

- 6.8 A Student who fails to earn 68 credits as per the specified course structure, and as indicated above, within **four** academic years from the date of commencement of his first year first semester, shall forfeit his seat in M. Tech. programme and his admission **shall stand cancelled**.

7.0 Evaluation - Distribution and Weightage of Marks

The performance of a student in each semester shall be evaluated subject- wise (irrespective of credits assigned) for a maximum of 100 marks.

- 7.1 The performance of a student in every subject/course (including practicals and Project) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid-Term Examinations conducted, first Mid-Term examinations in the middle of the Semester and second Mid-Term examinations during the last week of instruction.

- 7.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid- Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid-Term Examination for 30 marks:

a. Part - A: Objective/quiz paper for 10 marks.

b. Part – B: Descriptive paper for 20 marks.

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:

2. Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 40% of marks (i.e. 16 marks out of 40 marks) in CIE, 40% of marks (i.e. 24 marks out of 60) in SEE and

Overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks taking together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores

$\geq 40\%$ (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

The details of the end semester question paper pattern are as follows:

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- The duration of Semester End Examination is 3 hours.

7.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

In the Semester End Examination, held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

- The Student, in each subject, shall have to earn 40% of marks (i.e. 16 marks out of 40 marks) in CIE, 40% of marks (i.e. 24 marks out of 60) in SEE and Overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks taking together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores

$\geq 40\%$ (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

- 7.5 For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the Principal of the College and this is to be informed to the Director of Evaluation within two weeks, before commencement of the lab end examinations. The external examiner should be selected from outside the College concerned but within the cluster. No external examiner should be appointed from any other College in the same cluster/any other cluster which is run by the same Management.
- 7.6 There shall be Mini Project with Seminar during I year II semester for internal evaluation of 100 marks. The Departmental Academic Committee (DAC) will review the progress of the mini project during the seminar presentations and evaluate the same for 50 marks. Mini Project Viva Voce will be evaluated by the DAC for another 50 marks before the semester end examinations. Student shall carryout the mini project in consultation with the mini project supervisor which may include critically reviewing the literature, project implementation and submit it to the department in the form of a report and shall make an oral presentation before the DAC consisting of Head of the Department, Mini Project supervisor and two other senior faculty members of the department. The student has to secure a minimum of 50% of marks in i) seminar presentation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same as and when scheduled.
- 7.7 Every candidate shall be required to submit a dissertation on a topic approved by the Dissertation Review Committee.
- 7.8 A Dissertation Review Committee (DRC) shall be constituted with the Head of the Department as Chairperson, Dissertation Supervisor and one senior faculty member of the Department offering the M.Tech. programme.
- 7.9 Registration of Dissertation Work: A candidate is permitted to register for the

Dissertation Work after satisfying the attendance requirement in all the subjects, both theory and laboratory.

- 7.10 After satisfying 7.9, a candidate must present in ***Dissertation Work Review - I***, in consultation with his Dissertation Supervisor, the title, objective and plan of action of his Dissertation work to the Dissertation Review Committee (DRC) for approval ***within four weeks*** from the commencement of **Second year First Semester**. Only after obtaining the approval of the DRC can the student initiate the Dissertation work.
- 7.11 If a candidate wishes to change his supervisor or topic of the Dissertation, he can do so with the approval of the DRC. However, the DRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of Dissertation 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.
- 7.12 A candidate shall submit his Dissertation progress report in two stages at least with a gap of **three** months between them.
- 7.13 The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of DRC ***not earlier than 40 weeks*** from the date of approval of the Dissertation work. For the approval of DRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the DRC.
- 7.14 ***The Dissertation Work Review - II*** in II Year I Semester carries 100 internal marks. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.
- 7.15 ***The Dissertation Work Review - III*** in II Year II Sem. carries 100 internal marks. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The DRC will examine the overall progress of the Dissertation Work and decide whether or not the Dissertation is eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Dissertation Evaluation (Viva- Voce) examination.
- 7.16 Dissertation Work Reviews - II and III shall be conducted in phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful

students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review - III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review - III in the next academic year only at the time of Dissertation Work Review - II (Phase I).

- 7.17 After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the University and be included in the final thesis. The Thesis will be accepted for submission, if the similarity index is less than **30%**. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to **TWO**. The candidate has to register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.
- 7.18 Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the College/School/Institute, after submission of a research paper related to the Dissertation work in a UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- 7.19 The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College/School/Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.
- 7.20 If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission.
- 7.21 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and decide for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate has to secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.
- 7.22 If he fails to fulfill the requirements as specified in 7.21, he will reappear for the Dissertation Viva-Voce examination **only after three months**. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for

the award of the degree, unless he is asked to revise and resubmit his Dissertation Work by the board within a specified time period (within *four* years from the date of commencement of his first year first semester).

- 7.23 The Dissertation Viva-Voce External examination marks must be submitted to the University on the day of the examination.
- 7.24 *For mandatory non-credit Audit courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. These marks should also be uploaded along with the internal marks of other subjects.*
- 7.25 *No marks or letter grades shall be allotted for mandatory non-credit Audit Courses. Only Pass/Fail shall be indicated in Grade Card.*

8.0 Re-Admission/Re-Registration

8.1 Re-Admission for Discontinued Student

A student, who has discontinued the M. Tech. degree programme due to any reason whatsoever, may be considered for '**readmission**' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned, subject to item 6.6.

- 8.2 If a student is detained in a subject (s) due to shortage of attendance in any semester, he may be permitted to **re-register** for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he seeks re-registration, with prior permission from the authorities concerned, subject to item 3.2
- 8.3 *A candidate shall be given only one-time chance to re-register and attend the classes for a maximum of two subjects in a semester*, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work, in the next academic year and secure the required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

9.0 Examinations and Assessment - The Grading System

- 9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Mini Project with Seminar, Dissertation, etc., based on the percentage of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 7 above, and a corresponding Letter Grade shall be given.
- 9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above ($\geq 90\%$, $\leq 100\%$)	O (Outstanding)	10
Below 90% but not less than 80% ($\geq 80\%$, $< 90\%$)	A ⁺ (Excellent)	9
Below 80% but not less than 70% ($\geq 70\%$, $< 80\%$)	A (Very Good)	8
Below 70% but not less than 60% ($\geq 60\%$, $< 70\%$)	B ⁺ (Good)	7
Below 60% but not less than 50% ($\geq 50\%$, $< 60\%$)	B (above Average)	6
Below 50% ($< 50\%$)	F (FAIL)	0
Absent	Ab	0

- 9.3 A student obtaining 'F' Grade in any Subject is deemed to have 'failed' and is required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those subjects will remain as obtained earlier.
- 9.4 If a student has not appeared for the examinations, 'Ab' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted.
- 9.5 A Letter Grade does not imply any specific marks percentage; it is only the range of percentage of marks.
- 9.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.
- 9.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits For a Course

- 9.8 The student passes the Subject/ Course only when he gets $GP \geq 6$ (B Grade or above).
- 9.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points ($\sum CP$) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$SGPA = \left\{ \sum_{i=1}^N C_i G_i \right\} / \left\{ \sum_{i=1}^N C_i \right\} \dots \text{For each Semester,}$$

where 'i' is the Subject indicator index (taking into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as

specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

- 9.10** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\text{CGPA} = \left\{ \sum_{j=1}^M C_j G_j \right\} / \left\{ \sum_{j=1}^M C_j \right\} \dots \text{for all S Semesters registered (ie., up to and inclusive of S Semesters, } S \geq 2),$$

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' for from the 1st Semester onwards upto and inclusive of the Semester S (obviously $M > N$), 'j' is the Subject indicator index (taking into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade points	Credit Points
Course 1	4	A	8	$4 \times 8 = 32$
Course 2	4	O	10	$4 \times 10 = 40$
Course 3	4	B	6	$4 \times 6 = 24$
Course 4	3	B	6	$3 \times 6 = 18$
Course 5	3	A+	9	$3 \times 9 = 27$
Course 6	3	B	6	$3 \times 6 = 18$
	21			159

$$\text{SGPA} = 159/21 = 7.57$$

Illustration of calculation of CGPA

Semester	Credits	SGPA	Credits * SGPA
Semester I	24	7	$24 \times 7 = 168$
Semester II	24	6	$24 \times 6 = 144$
Semester III	24	6.5	$24 \times 6.5 = 156$
Semester IV	24	6	$24 \times 6 = 144$
	96		612

$$\text{CGPA} = 612/96 = 6.37$$

10.0 Award of Degree and Class

- 10.1** If a student who registers for all the specified Subjects/ Courses as listed in the

Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **68 Credits** (with CGPA ≥ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with the specialization that he was admitted into.

10.2 Award of Class

After a student has earned the requirements prescribed for the completion of the programme and is eligible for the award of M.Tech. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	$6.75 \leq \text{CGPA} < 7.75$
Second Class	$6.00 \leq \text{CGPA} < 6.75$

A student with final CGPA (at the end of the **PGP**) < 6.00 shall not be eligible for the Award of Degree.

11.0 Withholding of Results

If the student has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result and degree of the student will be withheld and he will not be allowed into the next semester.

12.0 General

12.1 Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

12.2 Credit Point: It is the product of grade point and number of credits for a course.

12.3 Wherever the words "he", "him", "his", occur in the regulations, they shall include "she", "her".

12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

12.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the University is final.

12.6 The University 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 University.

MALPRACTICES RULES**DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS**

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
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 to 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 to 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.
	Impersonate 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 performance in that 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	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.

	amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
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 clauses 6 to 8.	Student of the college's 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 based on 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.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractice)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination center from the college to another college for a specific period of not less than one year.

4. WIG

11. By

5. Kamm

12. D

6. Lasya

13. A

7. SO

14. B. Gothe

8. Passimeli

15. Pauline

9. G. G.

16. Ande

10. ngis

17. 107

ANNEXURE-II



**VIGNAN'S INSTITUTE OF MANAGEMENT AND
TECHNOLOGY FOR WOMEN**
(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



ACADEMIC CALENDAR 2025-26

I- M. Tech I & II SEMESTER

I - SEMESTER

S.No	Event	Date and Day	Duration
1	Commencement of Class Work	13-10-2025(MON)	
2	1 st Spell of Instructions	13-10-2025(MON) to 29-11-2025(SAT)	7 Weeks
3	1 st MID Term Examinations	01-12-2025(MON) to 06-12-2025(SAT)	1 Week
4	2 nd Spell of Instructions	08-12-2025(MON) to 31-01-2026(SAT)	8 Weeks
5	2 nd MID Term Examinations	02-02-2026(MON) to 07-02-2026(SAT)	1 Week
6	Preparation and Practical Examinations	09-02-2026(MON) to 13-02-2026(FRI)	1 Week
7	End Semester Examinations	16-02-2026(MON) to 27-02-2026(FRI)	2 Weeks
8	Commencement of Class Work for II- Semester	02-03-2026(MON)	---

II - SEMESTER

S.No	Event	Date and Day	Duration
1	Commencement of Class Work	02-03-2026(MON)	---
2	1 st Spell of Instructions	02-03-2026(MON) to 18-04-2026(SAT)	7 Weeks
3	1 st MID Term Examinations	20-04-2026(MON) to 24-04-2026(FRI)	1 Week
4	2 nd Spell of Instructions	27-04-2026(MON) to 10-07-2026(FRI)	8 Weeks
5	Summer Vacation	09-05-2026(SAT) to 31-05-2026(SUN)	3 Weeks
6	2 nd MID Term Examinations	13-07-2026(MON) to 18-07-2026(SAT)	1 Week
7	Preparation and Practical Examinations	20-07-2026(MON) to 24-07-2026(FRI)	1 Week
8	End Semester Examinations	27-07-2026(MON) to 07-08-2026(SAT)	2 Week

PRINCIPAL

Vignan's Institute of Management & Technology For Women
Kondapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt)-501301,
Telangana State

ANNEXURE-III



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE – VR25

I M.Tech. – I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	25MC101PC	Mathematical Foundations of Computer Science	3	0	0	3
2	25MC102PC	Advanced Data Structures	3	0	0	3
3	25MC103PE	1. Database Programming with PL/SQL	3	0	0	3
	25MC104PE	2. Deep Learning				
	25MC105PE	3. Natural Language Processing				
	25MC106PE	4. Advanced UNIX Programming				
4	25MC107PE	1. Applied Cryptography	3	0	0	3
	25MC108PE	2. Software Quality Engineering				
	25MC109PE	3. Mining Massive Datasets				
	25MC110PE	4. Agile Methodologies				
5	25MC111PC	Advanced Data Structures Lab	0	0	4	2
6	25MC112PE	1. Database Programming with PL/SQL Lab	0	0	4	2
	25MC113PE	2. Deep Learning Lab				
	25MC114PE	3. Natural Language Processing Lab				
	25MC115PE	4. Advanced UNIX Programming Lab				
7	25SM116MS	Research Methodology & IPR	2	0	0	2
8	25MC117AC	Audit Course - I	2	0	0	0
Total			16	0	8	18

I M.Tech. - II Semester

S.No.	Course Code	Course	L	T	P	Credits
1	25MC201PC	Advanced Algorithms	3	0	0	3
2	25MC202PC	Advanced Computer Architecture	3	0	0	3
3	25MC203PE	1. Enterprise Cloud Concepts	3	0	0	3
	25MC204PE	2. Cyber Security				
	25MC205PE	3. Parallel Computing				
	25MC206PE	4. Large language Models				
4	25MC207PE	1. Bioinformatics	3	0	0	3
	25MC208PE	2. Adhoc Sensor Networks				
	25MC209PE	3. Robotic Process Automation				
	25MC210PE	4. Generative AI				
5	25MC211PC	Advanced Algorithms Lab	0	0	4	2
6	25MC212PE	1. Enterprise Cloud Concepts Lab	0	0	4	2
	25MC213PE	2. Cyber Security Lab				
	25MC214PE	3. Parallel Computing Lab				
	25MC215PE	4. Large language Models Lab				
7	25MC216PC	Mini Project with Seminar	0	0	4	2
8	25MC217AC	Audit Course - II	2	0	0	0
Total			14	0	12	18

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VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE – VR24

II M.Tech. – I Semester

S.No	Course Code	Course	L	T	P	Credits
1	25MC301PE	1. Digital Forensics	3	0	0	3
	25MC302PE	2. Advance Operating Systems				
	25MC303PE	3. Quantum Computing				
	25MC304PE	4. Prompt Engineering				
2	25MC305OE	1. Intellectual Property Rights	3	0	0	3
	25MC306OE	2. Generative AI				
	25MC307OE	3. Intrusion Detection Systems				
	25MC308OE	4. Digital Forensics				
3	25MC301IPC	Dissertation Work Review - II	0	0	18	6
Total			6	0	18	12

II M.Tech. - II Semester

S.No	Course Code	Course	L	T	P	Credits
1	25MC401PC	Dissertation Work Review - III	0	0	18	6
2	25MC402PC	Dissertation Viva - Voce	0	0	42	14
Total			0	0	60	20

Note: L-Theory P-Practical C-Credits

Audit Course I & II:

- English for Research Paper Writing
- Disaster Management
- Sanskrit for Technical Knowledge
- Value Education
- Constitution of India
- Pedagogy Studies
- Stress Management by yoga
- Personality Development Through Life Enlightenment Skills

Open Electives for other Departments:

- Intellectual Property Rights
- Generative AI
- Intrusion Detection Systems
- Digital Forensics

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ANNEXURE-IV

M. Tech. CSE	L	T	P	C
I Year - I Semester	3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (PC-I)				

Course Objectives:

- To learn Introduces the elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes: The student will learn

- Ability to understand and construct precise mathematical proofs.
- Ability to use logic and set theory to formulate precise statements.
- Ability to analyze and solve counting problems on finite and discrete structures.
- Ability to describe and manipulate sequences.
- Ability to apply graph theory in solving computing problems.

UNIT - I:

The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT - II:

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT - III:

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT - IV:

Discrete Probability and Advanced Counting Techniques:

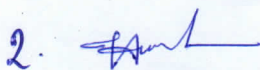
An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques:

Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT - V:

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

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Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2nd ed.

Reference Books:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

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M. Tech. CSE L T P C
I Year - I Semester 3 0 0 3

ADVANCED DATA STRUCTURES (PC-II)

Course Objectives:

- Introduces the heap data structures such as leftist trees, binomial heaps, Fibonacci and minmax heaps.
- Introduces a variety of data structures such as disjoint sets, hash tables, search structures and digital search structures.

Course Outcomes: The student will learn

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to understand how the choice of data structures impact the performance of programs.
- Design programs using a variety of data structures, including hash tables, search structures and digital search structures.

UNIT - I:

Heap Structures

Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT - II:

Hashing and Collisions

Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

UNIT - III:

Search Structures

OBST, AVL trees, Red-Black trees, Splay trees,

Multiway Search Trees

B-trees, 2-3 trees

UNIT - IV:

Digital Search Structures

Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

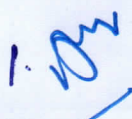
UNIT - V:

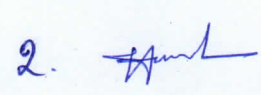
Pattern matching

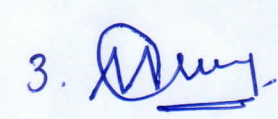
Introduction, Brute force, the Boyer -Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

Text Books:

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI
3. Algorithms

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Reference Books:

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

1. SK Basu

2. Mark Allen Weiss

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M. Tech. CSE

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I Year - I Semester

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DATABASE PROGRAMMING WITH PL/SQL (PROFESSIONAL ELECTIVE - I)

Course Objectives:

- Knowledge on significance of SQL fundamentals.
- Evaluate functions and triggers of PL/SQL
- Knowledge on control structures, packages in PL/SQL and its applications

Course Outcomes: The student will learn

- Understand importance of PL/SQL basics
- Implement functions and procedures using PL/SQL
- Understand the importance of triggers in database

UNIT - I:

PL/SQL Basics

Block Structure, Behavior of Variables in Blocks, Basic Scalar and Composite Data Types, Control Structures, Exceptions, Bulk Operations, Functions, Procedures, and Packages, Transaction Scope

UNIT - II:

Language Fundamentals & Control Structures

Lexical Units, Variables and Data Types, Conditional Statements, Iterative Statements, Cursor Structures, Bulk Statements, Introduction to Collections, Object Types: Varray and Table Collections, Associative Arrays, Oracle Collection API

UNIT - III:

Functions and Procedures

Function and Procedure Architecture, Transaction Scope, Calling Subroutines, Positional Notation, Named Notation, Mixed Notation, Exclusionary Notation, SQL Call Notation, Functions, Function Model Choices, Creation Options, Pass-by-Value Functions, Pass-by-Reference Functions, Procedures, Pass-by-Value Procedures, Pass-by-Reference Procedures, Supporting Scripts.

UNIT - IV:

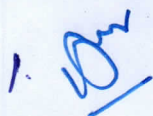
Packages

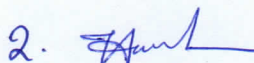
Package Architecture, Package Specification, Prototype Features, Serially Reusable Precompiler Directive, Variables, Types, Components: Functions and Procedures, Package Body, Prototype Features, Variables, Types, Components: Functions and Procedures, Definer vs. Invoker Rights Mechanics, Managing Packages in the Database Catalog, Finding, Validating, and Describing Packages, Checking Dependencies, Comparing Validation Methods: Timestamp vs. Signature.

UNIT - V: Searching and Sorting:

Triggers

Introduction to Triggers, Database Trigger Architecture, Data Definition Language

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Triggers, Event Attribute Functions, Building DDL Triggers, Data Manipulation Language Triggers, Statement-Level Triggers, Row-Level Triggers, Compound Triggers, INSTEAD OF Triggers, System and Database Event Triggers, Trigger Restrictions, Maximum Trigger Size, SQL Statements, LONG and LONG RAW Data Types.

Text Books:

1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGraw Hill Education.

Reference Books:

1. Benjamin Rosenzweig, Elena Silvestrova Rakhimov, Oracle PL/SQL by example Fifth Edition.
2. Dr. P. S. Deshpande, SQL & PL / SQL for Oracle 11g Black Book.

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M.Tech. CSE

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I Year - I Semester

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DEEP LEARNING (PROFESSIONAL ELECTIVE - I)**Course Objectives:**

- To understand complexity of Deep Learning algorithms and their limitations
- To be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes: The student will learn

- Implement deep learning algorithms, understand neural networks and traverse the layers of data
- Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces
- Understand applications of Deep Learning to Computer Vision
- Understand and analyze Applications of Deep Learning to NLP

UNIT - I:

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. ReLU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

UNIT - II:

Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

UNIT - III:

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

UNIT - IV:

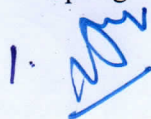
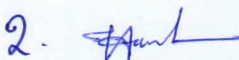
Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity

UNIT - V:

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

Text Books:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.

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3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

Reference Books:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Extensive Reading:

1. <http://www.deeplearning.net>
2. <https://www.deeplearningbook.org/>
3. <https://developers.google.com/machine-learning/crash-course/ml-intro>
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf
5. <http://neuralnetworksanddeeplearning.com/>

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M.Tech. CSE L T P C
I Year - I Semester 3 0 0 3
NATURAL LANGUAGE PROCESSING (PROFESSIONAL ELECTIVE - I)

Course Objectives:

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes: The student will learn

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms Able to design different language modelling Techniques.
- Able to design different language modeling Techniques.

UNIT - I:

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II:

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III:

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV:

Predicate-Argument Structure, Meaning Representation Systems, Software.

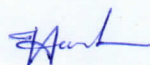
UNIT - V:

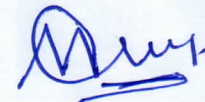
Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross Lingual Language Modeling

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

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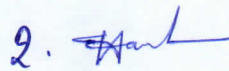
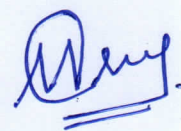
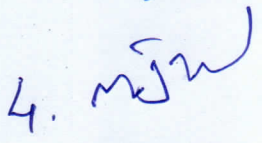
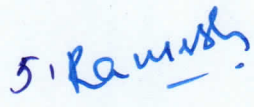
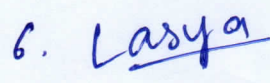
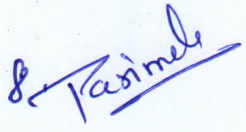
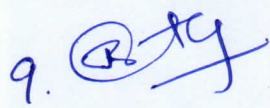
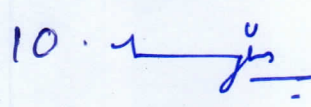
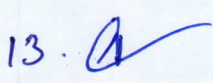
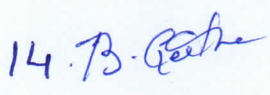
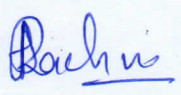
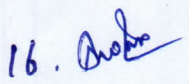
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2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

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M.Tech. CSE

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ADVANCED UNIX PROGRAMMING (PROFESSIONAL ELECTIVE - I)

Course Objectives:

- To understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
- To implement in C some standard Linux utilities such as ls, mv, cp etc. using system calls.
- To develop the skills necessary for systems programming including file system programming, process and signal management, and Inter Process Communication.
- To develop the basic skills required to write network programs using Sockets.

Course Outcomes: The student will learn

- Work confidently in Linux environment.
- Work with shell script to automate different tasks as Linux administration.

UNIT - I:

Linux Utilities - File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.

Shell programming with Bourne again shell (bash) - Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

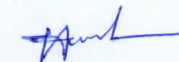
UNIT - II:

Files and Directories - File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links - symlink, link, unlink. **Directories** - Creating, removing and changing Directories- mkdir, rmdir, chdir, obtaining current working directorygetcwd, Directory contents, Scanning Directories- opendir, readdir, closedir, rewinddir functions.

UNIT - III:

Process - Process concept, Layout of a C program image in main memory, Process environment environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process managementfork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

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Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

UNIT - IV:

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions. **Message Queues** - Kernel support for messages, APIs for message queues, client/server example. **Semaphores** - Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

UNIT - V:

Shared Memory - Kernel support for shared memory, APIs for shared memory, shared memory example. **Sockets** - Introduction to Berkeley Sockets, IPC over a network, Client- Server model, Socket address structures (Unix domain and Internet domain), Socket system calls for connection-oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Socket options- setsockopt and fcntl system calls, Comparison of IPC mechanisms.

Text Books:

1. Unix System Programming using C++, T. Chan, PHI.
2. Advanced Programming in the Unix Environment, 2nd edition, W. R. Stevens and S. A. Rago, Pearson Education.
3. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
4. Unix Network Programming, W. R. Stevens, PHI.

Reference Books:

1. C Programming Language, Kernighan and Ritchie, PHI.
2. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones, Wrox, Wiley India Edition.
3. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson.
4. System Programming with C and Unix, A. Hoover, Pearson.
5. Unix System Programming, Communication, Concurrency and Threads, K. A. Robbins and S. Robbins, Pearson Education.
6. Unix shell Programming, S. G. Kochan and P. Wood, 3rd edition, Pearson Education.
7. Shell Scripting, S. Parker, Wiley India Pvt. Ltd.
8. Unix and Shell programming, B. A. Forouzan and R. F. Gilberg, Cengage Learning.
9. Linux System Programming, Robert Love, O'Reilly, SPD.

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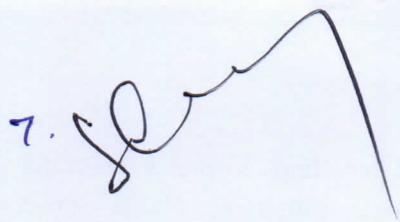
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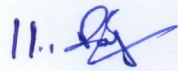
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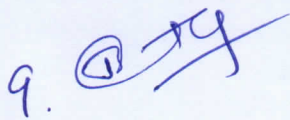
6. Lasya

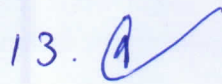
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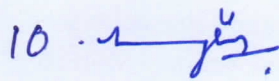
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M.Tech. CSE

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APPLIED CRYPTOGRAPHY (PROFESSIONAL ELECTIVE - II)

Course Objectives:

- Knowledge on significance of cryptographic protocols and symmetric and public key algorithms

Course Outcomes: The student will learn

- Understand the various cryptographic protocols
- Analyze key length and algorithm types and modes
- Illustrate different public key algorithms in cryptosystems
- Understand special algorithms for protocols and usage in the real world.

UNIT - I:

Foundations:

Terminology, Steganography, Substitution Ciphers and Transposition Ciphers, Simple XOR, One-Time Pads, Computer Algorithms, Large Numbers,

Cryptographic Protocols: Protocol Building Blocks

Introduction to Protocols, Communications Using Symmetric Cryptography, One-Way Functions, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation

UNIT - II: Cryptographic Techniques

Key length: Symmetric Key length, Public key length, comparing symmetric and public key length.

Algorithm types and modes: Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Cipher, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mod, Counter Mode, Other Block-Cipher Modes.

UNIT - III: Public-Key Algorithms

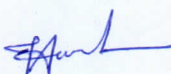
Background, Knapsack Algorithms, RSA, Pohlig-Hellman, Rabin, ElGamal, McEliece, Elliptic Curve Cryptosystems, LUC, Finite Automaton Public-Key Cryptosystems

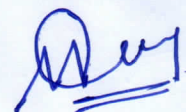
Public-Key Digital Signature Algorithms: Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, ESIGN

UNIT - IV: Special Algorithms for Protocols

Multiple-Key Public-Key Cryptography, Secret-Sharing Algorithms, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Computing with Encrypted Data, Fair Coin Flips, One-Way Accumulators, All-or-Nothing Disclosure of Secrets, Fair and Failsafe Cryptosystems, Zero-Knowledge Proofs of Knowledge, Blind Signatures, Oblivious Transfer, Secure Multiparty Computation, Probabilistic Encryption, Quantum Cryptography

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UNIT - V: Real World Approaches

IBM Secret key management protocol, ISDN, Kerberos, KryptoKnight, Privacy enhanced mail (PEM), Message security protocol (MSP), PGP, Public-Key Cryptography Standards (PKCS), Universal Electronic Payment System (UEPS).

Text Books:

1. Bruce Schneier, Applied Cryptography, Second Edition: Protocols, Algorithms, and Source Code in C (cloth).

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SOFTWARE QUALITY ENGINEERING (PROFESSIONAL ELECTIVE - II)

Course Objectives:

- Knowledge on significance of Quality, quality assurance, quality engineering.

Course Outcomes: The student will learn

- Understand software quality and its perspectives
- Analyze defect prevention and defect reduction in software quality assurance
- Illustrate software quality engineering activities and its process

UNIT - I: Software Quality

Quality: perspectives and expectations, Quality frameworks and ISO-9126, correctness and defects: Definitions, properties and Measurements, A historical perspective of quality, software quality.

UNIT - II: Quality Assurance

Classification: QA as dealing with defects, Defect prevention- Education and training, Formal method, Other defect prevention techniques, Defect Reduction - Inspection: Direct fault detection and removal, Testing: Failure observation and fault removal, other techniques and risk identification, Defect Containment- software fault tolerance, safety assurance and failure containment

UNIT - III: Quality Engineering

Quality Engineering: Activities and process, Quality planning: Goal setting and Strategy formation, Quality assessment and Improvement, Quality engineering in software process.

UNIT - IV: Test Activities, Management and Automation

Test planning and preparation, Test execution, Result checking and measurement, Analysis and follow- up, Activities People and Management, Test Automation.

UNIT - V: Coverage and usage testing based on checklist and partitions

Checklist based testing and its limitations, Testing for partition Coverage, Usage based Statistical testing with Musa's operational profiles, Constructing operational profiles

Case Study: OP for the cartridge Support Software

Text Books:

1. Jeff Tian, Software Quality Engineering, Testing, Quality Assurance, and Quantifiable improvement
2. Richard N. Taylor, Software Architecture: Foundations, Theory, and Practice

1. Jeff Tian

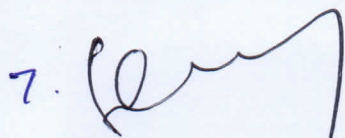
2. Richard N. Taylor

3. W. R. Taylor

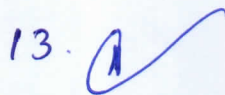
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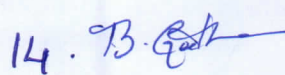
5. Ramachandran

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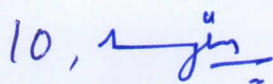
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MINING MASSIVE DATASETS (PROFESSIONAL ELECTIVE - II)

Course Objectives:

- This course will cover practical algorithms for solving key problems in mining of massive datasets.
- This course focuses on parallel algorithmic techniques that are used for large datasets.
- This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied in detail.

Course Outcomes: The student will learn

- Handle massive data using MapReduce.
- Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
- Understand the algorithms for extracting models and information from large datasets
- Develop recommendation systems.
- Gain experience in matching various algorithms for particular classes of problems.

UNIT - I:

Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining, MapReduce and the New Software Stack-Distributed File Systems, MapReduce, Algorithms Using MapReduce.

UNIT - II:

Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.

Streaming Data: Mining Data Streams-The Stream Data Model, Sampling Data in a Stream, Filtering Streams

UNIT - III:

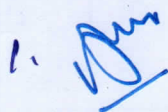
Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam

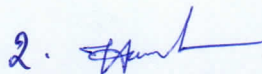
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.

Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism

UNIT - IV:

Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation. Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The Netflix Challenge. of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating

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memory for arrays of different data types

UNIT - V:

Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles

Text Books:

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

Reference Books:

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.

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AGILE METHODOLOGIES (PROFESSIONAL ELECTIVE - II)				

Course Objectives:

- Knowledge on concepts of Agile development, releasing, planning and developing

Course Outcomes: The student will learn

- Understand basic concepts of agile methods and extreme programming
- Analyze real customer involvement and ubiquitous language
- Discuss risk management and iteration planning
- Summarize incremental requirements, refactoring, incremental design and architecture

UNIT - I:

Introduction Extreme Programming (XP) - Agile Development

Why Agile - Understanding Success, Beyond Deadlines, Importance of Organizational Success, Introduction to Agility How to Be Agile - Agile methods, Don't make your own method, Road to mastery Understanding XP (Extreme Programming) - XP life cycle, XP team, XP Concepts Adopting XP - Knowing whether XP is suitable, Implementing XP, assessing Agility Practicing XP - Thinking -Pair Programming, Energized work, Informative Workspace, Root cause Analysis, Retrospectives

UNIT - II:

Collaborating

Trust, Sit together, Real customer involvement, Ubiquitous language, meetings, coding standards, Iteration demo, Reporting

UNIT - III:

Releasing

Bugfree Release, Version Control, fast build, continuous integration, Collective ownership, Documentation

UNIT - IV:

Planning

Version, Release Plan, Risk Management, Iteration Planning, Slack, Stories, Estimating

UNIT - V:

Developing:

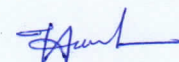
Incremental requirements, Customer tests, Test driven development, Refactoring, Incremental design and architecture, spike solutions, Performance optimization, Exploratory testing

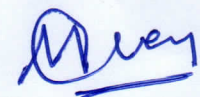
Text Books:

1. The art of Agile Development, James Shore and Shane Warden, 11th Indian Reprint, O'Reilly, 2018.

Reference Books:

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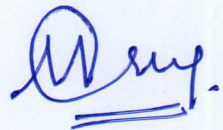
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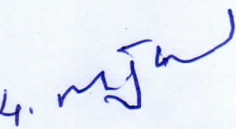
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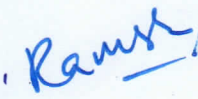
1. Learning Agile, Andrew Stellman and Jennifer Greene, O'Reilly, 4th Indian Reprint, 2018.
2. Practices of an Agile Developer, Venkat Subramaniam and Andy Hunt, SPD, 5th Indian Reprint, 2015.
3. Agile Project Management - Jim Highsmith, Pearson Low price Edition 2004.

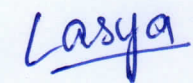
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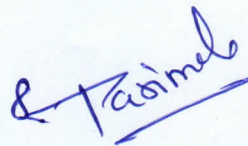
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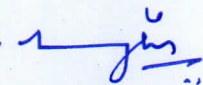
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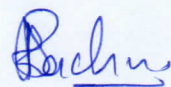
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ADVANCED DATA STRUCTURES LAB (LAB - I)

Course Objectives:

- Introduces the basic concepts of Abstract Data Types.
- Reviews basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
- Introduces sorting and pattern matching algorithms.

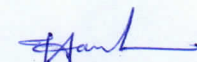
Course Outcomes: The student will learn

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

List of Programs

1. Write a program to perform the following operations:
 - a) Insert an element into a binary search tree.
 - b) Delete an element from a binary search tree.
 - c) Search for a key element in a binary search tree.
2. Write a program for implementing the following sorting methods:
 - a) Merge sort b) Heap sort c) Quick sort
3. Write a program to perform the following operations:
 - a) Insert an element into a B-tree.
 - b) Delete an element from a B-tree.
 - c) Search for a key element in a B-tree.
4. Write a program to perform the following operations:
 - a) Insert an element into a Min-Max heap
 - b) Delete an element from a Min-Max heap
 - c) Search for a key element in a Min-Max heap
5. Write a program to perform the following operations:
 - a) Insert an element into a Leftist tree
 - b) Delete an element from a Leftist tree
 - c) Search for a key element in a Leftist tree
6. Write a program to perform the following operations:
 - a) Insert an element into a binomial heap
 - b) Delete an element from a binomial heap.
 - c) Search for a key element in a binomial heap

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7. Write a program to perform the following operations:
 - a) Insert an element into a AVL tree.
 - b) From Delete an element a AVL search tree.
 - c) Search for a key element in a AVL search tree.
8. Write a program to perform the following operations:
 - a) Insert an element into a Red-Black tree.
 - b) Delete an element from a Red-Black tree.
 - c) Search for a key element in a Red-Black tree.
9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer pattern matching algorithm.

Text Books:

1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C-A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
3. Introduction to Data Structures in C, Ashok Kamthane, 1st Edition, Pearson

Reference Books:

1. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/ Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dream tech Press
3. Data structures: A Pseudocode Approach with C, R.F. Gilberg And B.A. Forouzan, 2nd Edition, Cengage Learning

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5. Ramish
6. Lasya
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DATABASE PROGRAMMING WITH PL/SQL LAB (Lab - II)

Course Objectives:

- Knowledge on significance of SQL fundamentals.
- Evaluate functions and triggers of PL/SQL
- Knowledge on control structures, packages in PL/SQL and its applications.

Course Outcomes: The student will learn

- Understand importance of PL/SQL basics
- Implement functions and procedures using PL/SQL
- Understand the importance of triggers in database

List of Programs

1. Write a PL/SQL program using FOR loop to insert ten rows into a database table.
2. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID), write a cursor to select the five highest paid employees from the table.
3. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.
4. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.
5. Write a PL/SQL program to demonstrate Exceptions.
6. Write a PL/SQL program to demonstrate Cursors.
7. Write a PL/SQL program to demonstrate Functions.
8. Write a PL/SQL program to demonstrate Packages.
9. Write PL/SQL queries to create Procedures.
10. Write PL/SQL queries to create Triggers.

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DEEP LEARNING LAB (Lab - II)

Course Objectives:

- To Build The Foundation Of Deep Learning.
- To Understand How To Build The Neural Network.
- To enable students to develop successful machine learning concepts.

Course Outcomes: The student will learn

- Upon the Successful Completion of the Course, the Students would be able to:
- Learn The Fundamental Principles of Deep Learning.
- Identify The Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
- Implement Deep Learning Algorithms and Solve Real-world problems.

List of Programs

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensor flow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Auto encoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks

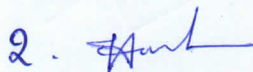
Text Books:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

Reference Books:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

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NATURAL LANGUAGE PROCESSING(Lab-I)

Course Objectives:

- To Develop and explore the problems and solutions of NLP.

Course Outcomes: The student will learn

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammar.
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms

List of Programs

Implement the following using Python

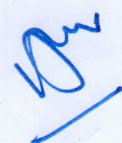
1. Tokenization
2. Stemming
3. Stop word removal (a,the,are)
4. Word Analysis
5. Word Generation
6. Pos tagging
7. Morphology
8. chunking
9. N-Grams
10. N-Grams Smoothing

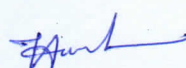
Text Books:

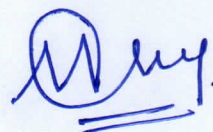
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

Reference Books:

1. Speech and Natural Language Processing- Daniel Jurafsky & James H Martin, Pearson Publications.

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ADVANCE UNIX PROGRAMMING LAB (LAB - I)

Course Objectives:

- **To introduce** the fundamental concepts and architecture of Linux/Unix operating systems and their utilities.
- **To familiarize students** with essential file handling, process, and disk management commands in Linux.
- **To enable students** to develop shell scripts for automation of routine system tasks.
- **To provide knowledge** of system calls for file I/O, process creation, and inter process communication.
- **To impart understanding** of process management, signals, and synchronization mechanisms in Unix/Linux.
- .

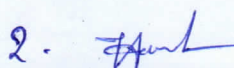
Course Outcomes: The student will learn

- Demonstrate proficiency in using Linux utilities and shell commands for file management, process handling, and system administration tasks.
- Develop shell scripts using control structures, functions, pipes, and redirections to automate system tasks.
- Apply system calls for low-level file handling, directory manipulation, and file metadata management in C programs.
- Implement process creation, execution, and signal handling using appropriate Unix/Linux system calls.
- Utilize inter process communication mechanisms such as pipes, FIFOs, message queues, and semaphores to achieve synchronization and data exchange.

List of Experiments

1. Study and practice of basic Linux commands (ls, cat, cp, mv, chmod, grep, ps, df, ping, etc.)
2. Write a shell script to display system information (user name, current directory, date, uptime, etc.)
3. Write a shell script to perform arithmetic operations and conditional branching
4. Write a shell script using looping and functions (factorial / Fibonacci / prime number)
5. Write a C program to copy the contents of one file to another using system calls
6. Write a C program to display file properties using `stat()` system call
7. Write a C program to create a directory, list files using directory-related system calls
8. Write a C program to demonstrate process creation using `fork()` and `exec()`
9. Write a C program to demonstrate `wait()` and creation of zombie/orphan processes
10. Write a C program to handle signals using `signal()` and `alarm()` functions

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11. Write a C program to implement IPC using unnamed pipes between parent and child processes
12. Write a C program to implement IPC using named pipes (FIFOs)
13. Write a C program to demonstrate message queue communication between two processes
14. Write a C program to implement shared memory communication between two processes
15. Write a client-server application using sockets (TCP connection)

TEXTBOOKS:

1. Unix System Programming using C++, T. Chan, PHI.
2. Advanced Programming in the Unix Environment, 2nd edition, W. R. Stevens and S. A. Rago, Pearson Education.
3. Unix Concepts and Applications, 4th Edition, Sumit Abha Das, TMH.
4. Unix Network Programming, W. R. Stevens, PHI.

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| 1. <u>Dev</u> | 2. <u>Amul</u> | 3. <u>Dev.</u> |
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M.Tech. CSE

I Year - I Semester

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RESEARCH METHODOLOGY & IPR

Course Objectives:

- To understand the research problem
- To know literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: The student will learn

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important placing row of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. 6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

UNIT - I: Meaning of research problem

Sources of research problems, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problems, data collection, analysis, interpretation, Necessary instrumentations.

UNIT - II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

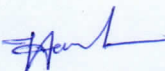
UNIT - IV: Nature of Intellectual Property

Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - V:

Scope of Patent Rights. Licensing and transfer of technology. Patent information And databases. Geographical Indications. New Developments in IPR: Administration of

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Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. C.R.Kothari, Research Methodology, methods & techniques, 2nd edition, New age International publishers

Reference Books:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
3. May all, "Industrial Design", Mc Graw Hill, 1992.
4. Niebel, "Product Design", Mc Graw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

1. Stuart Melville

2. Halbert

3. May all

4. Niebel

5. Ranjit Kumar

6. Asimov

7. Robert P. Merges

8. Peter S. Menell

9. Mark A. Lemley

10. T. Ramappa

11. Stuart Melville

12. Wayne Goddard

13. C.R. Kothari

14. Stuart Melville

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M.Tech. CSE

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I Year - I Semester

VALUE EDUCATION

Course Objectives:

- Aim to cultivate a strong moral compass in individuals by developing key ethical values like integrity, empathy, respect, and responsibility, enabling them to make positive choices and contribute positively to society, while the outcomes would be demonstrated through responsible behavior, critical thinking about ethical dilemmas, and the ability to apply values in real-life situations.

Course Outcomes: The student will learn

- Demonstrate ethical decision-making skills: Ability to identify ethical dilemmas and make responsible choices in real-life situations
- Articulate ethical principles: Clearly explain the reasoning behind moral values and their application.
- Engage in constructive dialogue on ethical issues: Actively participate in discussions about complex ethical problems, considering multiple perspectives.
- Show empathy and compassion towards others: Demonstrate understanding and concern for the well-being of others.

UNIT - I:

Values and self-development Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation. Standards and principles, Value judgments

UNIT - II:

Importance of cultivation of values Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT - III:

Personality and Behavior Development Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness , Avoid fault Thinking, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, doing best for saving nature

UNIT - IV:

Character and Competence Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, all religions and same message, mind your Mind, Self-control, Honesty, Studying effectively

Text Books:

1. Chakraborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

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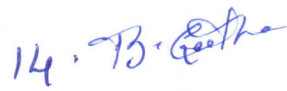
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I Year - II Semester

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ADVANCED ALGORITHMS (PC-III)

Course Objectives:

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.
- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.
- To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes: The student will learn

- Analyze the complexity / performance of different algorithms.
- Determine the appropriate data structure for solving a particular set of problems.
- Categorize the different problems in various classes according to their complexity.

UNIT-I-Sorting

Review of various sorting algorithms, topological sorting Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT-II-Matroids

Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-III-Flow Networks

Max flow-min cut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP- decomposition.

UNIT-IV-Shortest Path in Graphs

Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schönhage-Strassen Integer Multiplication algorithm.

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UNIT-V-Linear Programming

Geometry of the feasibility region and Simplex algorithm NP-completeness: Examples, proof of NP-hardness and NP-completeness. Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

Reference Books:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms".
2. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms".
3. Kleinberg and Tardos. "Algorithm Design".

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I Year - II Semester

ADVANCED COMPUTER ARCHITECTURE (PC-IV)

Course Objectives:

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multi-threaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems.

Course Outcomes: The student will learn

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipe lining, Super scalar processors

UNIT-I

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multi computers, Multi vector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT-II

Principles of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors.

UNIT-III

Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT-IV

Parallel and Scalable Architectures, Multi processors and Multi computers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multi computers, Message-passing Mechanisms, Multi vector and SIMD computers.

UNIT-V

Vector Processing Principles, Multi vector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

TEXTBOOK:

Advanced Computer Architecture, KaiHwang, 2 ndEdition, Tata Mc Graw Hill

Publishers.

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Reference Books:

1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition, ELSEVIER
2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC, Taylor & Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Well in, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D.Sima, T.Fountain, P.Kacsuk, Pearson education.
5. Computer Architecture, B.Parhami, Oxford Univ.Press.

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I Year - II Semester

ENTERPRISE CLOUD CONCEPTS (PROFESSIONAL ELECTIVE - III)

Course Objectives:

- Knowledge of the significance of cloud computing and its fundamental concepts and models.

Course Outcomes: The student will learn

- Understand the importance of cloud architecture
- Illustrating the fundamental concepts of cloud security
- Analyze various cloud computing mechanisms
- Understanding the architecture and working of cloud computing.

UNIT-I

Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges. Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

UNIT-II

Cloud-Enabling Technology: Broad and Networks and Internet Architecture, Data Center Technology, Virtualization Technology. Cloud Computing Mechanisms: Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication.

UNIT-III

Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System, Case Study Example Cloud Computing Architecture Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example

UNIT-IV

Cloud-Enabled Smart Enterprises: Introduction, Revisiting the Enterprise Journey, Service-Oriented Enterprises, Cloud Enterprises, Smart Enterprises, The Enabling Mechanisms of Smart Enterprises Cloud-Inspired Enterprise Transformations: Introduction, The Cloud Scheme for Enterprise Success, Elucidating the Evolving Cloud Idea, Implications of the Cloud on Enterprise Strategy, Establishing a Cloud-Incorporated Business Strategy

UNIT-V

Transitioning to Cloud-Centric Enterprises: The Tuning Methodology, Contract Management in the Cloud Cloud-Instigated IT Transformations Introduction, Explaining Cloud Infrastructures, A Briefing on Next-Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure Solutions, Clouds for Business Continuity,

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The Relevance of Private Clouds, The Emergence of Enterprise Clouds

TEXTBOOK:

1. Erl Thomas, Put tini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition, Pethuru Raj, Cloud Enterprise Architecture, CRC Press

Reference Books:

1. James Bond, The Enterprise Cloud, O'Reilly Media, Inc

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I Year - II Semester

CYBER SECURITY (PROFESSIONAL ELECTIVE - III)

Course Objectives:

- To understand various types of cyber-attacks and cyber-crimes
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks

Course Outcomes: The student will learn

- Analyze and evaluate the cyber security needs of an organization.
- Understand Cyber Security Regulations and Roles of International Law
- Design and develop a security architecture for an organization.
- Understand fundamental concepts of data privacy attacks

UNIT - I:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II:

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT - III:

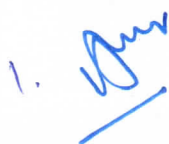
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV:

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations

UNIT - V:

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy

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Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. **Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Textbooks:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&F Group.

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PARALLEL COMPUTING (PROFESSIONAL ELECTIVE - III)

Course Objectives:

- To introduce the foundations of parallel Computing
- To learn various parallel computing architectures and programming models
- To gain knowledge of writing efficient parallel programs

Course Outcomes: The student will learn

- Ability to understand the concepts of parallel architectures
- Ability to select the data structures that efficiently model the information in a problem.
- Ability to develop an efficient parallel algorithm to solve it.
- Ability to implement an efficient and correct code to solve it, analyse its performance

UNIT - I:

Parallel Computing: Introduction, Motivation and scope - Parallel Programming Platforms – Basic Communication Operations

UNIT - II:

Principles of Parallel Algorithm Design - Analytical Modelling of Parallel Programs

UNIT - III:

Programming using Message Passing Paradigm (MPI) – Programming Shared Address Space Platforms (PThreads)

UNIT - IV:

Dense Matrix Algorithms (Matrix-Vector Multiplication, Matrix-Matrix Multiplication) – Sorting Algorithms (Insertion Sort, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

UNIT - V:

Graph Algorithms (Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm) Search Algorithms (DFS, BFS)

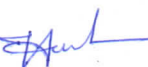
Textbooks:

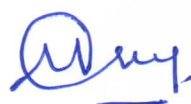
1. Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

Reference Books:

1. Parallel Computing – Theory and Practice, Second Edition, Michael J. Quinn, Tata McGrawHill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI.

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LARGE LANGUAGE MODELS (PROFESSIONAL ELECTIVE - III)

Course Objectives:

- To introduce the foundations of transformer architectures and their evolution into LLMs.
- To equip students with skills to train, fine-tune, and deploy LLMs for various tasks.
- To explore ethical, legal, and societal implications of LLMs in real-world applications.
- To expose students to state-of-the-art LLM frameworks, evaluation techniques, and research trends

Course Outcomes: The student will learn

- Understand the architecture and inner workings of transformer-based LLMs.
- Apply prompt engineering and fine-tuning techniques for domain-specific tasks.
- Evaluate LLM performance using standard metrics and benchmarks.
- Identify challenges in LLM training, deployment, and scaling.
- Analyze ethical, legal, and societal implications of LLM usage.

UNIT - I: – Foundations of Large Language Models

Introduction to LLMs: Definition, scope, and historical evolution from statistical NLP to transformers. The Transformer architecture: Attention mechanisms, self-attention, multi-head attention. Pretraining objectives: Masked language modeling (MLM), Causal language modeling (CLM). Evolution of LLMs: BERT, GPT series, T5, LLaMA, Mistral.

UNIT - II: – Training and Fine-Tuning LLMs

Pretraining datasets and tokenization: BPE, SentencePiece, WordPiece. Fine-tuning approaches: Full fine-tuning, LoRA, adapters, instruction tuning. Domain adaptation and few-shot/zero-shot learning. Data augmentation for LLMs and prompt-based tuning.

UNIT - III: – Prompt Engineering and Applications

Principles of prompt design: Zero-shot, few-shot, and chain-of-thought prompting. System prompts, role prompting, and context length optimization. Use cases: Text generation, summarization, code generation, question answering, chatbots. Tools & frameworks: Lang Chain, Llama Index, Hugging Face Transformers.

UNIT - IV: – Evaluation and Deployment of LLMs

Evaluation metrics: Perplexity, BLEU, ROUGE, METEOR, human evaluation. Benchmark datasets: GLUE, SuperGLUE, HELM, BIG-bench. Deployment strategies: API-based deployment, on-prem deployment, inference optimization. Scaling and latency considerations; quantization and pruning for LLMs.

UNIT - V: – Ethics, Safety, and Future Directions

Bias, fairness, and toxicity in LLMs. Hallucination problem and mitigation techniques.

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Legal and regulatory issues: Copyright, data privacy, AI Act. Trends in LLM research: Multimodal LLMs, retrieval-augmented generation (RAG), open-source LLM ecosystems.

Textbooks:

1. Vaswani, A. et al. (2017) Attention Is All You Need – NIPS Conference Paper.
2. Lewis, P. et al. (2021) Language Models are Few-Shot Learners – OpenAI Research Paper.
3. Tunstall, L., von Werra, L., & Wolf, T. (2022) Natural Language Processing with Transformers – O'Reilly Media.

Reference Books:

1. Bommasani, R. et al. (2021) On the Opportunities and Risks of Foundation Models – Stanford CRFM.
2. Jurafsky, D., & Martin, J. H. (2023) Speech and Language Processing (3rd Edition draft) – Pearson.
3. Mollick, E., & Mollick, L. (2024) Co-Intelligence: Living and Working with AI – Little, Brown Spark.
4. Hugging Face Documentation – <https://huggingface.co/docs/>

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BIO INFORMATICS (Professional Elective-IV)

Course Objectives:

- Knowledge on concepts of bio informatics and biological motivations of sequence analysis

Course Outcomes: The student will learn

- Understand the Central Dogma & XML (Bio XML) for Bio informatics
- Analyze Perl (Bioperl) for Bio informatics
- Illustrate Data bases technology, architecture and its interfaces
- Understand Sequence Alignment Algorithms, Phylogenetic Analysis.

UNIT- I

The Central Dogma & XML (Bio XML) for Bio informatics: Watson's definition, information flow, from data to knowledge, Convergence, the organization of DNA, the organization of Proteins, Introduction, Differences between HTML and XML, fundamentals of XML, fundamentals of XML namespaces. Introduction to DTDs, Document type Declarations, Declaring elements, declaring attributes, working with entities XML Schemas, Essential Concepts, working with simple types, working with complex types, Basic name spaces issues.

UNIT- II

Perl (Bio perl) for Bio informatics: Representing sequence data, program to store a DNA sequence, concatenating DNA fragments, Transcription, Calculating the reverse complement in Perl, Proteins, files, reading proteins in files, Arrays, Flow control, finding motifs, counting Nucleotides, exploding strings into arrays, operating on strings, writing to files, subroutines and bugs.

UNIT- III

Databases: Flat file, Relational, object-oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.

UNIT-IV

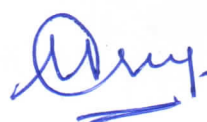
Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models for sequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.

UNIT-V

Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor- Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Other methods, Tree evaluation and problems in phylogenetic analysis,

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Clustering, Protein structure visualization and Protein structure prediction.

TEXTBOOK:

1.S.C.Rastogi,N.Mendiratta,"BioinformaticsMethodsandApplications",CBSpublications, 2004

2.JamesD.Tisdall,"BeginningPerlforBioinformatics"O'Reillymedia,1stEdition, 2001

Reference Books:

1. D.R.Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003)
2. Att Wood,"Bio informatics" Pearson Education, 2004
3. Bryan Bergeron,M.D,"Bio informatics Computing "Pearson Education,2003

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AD-HOC AND SENSOR NETWORKS (PROFESSIONAL ELECTIVE - IV)**Course Objectives:**

- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, multicast and geocasting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

Course Outcomes: The student will learn

- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for adhoc networks
- Understand the transport protocols of sensor networks

UNIT- I

Introduction to Ad Hoc Networks Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; Position- based routing algorithms-Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR

UNIT- II

Data Transmission Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT- III

Geocasting Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT-IV

Basics of Wireless Sensors and Lower Layer Issues Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT-V

Upper Layer Issues of WSN Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

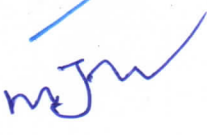
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TEXTBOOK:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kaufman)

Reference Books:

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

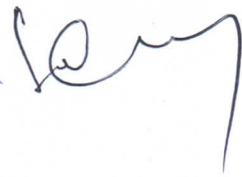
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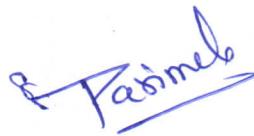
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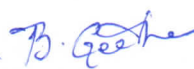
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ROBOTIC PROCESS AUTOMATION (Professional Elective-IV)**Course Objectives:**

- Aim of the course is to make learners familiar with the concepts of Robotic Process Automation

Course Outcomes: The student will learn

- Describe RPA, where it can be applied and how it's implemented.
- Identify and understand Web Control Room and Client Introduction
- Understand how to handle various devices and the workload
- Understand Bot creators, Web recorders and task editors

UNIT - I:

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases– Automation Anywhere Enterprise Platform–Advanced features and capabilities– Ways to create Bots

UNIT - II:

Genetic algorithms - Mathematical foundation, Genetic problem solving, crossover and mutation. genetic algorithms and Markov process, applications of genetic algorithms

UNIT - III:

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

UNIT - IV:

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders – Task Editor–Variables–Command Library–Loop Command–Excel Command– Database Command–String Operation Command– XML Command

UNIT - V:

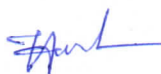
Terminal Emulator Command- PDF Integration Command-FTP Command-PGP Command-Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer

Text Books:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool-Ui Path: Create Software robots. With the leading RPA tool – Ui Path Kindle Edition.

Reference Books:

1. Robotic Process Automation A Complete Guide-2020 Edition Kindle Edition

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GENERATIVE AI (PROFESSIONAL ELECTIVE - IV)

Course Objectives:

- To introduce the foundations, evolution, and core concepts of AI, ML, DL, NLP, and Generative AI.
- To develop understanding of advanced neural architectures and generative models such as GANs, VAEs, and Transformers.
- To explore Large Language Models, prompt engineering, and their real-world applications.
- To familiarize learners with frameworks, multimodal applications, and ethical considerations in Generative AI.

Course Outcomes: The student will learn

- Demonstrate knowledge of AI foundations, generative models, and advanced neural architectures.
- Apply generative AI techniques to create solutions for text, image, video, and multimodal tasks.
- Design, fine-tune, and optimize Large Language Models for specific applications.
- Evaluate ethical, social, and legal implications of Generative AI deployments and propose mitigation strategies.

UNIT- I

Foundations of AI and Generative Models Introduction and historical evolution to Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP) and Deep Learning (DL), Structure of Artificial Neural Networks (ANNs), Mathematical and computational foundations of generative modeling, Overview of generative models and their applications across various domains; Importance of Generative AI in modern applications, Transfer learning and in advancing Generative AI

UNIT- II

Advanced Neural Architectures for Generative AI Variational Autoencoders (VAEs): principles and applications, Generative Adversarial Networks (GANs): architecture and working principles; Transformer architecture and attention mechanisms (in detail); Long Short-Term Memory Networks (LSTMs) and the limitations of traditional RNNs/LSTMs, Advanced Transformer architectures and techniques, Pre-training and transfer learning strategies for generative models.

UNIT- III

Large Language Models and Prompt Engineering Overview of Large Language Models (LLMs), GPT architecture, variants, and working principles, Pretraining and fine-tuning GPT models for applications (e.g., chatbots, text generation), Case study: GPT-based customer support chatbot, BERT architecture, pre-training objectives, and fine-tuning, Prompt Engineering: Designing effective prompts, controlling model behavior,

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and improving output quality, Fine-tuning language models for creative writing and chatbot development

UNIT-IV

Multi-Agent Systems and Generative AI Applications Introduction to Multi-Agent Systems (MAS), Types of agents: reactive, deliberative, hybrid, and learning agents, Multi-agent collaboration and orchestration for generative tasks, Use cases: autonomous research assistants, cooperative creative generation, distributed problem-solving, Frameworks and tools: AutoGen, CrewAI, Hugging GPT for LLM-powered multi-agent systems, Generative AI applications: Art, Creativity, Image/Video generation, Music composition, Healthcare, Finance, Real-world case studies and deployment challenges

UNIT-V

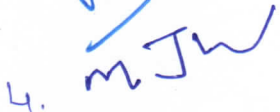
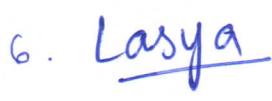
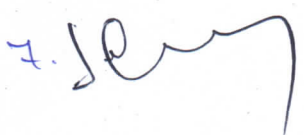
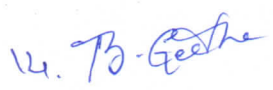
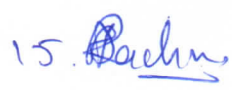
Frameworks, Multimodal Applications, and Ethics LangChain framework: components and LLM application development, Retrieval-Augmented Generation (RAG), Embeddings, Indexing networks, and Vector databases, Generative AI across modalities: Text, Code, Image, and Video generation, Image and Video generation using GANs and VAEs, Multimodal Generative AI: integration and training strategies, Ethical considerations: bias, fairness, trust, and responsible AI deployment, Social and legal implications of Generative AI, Risk mitigation strategies and real-world ethical case studies

TEXTBOOK:

1. Altaf Rehmani, Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology.
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook. Joseph Babcock, Raghav Bali, Generative AI with Python and TensorFlow 2, 2024.

Reference Books:

1. Josh Kalin, Generative Adversarial Networks Cookbook.
2. Jesse Sprinter, Generative AI in Software Development: Beyond the Limitations of Traditional Coding, 2024.

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ADVANCED ALGORITHMS LAB(Lab-III)**Course Objectives:**

- The student can able to attain knowledge in advanced algorithms..

Course Outcomes: The student will learn

- The student can able to attain knowledge in advanced algorithms.

List of Experiments:

1. Implement assignment problem using Brute Force method.
2. Perform multiplication of long integers using divide and conquer method.
3. Implement a solution for the knap sack problem using the Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition.
6. Implement War shall algorithm.
7. Implement the Rabin Karp algorithm.
8. Implement the KMP algorithm.
9. Implement Har spool algorithm.
10. Implement max-flow problem.

Text books:

1. **Design and Analysis of Algorithms**, S.Sridhar, OXFORD University Press.

Reference Books:

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.

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ENTERPRISE CLOUD CONCEPTS LAB (Professional Elective-III Lab)

Course Objectives:

- Knowledge on significance of cloud computing and its fundamental concepts and models.

Course Outcomes: The student will learn

- Understand importance of cloud architecture
- Illustrating the fundamental concepts of cloud security
- Analyze various cloud computing mechanisms
- Understanding the architecture and working of cloud computing.

List of Experiments

1. Install Virtual box/V M ware Work station with different flavors of linux or windows O S on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java..
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using try stack (Online Open stack DemoVersion)
6. Install Hadoops in glenode cluster and run simple applications like word count.

E-Resources:

1. <https://www.iitk.ac.in/nt/faq/vbox.htm>
2. <https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjqrNG0za73AhXZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu%2F~sedwards%2Fclasses%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz>
3. <https://www.cloudsimtutorials.online/cloudsim/>
4. <https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-intrystack/>
5. <https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster>

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CYBER SECURITY LAB (LAB -IV)

Course Objectives:

- To get practical exposure of Cyber security threats
- Learn about cyber forensic tools

Course Outcomes: The student will learn

- Get the skill to identify cyber threats/attacks.
- Get the knowledge to solve security issues in day-to-day life.

List of Experiments:

1. Perform an Experiment for port scanning with NMAP.
2. Setup a honeypot and monitor the honeypot on the network
3. Install Jcrpt /Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.
4. Generate minimum 10 passwords of length 12 characters using open SSL command
5. Perform practical approach to implement Foot printing-Gathering target information using Dmitry-Dmagic, UAtester.
6. Working with sniffers for monitoring network communication (Wireshark).
7. Use Snort to perform real time traffic analysis and packet logging.
8. Perform email analysis using Autopsy tool.
9. Perform Registry analysis and get boot time logging using process monitor tool
10. Perform File type detection using Autopsy tool
11. Perform Memory capture and analysis using FTK imager tool
12. Perform Network analysis using the Network Miner tool

Text books:

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010

Reference Books:

1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.

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PARALLEL COMPUTING LAB (LAB -IV)**Course Objectives:**

- To introduce the foundations of parallel Computing
- To learn various parallel computing architectures and programming models
- To gain knowledge of writing efficient parallel programs..

Course Outcomes: The student will learn

- Ability to understand the concepts of parallel architectures
- Ability to select the data structures that efficiently model the information in a problem.
- Ability to develop an efficient parallel algorithm to solve it.
- Ability to implement an efficient and correct code to solve it, analyze its performance

List of Experiments:

1. Design a parallel program to implement Matrix-Vector and Matrix-Matrix Multiplication using MPI library.
2. Design a parallel program to implement Bubble Sort using OpenMP and Pthread Programming Constructs.
3. Design a parallel program to implement Quick Sort using OpenMP and Pthread Programming Constructs.
4. Design a parallel program to implement Bucket Sort using OpenMP and Pthread Programming Constructs.
5. Design a parallel program to implement Prim's Algorithm using OpenMP and Pthread Programming Constructs.
6. Design a parallel program to implement DFS Algorithm using OpenMP and Pthread Programming Constructs.
7. Design a parallel program to implement BFS Algorithm using OpenMP and Pthread Programming Constructs.
8. Design a parallel program to implement Dijkstra's Algorithm using MPI library.

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LARGE LANGUAGE MODELS LAB (LAB -IV)**Course Objectives:**

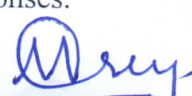
- To provide hands-on understanding of transformer architectures and attention mechanisms used in modern large language models.
- To develop practical skills in fine-tuning, optimizing, and deploying pretrained LLMs for various NLP tasks such as classification, summarization, and text generation.
- To apply prompt engineering and parameter-efficient techniques for effective utilization of LLMs in real-world applications.
- To explore evaluation metrics, ethical aspects, and safety considerations in building and analyzing large language model-based systems.

Course Outcomes: The student will learn

- To implement and understand the working of transformer architectures, including attention and self-attention mechanisms used in large language models.
- To fine-tune, adapt, and optimize pretrained LLMs for various NLP tasks using modern frameworks and parameter-efficient techniques.
- To design, construct, and evaluate effective prompts for zero-shot, few-shot, and reasoning-based applications.
- To evaluate the performance of large language models using standard metrics, deploy them as APIs, and optimize them for efficient inference.
- To identify, analyze, and mitigate ethical issues such as bias, hallucination, and unfairness in large language model outputs.

List of Experiments:

1. Write a program to implement the Self-Attention mechanism
2. Write a program to visualize Multi-Head Attention in a Transformer model.
3. Write a program to demonstrate Masked and Causal Language Modeling
4. Write a program to perform Tokenization using BPE, Word Piece, and Sentence Piece
5. Write a program to fine-tune a pretrained Transformer model for Text Classification
6. Write a program to perform Parameter-Efficient Fine-Tuning using LoRA or Adapter Layers.
7. Write a program to perform Zero-Shot and Few-Shot Prompting.
8. Write a program to implement Chain-of-Thought (CoT) Prompting.
9. Write a program to build a Chatbot using Lang Chain.
10. Write a program to evaluate LLM outputs using BLEU, ROUGE, METEOR, and Perplexity metrics.
11. Write a program to deploy a fine-tuned model as an API using Fast API or Flask.
12. Write a program to optimize model inference using Quantization.
13. Write a program to detect Bias and Toxicity in LLM-generated responses.

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14. Write a program to implement Retrieval-Augmented Generation (RAG)

Textbooks:

1. Vaswani, A. et al. (2017) Attention Is All You Need – NIPS Conference Paper.
2. Lewis, P. et al. (2021) Language Models are Few-Shot Learners – OpenAI Research Paper.
3. Tunstall, L., von Werra, L., & Wolf, T. (2022) Natural Language Processing with Transformers – O'Reilly Media.

Reference Books:

1. Bom Masani, R. et al. (2021) On the Opportunities and Risks of Foundation Models – Stanford CRFM.
2. Jurafsky, D., & Martin, J. H. (2023) Speech and Language Processing (3rd Edition draft) – Pearson.
3. Mollick, E., & Mollick, L. (2024) Co-Intelligence: Living and Working with AI – Little, Brown Spark.
4. Hugging Face Documentation – <https://huggingface.co/docs/>

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CONSTITUTION OF INDIA

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II:

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III:

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

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UNIT-V:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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DIGITAL FORENSICS (PROFESSIONAL ELECTIVE - V)

Course Objectives:

- provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Course Outcomes: The student will learn

- Understand relevant legislation and codes of ethics.
- Computer forensics and digital detective and various processes, policies and procedures.
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics.

UNIT - I:

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

UNIT - II:

Cyber Crime Scene Analysis:

Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT - III:

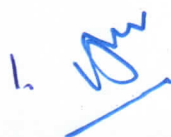
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT - IV:

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT - V:

Mobile Forensics: mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile

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forensic technique and methods to search and seizure electronic evidence

Text Books:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

Reference Books:

1. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence, Packt Publishing; 1st edition (30 April 2020), ISBN : 1838648178.
2. Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar , Cybercrime and Digital Forensics: An Introduction, Routledge.

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3. W. Oettinger

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ADVANCED OPERATING SYSTEMS (PROFESSIONAL ELECTIVE - V)

Course Objectives:

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems), Hardware and software features that support these systems.

Course Outcomes: The student will learn

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi-processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

UNIT - I:

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT - II:

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Heuristic Algorithm.

UNIT - III:

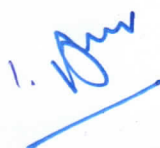
Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT - IV:

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT - V:

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and

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Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

Text Books:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjana G. Shivaratri, Tata McGraw-Hill Edition 2001.

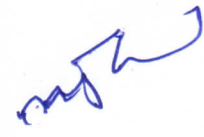
Reference Books:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition - 2, 2007.

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M.Tech. CSE L T P C

II Year - III Semester 3 0 0 3

QUANTUM COMPUTING (PROFESSIONAL ELECTIVE - V)

Course Objectives:

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

Course Outcomes: The student will learn

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand the Impact of Quantum Computing on Cryptography

UNIT - I:

Introduction to Essential Linear Algebra Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory **Complex Numbers** Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers

UNIT - II:

Basic Physics for Quantum Computing The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement Basic Quantum Theory Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE

UNIT - III:

Quantum Architecture Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture **Quantum Hardware** Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials

UNIT - IV:

Quantum Algorithms What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm

UNIT - V:

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve The Impact of **Quantum Computing on Cryptography:** Asymmetric Cryptography, Specific Algorithms, Specific Applications.

Text Books:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press

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2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

Reference Books:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. Basic Concepts, Vol
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

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II Year - III Semester 3 0 0 3

PROMPT ENGINEERING (PROFESSIONAL ELECTIVE - V)

Course Objectives:

- To introduce the principles and techniques of effective prompt engineering for generative AI models.
- To understand the architecture, capabilities, and evolution of large language models such as GPT-3.5, GPT-4, Gemini, and LLaMA.
- To explore standard practices in structured and unstructured text generation using tools like ChatGPT.
- To apply chunking, tokenization, and formatting techniques for improving text generation and manipulation.
- To understand the role of embeddings, vector databases (FAISS, Pinecone), and Retrieval Augmented Generation (RAG) in modern NLP systems.

Course Outcomes: The student will learn

- Explain and apply the core principles of prompt engineering for guiding generative AI outputs effectively.
- Describe the underlying architecture and functionality of state-of-the-art large language models (LLMs)
- Generate and manipulate structured outputs (JSON, YAML, CSV) using ChatGPT with advanced prompting techniques.
- Implement text chunking, tokenization, and format control using tools like Spa Cy, Tiktoken, and Python. 5. Utilize vector databases such as FAISS and Pinecone in Retrieval-Augmented Generation (RAG) pipelines for efficient information retrieval..

UNIT - I:

Fundamentals and Principles of Prompting Overview of the Five Principles of Prompting: Give Direction, Specify Format, Provide Examples, Evaluate Quality, Divide Labor.

UNIT - II:

Introduction to Large Language Models for Text Generation What Are Text Generation Models, Vector Representations: The Numerical Essence of Language, Transformer Architecture: Orchestrating Contextual Relationships, Probabilistic Text Generation: The Decision Mechanism, Historical Underpinnings: The Rise of Transformer Architectures, OpenAI's Generative Pretrained Transformers, GPT-3.5-turbo and ChatGPT, GPT-4, Google's Gemini, Meta's Llama and Open Source.

UNIT - III:

Standard Practices for Text Generation with ChatGPT- Part-A Generating Lists, Hierarchical List Generation, When to Avoid Using Regular Expressions, Generating JSON, YAML Filtering YAML Payloads, Handling Invalid Payloads in YAML, Diverse Format Generation with ChatGPT, Mock CSV Data, Universal Translation Through LLMs, Ask for Context, Text Style Unbundling, Identifying the Desired Textual

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Features, Generating New Content with the Extracted Features, Extracting Specific Textual Features with LLMs..

UNIT - IV:

Standard Practices for Text Generation with ChatGPT- Part-B Chunking Text, Benefits of Chunking Text, Scenarios for Chunking Text, Poor Chunking Example, Chunking Strategies, Sentence Detection Using SpaCy, building a Simple Chunking Algorithm in Python, Sliding Window Chunking, Text Chunking Packages, Text Chunking with Tiktoken, Encodings, Understanding the Tokenization of Strings.

UNIT - V:

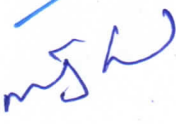
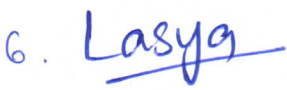
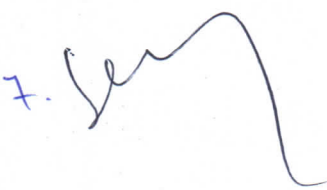
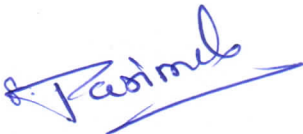
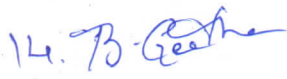
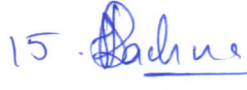
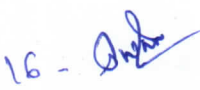
Vector Databases with FAISS and Pinecone Retrieval Augmented Generation (RAG), Introducing Embeddings, Document Loading. Memory Retrieval with FAISS, RAG with Lang Chain, Hosted Vector Databases with Pinecone, Self Querying, Alternative Retrieval Mechanisms.

Textbooks:

1. Phoenix J, Taylor M. Prompt engineering for generative AI. " O'Reilly Media, Inc."; 2024 May 16.

Reference Books:

1. Tunstall L, Von Werra L, Wolf T. Natural language processing with transformers. " O'Reilly Media, Inc."; 2022 Jan 26. 2. Foster D. Generative deep learning. " O'Reilly Media, Inc."; 2022 Jun 28.

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INTELLECTUAL PROPERTY RIGHTS (OPEN ELECTIVE)

Course Outcomes: The student will learn

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs

UNIT - I:

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II:

Trademarks: Purpose and function of trademarks, acquisition of trademark rights, protectable matter, selecting, and evaluating trademark, trademark registration processes..

UNIT - III:

Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, international copyright law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT - IV:

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation of the right of publicity, false advertising.

UNIT - V:

New development of intellectual property: new developments in trademark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trademark law, copyright law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

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GENERATIVE AI (OPEN ELECTIVE)

Course Objectives:

- To introduce the foundations, evolution, and core concepts of AI, ML, DL, NLP, and Generative AI.
- To develop understanding of advanced neural architectures and generative models such as GANs, VAEs, and Transformers.
- To explore Large Language Models, prompt engineering, and their real-world applications.
- To familiarize learners with frameworks, multimodal applications, and ethical considerations in Generative AI.

Course Outcomes: The student will learn

- Demonstrate knowledge of AI foundations, generative models, and advanced neural architecture.
- Apply generative AI techniques to create solutions for text, image, video, and multimodal tasks.
- Design, fine-tune, and optimize Large Language Models for specific applications.
- Evaluate ethical, social, and legal implications of Generative AI deployments and propose mitigation strategies.

UNIT - I:

Foundations of AI and Generative Models Introduction and historical evolution to Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP) and Deep Learning (DL), Structure of Artificial Neural Networks (ANNs), Mathematical and computational foundations of generative modeling, Overview of generative models and their applications across various domains; Importance of Generative AI in modern applications, Transfer learning and in advancing Generative AI

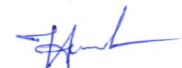
UNIT - II:

Advanced Neural Architectures for Generative AI Variational Autoencoders (VAEs): principles and applications, Generative Adversarial Networks (GANs): architecture and working principles; Transformer architecture and attention mechanisms (in detail); Long Short-Term Memory Networks (LSTMs) and the limitations of traditional RNNs/LSTMs, Advanced Transformer architectures and techniques, Pre-training and transfer learning strategies for generative models.

UNIT - III:

Large Language Models and Prompt Engineering Overview of Large Language Models (LLMs), GPT architecture, variants, and working principles, Pre training and fine-tuning GPT models for applications (e.g., chatbots, text generation), Case study: GPT-based customer support chatbot, BERT architecture, pre-training objectives, and fine-tuning, Prompt Engineering: Designing effective prompts, controlling model behavior, and improving output quality, Fine-tuning language models for creative writing and chatbot development.

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UNIT - IV:

Multi-Agent Systems and Generative AI Applications Introduction to Multi-Agent Systems (MAS), Types of agents: reactive, deliberative, hybrid, and learning agents, Multi-agent collaboration and orchestration for generative tasks, Use cases: autonomous research assistants, cooperative creative generation, distributed problem-solving, Frameworks and tools: AutoGen, CrewAI, Hugging GPT for LLM-powered multi-agent systems, Generative AI applications: Art, Creativity, Image/Video generation, Music composition, Healthcare, Finance, Real-world case studies and deployment challenges.

UNIT - V:

Frameworks, Multimodal Applications, and Ethics LangChain framework: components and LLM application development, Retrieval-Augmented Generation (RAG), Embeddings, Indexing networks, and Vector databases, Generative AI across modalities: Text, Code, Image, and Video generation, Image and Video generation using GANs and VAEs, Multimodal Generative AI: integration and training strategies, Ethical considerations: bias, fairness, trust, and responsible AI deployment, Social and legal implications of Generative AI, Risk mitigation strategies and real-world ethical case studies.

Textbooks:

1. Altaf Rehmani, Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology.
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook. Joseph Babcock, Raghav Bali, Generative AI with Python and TensorFlow 2, 2024.

Reference Books:

1. Josh Kalin, Generative Adversarial Networks Cookbook.
2. Jesse Sprinter, Generative AI in Software Development: Beyond the Limitations of Traditional Coding, 2024.
3. Fabian Gloeckle et al., Better & Faster Large Language Models via Multi-token Prediction, arXiv:2404.19737v1, 2024. Vaswani et al., Attention Is All You Need, NeurIPS 2017.

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INTRUSION DETECTION SYSTEMS (OPEN ELECTIVE)

Course Objectives:

- Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion.
- Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

Course Outcomes: The student will learn

- Understand fundamental knowledge of intrusion detection and prevention
- Understand different types of attacks in network layer and code injection human layer.
- Analyze different anomaly detection algorithms

UNIT - I:

The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's - Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS

UNIT - II:

Classes of attacks - Network layer: scans, denial of service, penetration Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sop Hesitated groups-Automated: Drones, Worms, Viruses.

UNIT - III:

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS.

UNIT - IV:

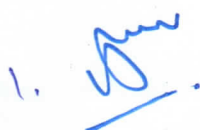
Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection.

UNIT - V:

Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detection Obfuscation, polymorphism- Document vectors. Email/IM security issues-Viruses/Spam- From signatures to thumbprints to zero day detection-Insider Threat issues-Taxonomy- Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security.

Textbooks:

1. Peter Szor, The Art of Computer Virus Research and Defense, Symantec Press ISBN 0-321-30545-3.
2. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacks

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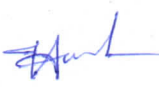
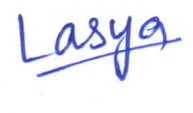
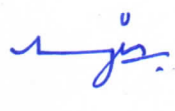
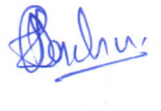
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Reference Books:

1. Saiful Hasan, Intrusion Detection System, Kindle Edition.
2. Ankit Fadia, Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection.

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DIGITAL FORENSICS (OPEN ELECTIVE)

Course Objectives:

- provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Course Outcomes: The student will learn

- Understand relevant legislation and codes of ethics.
- Computer forensics and digital detective and various processes, policies and procedures.
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics.

UNIT - I:

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

UNIT - II:

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT - III:

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause. IDS.

UNIT - IV:

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT - V:

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent

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trends in mobile forensic technique and methods to search and seizure electronic evidence

Textbooks:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

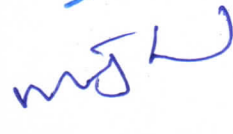
Reference Books:

1. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence, Packt Publishing; 1st edition (30 April 2020), ISBN : 1838648178.
2. Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-Spellar , Cybercrime and Digital Forensics: An Introduction, Routledge.

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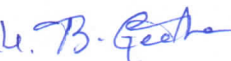
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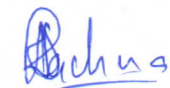
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