

G. Pullaiah College of Engineering and Technology
(Autonomous)

**(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA (ECE & EEE)
| Affiliated to JNTUA)**

Nandikotkur Road, Venkayapalli (V), Kurnool – 518452, Andhra Pradesh

MASTER OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS GPCET – R25

M.Tech Regular Two Year Degree Programme
(for the batches admitted from the academic year 2025-26)

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Academic Regulations of M.Tech. (Full Time/Regular) Programme

(Effective for the students admitted into I year from the Academic Year 2025-26 and onwards)

G.Pullaiah College of Engineering and Technology, Kurnool offers **Two Years (Four Semesters)** full-time Master of Technology (M.Tech.) Degree programme, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.

The G.Pullaiah College of Engineering and Technology, Kurnool shall confer M. Tech. degree on candidates who are admitted to the programme and fulfill all the requirements for the award of the degree.

1. Award of the M.Tech. Degree

A student will be declared eligible for the award of the M.Tech. degree if he/she fulfills the following:

1.1 Pursues a course of study for not less than two academic years and not more than four academic years.

1.2 Registers for 75 credits and secures all 75 credits.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. course and their admission stands cancelled.

3. Programme of Study:

The following M.Tech specialization is currently offered under the Department of Computer Science and Engineering.

S.No	Discipline	Name of the Specialization	Code
01	Computer Science and Engineering	Computer Science & Engineering	58

4. Eligibility for Admissions:

4.1 Admission to the M. Tech Program shall be made subject to the eligibility, qualification and specialization prescribed by the A.P. State Government/University from time to time.

4.2 Admissions shall be made either 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 A.P. State Government (APPGECET) for M.Tech programmes an entrance test conducted by University/on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

5. Programme related terms:

5.1 **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/Tutorial) or two hours of practical work/field work per week.

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit

- 5.2 **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- 5.3 **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses.

6. Programme Pattern:

- 6.1 Total duration of the of M.Tech. programme is two academic years
- 6.2 Each academic year of study is divided into two semesters.
- 6.3 Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per semester.
- 6.4 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.
- 6.5 The medium of instruction of the programme (including examinations and project reports) will be in English only.
- 6.6 All subjects/courses offered for the M.Tech. degree programme are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Core Courses	Foundational & Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
2.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline which are of importance in the context of special skill development
3.	Mandatory Course	Quantum Technology and Application	To understand importance of latest technologies, research and process of creation of patents through research
		Research methodology & IPR	
4.		Skill Enhancement courses (SE)	Interdisciplinary / job-oriented/domain courses which are relevant to the industry
		Comprehensive Viva	To test the overall domain knowledge
		Short Term Industry Internship	To provide real time exposure
		Dissertation	To provide application of domain knowledge to solve real problems
5.	Audit Courses	Mandatory non credit courses	Covering subjects of developing desired attitude among the learners.

- 6.7 The college shall take measures to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- 6.8 A faculty advisor/mentor shall be assigned to each specialization to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.
- 6.9 Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Attendance Requirements:

- 7.1 A student shall be eligible to appear for the University external examinations if he/she acquires i) a minimum of 50% attendance in each course and ii) 75% of attendance in aggregate of all the courses.
- 7.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- 7.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence
- 7.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class.
- 7.5 A stipulated fee shall be payable towards condonation of shortage of attendance.
- 7.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission into that semester when offered next.
- 7.7 If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- 7.8 If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

8. 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 for theory and 100 marks for practical, based on Internal Evaluation and End Semester Examination.

- 8.1 There shall be five units in each of the theory subjects. For the theory subjects 60 marks will be for the End Examination and 40 marks will be for Internal Evaluation.
- 8.2 Two Internal Examinations shall be conducted for 30 marks each, one in the middle of the Semester and the other immediately after the completion of instruction period. The other 10 marks is awarded for continuous assessment in the form of assignments, quizzes, open book examination, presentation, etc. First mid examination shall be conducted for I & II units of the syllabus and second mid examination for III, IV & V units. Each mid exam shall be conducted for a total duration of 120 minutes with 3 questions (without choice) and each question carries 10 marks. Final Internal marks for a total of 40 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage to the better internal exam and 20% to the other.
- 8.3 The following pattern shall be followed in the End Examination:
 - i. Five questions shall be set from each of the five units with either/or type for 12 marks each.
 - ii. All the questions have to be answered compulsorily.

- iii. Each question may consist of one, two or more bits.
- 8.4 For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day-to-day performance.
The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup mark of Procedure-10, Experimentation-25, Results-10, Viva- voce-15.
- 8.5 There shall be Mandatory **Audit courses** in I & II semesters for zero credits. There is no external examination for audit courses. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re- examination shall be conducted for failed candidates for 40 marks for every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.
- 8.6 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 8.7 In case the candidate does not secure the minimum academic requirement in any of the subjects he/she has to reappear for the Semester Examination either supplementary or regular in that subject or repeat the course when next offered or do any other specified subject as may be required.
- 8.8 The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

9. Credit Transfer Policy

As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 40% of the Professional and Open Electives in a semester through SWAYAM/SWAYAM Plus.

- 9.1 The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.
- 9.2 The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform
- 9.3 Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution
- 9.4 The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculum in the offline mode.
- 9.5 The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
- 9.6 Students may register for an 8-week (2 credits) or 12-week (3 credits) SWAYAM / SWAYAM plus course with the approval of the Head of the Department (HoD).
- 9.7 Examination fees, if applicable, shall be borne by the student. Pass marks and grading will be as per the GPCET academic regulations.

- 9.8 A student must get minimum 40% marks for assignments and quizzes on the SWAYAM/ SWAYAM plus platform to be eligible for the end-semester examination. The students who are unable to get minimum internal marks in SWAYAM/ SWAYAM plus platform, they have to re-register for the course in subsequent semester through SWAYAM/ SWAYAM plus platform.
 - 9.9 The end-semester exam may be conducted by the National Testing Agency (NTA), the National Programme on Technology Enhanced Learning (NPTEL) or the University during the regular end-term exams. Evaluation shall comprise 60% weightage for the end-semester examination and 40% for assignments and quizzes conducted by the SWAYAM/ SWAYAM plus course coordinator. The student has to get 50% marks for internal and external with minimum of 40% marks in the external examination to declare them as pass.
 - 9.10 The institution shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester. However, the credits will be transferred to the students who got minimum 50% marks with 40% marks in the external examination
 - 9.11 The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
 - 9.12 The university shall ensure no overlap of SWAYAM MOOC exams with that of the university examination schedule. In case of delay in SWAYAM results, the university will re-issue the marks sheet for such students.
 - 9.13 Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the minimum 50% of marks and grades.
 - 9.14 The institution shall submit the following to the examination section of the university:
 - a) List of students who have passed MOOC courses in the current semester along with the certificates of completion.
 - b) Undertaking form filled by the students for credit transfer.
 - 9.15 The university shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.
- Note:** Students shall also be permitted to register for MOOCs offered through online platforms other than SWAYAM NPTEL. In such cases, credit transfer shall be permitted only after seeking approval of the University at least three months prior to the commencement of the semester.

10. Re-registration for Improvement of Internal Evaluation Marks:

A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination

- 10.1 The candidate should have completed the course work and obtained examinations results for **I, II and III** semesters.
- 10.2 The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%.
- 10.3 Out of the subjects the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of **three** Theory subjects for Improvement of Internal evaluation marks.
- 10.4 The candidate has to re-register for the chosen subjects and fulfill the academic requirements.
- 10.5 For reregistration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required
- 10.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation

marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

11. Evaluation of Project/Dissertation Work:

The Project work shall be initiated at the beginning of the III Semester and the duration of the Project is of two semesters. Evaluation of Project work is for 300 marks with 200 marks for internal evaluation and 100 marks for external evaluation. Progress of the project work is monitored through three reviews:

- Project review – I at the beginning of the III semester for zero marks
- Project review – II at the end of the third semester for 100 marks
- Project review – III before submission of the thesis i.e., end of the IV semesters for 100 marks

External evaluation of final Project work viva voce in IV semester shall be for 100 marks.

A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one faculty member of the department offering the M.Tech. programme.

- 11.1 A candidate is permitted to register for the Project Work in III Semester after satisfying the attendance requirement in all the subjects, both theory and laboratory (in I & II semesters).
- 11.2 A candidate is permitted to submit Project dissertation with the approval of PRC. The candidate has to pass all the theory, practical and other courses before submission of the Thesis.
- 11.3 Project work shall be carried out under the supervision of teacher in the parent department concerned.
- 11.4 A candidate shall be permitted to work on the project in an industry/research organization on the recommendation of the Head of the Department. In such cases, one of the teachers from the department concerned would be the internal guide and an expert from the industry/research organization concerned shall act as co-supervisor/ external guide. It is mandatory for the candidate to make full disclosure of all data/results on which they wish to base their dissertation. They cannot claim confidentiality simply because it would come into conflict with the Industry's or R&D laboratory's own interests. A certificate from the external supervisor is to be included in the dissertation.
- 11.5 Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC.
- 11.6 The candidate shall submit status report by giving seminars in three different phases (two in III semester and one in IV semester) during the project work period. These seminar reports must be approved by the PRC before submission of the Project Thesis.
- 11.7 After registration, a candidate must present in Project Review - I, in consultation with his Project Supervisor, the title, objective and plan of action of his Project work to the PRC for approval within four weeks from the commencement of III Semester. Only after obtaining the approval of the PRC can the student initiate the project work.
- 11.8 The Project Review - II in III semester carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work.
- 11.9 A candidate has to secure a minimum of 50% of marks to be declared successful in Project Review - II. Only after successful completion of Project Review – II, candidate shall be

permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Review - II shall reappear after three months.

- 11.10 The Project Review - III in IV semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Review - III. If student fails to obtain the required minimum marks, he/she has to reappear for Project Review - III after a month.
- 11.11 For the approval of PRC the candidate shall submit the draft copy of dissertation to the Head of the Department and make an oral presentation before the PRC.
- 11.12 After approval from the PRC, the student is permitted to submit a report. The dissertation report will be accepted only when the plagiarism is within 30% checked through Turnitin software (repository mode). The plagiarism report shall be submitted along with the dissertation report.
- 11.13 Research paper related to the Project Work shall be published in an SCI/ESCI/Scopus/UGC Care listed journal, or in conference proceedings with ISBN number organized by professional societies such as IEEE, IEI, etc.
- 11.14 After successful plagiarism check and publication of research paper, three copies of the dissertation certified by the supervisor and HOD shall be submitted to the College.
- 11.15 The dissertation shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College shall submit a panel of three examiners as submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the University.
- 11.16 If the report of the examiner is not satisfactory, the candidate shall revise and resubmit the dissertation, in the time frame as decided by the PRC. If report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the University
- 11.17 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva voce exam.
- 11.18 The Project Viva voce examinations shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who has adjudicated the dissertation. For Dissertation Evaluation (Viva voce) in IV Sem. there are external marks of 100 and it is evaluated by external examiner. The candidate has to secure a minimum of 50% marks in Viva voce exam.
- 11.19 If he fails to fulfill the requirements as specified, he will reappear for the Project 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.

12. Industry Internships:

Industry internship either onsite or virtual with a minimum of 06-08 weeks" duration, done at the end of Ist year second semester. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the PG program. The student shall register for the internship as per course structure after commencement of academic year.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department,

Mentor/Supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. Internship will be evaluated for 100 marks with 50 marks for the report evaluated by the mentor and 50 marks for oral presentation. A student should secure minimum 50% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

13. Comprehensive Viva

A Comprehensive Viva shall be conducted after the II Semester examinations for 100 marks by a committee consisting of the Head of the Department, one senior faculty member of the same specialization, and an external subject expert appointed by the University. The student must secure a minimum of 50% marks to be declared as passed

14. Credits for Co-curricular Activities

The credits assigned for co-curricular activities shall be given by the principals of the colleges and the same shall be submitted to the University. A Student should earn 01 credits under the head of co-curricular activities, viz., attending Conference, Scientific Presentations and Other Scholarly Activities.

Following are the guidelines for awarding Credits for Co-curricular Activities

Name of the Activity	Maximum Credits / Activity
Participation in National Level Seminar/ Conference / Workshop /Training programs (related to the specialization of the student)	0.5
Participation in International Level Seminar / Conference / workshop/Training programs held outside India (related to the specialization of the student)	1
Academic Award/Research Award from State Level/National Agencies	0.5
Academic Award/Research Award from International Agencies	1
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	0.5
Research / Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	1

Note:

- Credit shall be awarded only for the first author. Certificate of attendance and participation in a Conference/Seminar is to be submitted for awarding credit. A minimum participation of five days is required to earn the necessary credits. Alternatively, the student may attend five different one day programs to meet this requirement.
- Certificate of attendance and participation in workshops and training programs (Internal or External) is to be submitted for awarding credit. The total duration should be at least one week.
- Participation in any activity shall be permitted only once for acquiring required credits under cocurricular activities

15. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks

obtained by the student fall.

Structure of Grading of Academic Performance

Letter Grade	Marks Range	Grade Point
S	91-100	10
A	81-90	9
B	70-80	8
C	60-69	7
D	55-59	6
E	50-54	5
F	<50	0
Absent	Ab (Absent)	0

- A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- For noncredit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum (C_i \times G_i) / \sum C_i$$

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

- The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \sum (C_i \times S_i) / \sum C_i$$

where " S_i " is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

16. Award of Class:

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

Class Awarded	Percentage of Marks to be secured
First Class with Distinction	≥ 8
First Class	≥ 7 and < 8
Pass Class	≥ 5 and < 7

17. Exit Policy:

The student shall be permitted to exit with a PG Diploma based on his/her request to the university through the respective institution at the end of first year subject to passing all the courses in first

year.

The University shall resolve any issues that may arise in the implementation of this policy from time to time and shall review the policy in the light of periodic changes brought by UGC, AICTE and State government.

18. Withholding of Results:

If the candidate has any case of in-discipline pending against him/her, the result of the candidate shall be withheld, and he/she will not be allowed/promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

19. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

20. General:

- 20.1 The academic regulations should be read as a whole for purpose of any interpretation.
- 20.2 Disciplinary action for Malpractice/improper conduct in examinations is appended.
- 20.3 Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- 20.4 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 20.5 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.

RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.

(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four 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. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's 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 four consecutive semesters from class work and all University examinations if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant - Superintendent /any	In case of students of the college, they shall be expelled from examination halls and cancellation of

	officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

		semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations, depending on the recommendation of the committee.
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.	

1. Malpractices identified by squad or special invigilators
2. Punishments to the candidates as per the above guidelines.
3. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
4. A show cause notice shall be issued to the college.
5. Impose a suitable fine on the college.
6. Shifting the examination center from the college to another college for a specific period of not less than one year.

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfill all the norms required for the award of Degree.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

M.TECH IN COMPUTER SCIENCE AND ENGINEERING COURSE STRUCTURE & SYLLABUS

SEMESTER – I

S.No.	Code	Course Name	Cate gory	Hours per week			Cre dits	Scheme of evaluation		
				L	T	P		Maximum Marks	Internal marks	External Marks
1.	C45801	Advanced Data Structures & Algorithms	PC	3	0	0	3	40	60	100
2.	C45802	Distributed Operating Systems	PC	3	0	0	3	40	60	100
3.	C45803a C45803b C45803c	Program Elective-I 1. Advanced Computer Architecture 2. Cloud Computing 3. Applied Machine Learning	PE	3	0	0	3	40	60	100
4.	C45804a C45804b C45804c	Program Elective-II 1. Natural Language Processing 2. Smart Sensor Networks & IoT 3. Computing for Data Analytics	PE	3	0	0	3	40	60	100
5.	C45805	Advanced Data Structures & Algorithms Lab	PC	0	0	4	2	40	60	100
6.	C45806	Distributed Operating Systems Lab	PC	0	0	4	2	40	60	100
7.	C45807	Research Methodology and IPR	MC	2	0	0	2	40	60	100
8.	C45808	Full stack Development Using MERN	SE	0	1	2	2	40	60	100
9.	C45809a	Audit Course – I English for Research Paper Writing	AC	2	0	0	0	40*	-	40*
	C45809b	Disaster Management								
	C45809c	Essence of Indian Traditional Knowledge								
Total:				16	1	10	20	320	480	800

*There is no external examination for audit course. Student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

M.TECH IN COMPUTER SCIENCE AND ENGINEERING COURSE STRUCTURE & SYLLABUS

SEMESTER – II

S.No.	Code	Course Name	Category	Hours per week			Credits	Scheme of evaluation		
				L	T	P		Maximum Marks		
								Internal marks	External Marks	Total
1.	C45810	Advances in Software Engineering	PC	3	0	0	3	40	60	100
2.	C45811	Advanced Database Management Systems	PC	3	0	0	3	40	60	100
3.	C45812a C45812b C45812c	Program Elective – III 1. Block Chain Technology 2. Advanced Computer Networks 3. Deep Learning	PE	3	0	0	3	40	60	100
4.	C45813a C45813b C45813c	Program Elective – IV 1. Generative AI 2. Digital Forensics 3. Robotic Process Automation	PE	3	0	0	3	40	60	100
5.	C45814	Advance in Software Engineering Lab	PC	0	0	4	2	40	60	100
6.	C45815	Advanced Database Management Systems Lab	PC	0	0	4	2	40	60	100
7.	C45816	Quantum Technologies And Applications	MC	2	0	0	2	40	60	100
8.	C45817	Comprehensive Viva Voce	PC	0	0	0	2	100	-	100
9.	C45818	Audit Course – II	AC	2	0	0	0	40*	-	-
Total				16	0	8	20	380	420	800

*There is no external examination for audit course. Student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

M.TECH IN COMPUTER SCIENCE AND ENGINEERING COURSE STRUCTURE & SYLLABUS

SEMSTER - III

S.No.	Code	Course Name	Category	Hours per week			Credits	Scheme of evaluation		
				L	T	P		Maximum Marks		
								Internal marks	External Marks	Total
1.	C45819a C45819b C45819c	Program Elective – V 1. Software Defined Networks 2. Reinforcement Learning 3. Data Science	PE	3	0	0	3	40	60	100
2.	C45820	Open Elective-I	OE	3	0	0	3	40	60	100
3.	C45821	Dissertation Phase – I	PR	0	0	20	10	100	-	100
	C45822	Industry Internship		0	0	0	2	100	-	100
4	C45823	Co- Curricular Activities		0	0	0	1	Grade		
Total				6	0	20	19	280	120	400

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per week			Credits	Scheme of Examination		
				L	T	P		Internal	External	Total
1.	C43824	Dissertation Phase – II	PR	0	0	32	16	100	100	200
Total							16	100	100	200

OPEN ELECTIVE OFFERED TO OTHER DEPARTMENTS

- Advanced Data Structures & Algorithms
- Cloud Computing

3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co.

Course Code	DISTRIBUTED OPERATING SYSTEMS	L	T	P	C
C45802		3	0	0	3
Semester		I			
Course Objectives:					
- Introduce the architectures, principles, and design issues of distributed, database, and multiprocessor operating systems. - Develop an understanding of communication, synchronization, deadlock handling, and agreement protocols in distributed environments. - Explain distributed resource management, shared memory, scheduling, and fault tolerance techniques. - Provide knowledge of security and protection models, and cryptographic methods for secure distributed computing. - Explore the structure and design issues of multiprocessor and database operating systems with concurrency control mechanisms.					
Course Outcomes (CO): Student will be able to					
CO1: Explain the architectures, limitations, and synchronization mechanisms (logical clocks, mutual exclusion) in distributed systems. CO2: Analyze distributed deadlock detection methods, agreement protocols, and distributed resource management techniques. CO3: Apply concepts of distributed shared memory, scheduling, and fault-tolerance techniques for reliable system design. CO4: Evaluate models of protection, access control, and cryptographic algorithms for ensuring data security in distributed systems. CO5: Compare multiprocessor and database operating systems, and analyze concurrency control algorithms for distributed databases.					
UNIT - I	Lecture Hrs:				
Architectures of Distributed Systems, System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks, casual ordering of messages, global state, cuts of a distributed computation, termination detection. Distributed Mutual Exclusion, introduction, the classification of mutual exclusion and associated algorithms, a comparative performance analysis.					
UNIT - II	Lecture Hrs:				
Distributed Deadlock Detection, Introduction, deadlock handling strategies in distributed systems, issues in deadlock detection and resolution, control organizations for distributed deadlock detection, centralized and distributed deadlock detection algorithms, hierarchical deadlock detection algorithms. Agreement protocols, introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, and applications of agreement algorithms. Distributed resource management: introduction-architecture, mechanism for building distributed file systems design issues, log structured file systems.					
UNIT - III	Lecture Hrs:				
Distributed shared memory, Architecture, algorithms for implementing DSM, memory coherence and protocols, design issues. Distributed Scheduling, introduction, issues in load distributing, components of a load distributing algorithm, stability, load distributing algorithm, performance comparison, selecting a suitable load sharing algorithm, requirements for load distributing, task migration and associated issues. Failure Recovery and Fault tolerance: introduction, basic concepts, classification of failures, backward and forward error recovery, backward error recovery, recovery in concurrent systems, consistent set of check points, synchronous and asynchronous check pointing and recovery, check pointing for distributed data base systems, recovery in replicated distributed databases					
UNIT - IV	Lecture Hrs:				
Protection and security, preliminaries, the access matrix model and its implementations. -safetyin matrix model, advanced models of protection. Data security, cryptography: Model of cryptography, conventional cryptography modern cryptography, private key cryptography, data encryption standard public key cryptography, multiple encryptions, authentication in distributed systems.					

UNIT - V	Lecture Hrs:
Multiprocessor operating systems, basic multiprocessor system architectures, inter connection networks for multiprocessor systems, caching hypercube architecture. Multiprocessor Operating System, structures of multiprocessor operating system, operating system design issues, threads, process synchronization and scheduling. Concurrency control model of database systems, the problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms, introduction, basic synchronization primitives, lock based algorithms, time stamp based algorithms, optimistic algorithms, concurrency control algorithms, data replication.	
Textbooks:	
1. Advanced concepts in operating systems: Distributed ,Database and multi processor operating systems", Mukesh Singhal, Niranjana and G. Shivaratri, TMH, 2001 2. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson Education, 2nd Edition, 2006.	
Reference Books:	
1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson Education, 2nd Edition, 2006. 2. Silberschatz, Galvin, Gagne, Operating System Concepts, Wiley, 9th Edition, 2018. 3. M. Mitzenmacher, E. Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University Press, 2005. 4. Alan Tucker, Applied Combinatorics, John Wiley & Sons, 5th Edition, 2007. 5. Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann, 1996. 6. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Distributed Systems: Concepts and Design, Pearson, 5th Edition, 2011.	

Course Code	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
C45803a		3	0	0	3
Semester		I			
Course Objectives:					
- To impart the concepts and principles of parallel and advanced computer architectures. - To develop the design techniques of Scalable and multithreaded Architectures. - To apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems					
Course Outcomes (CO): Student will be able to					
- Analyze various parallel computer models, program partitioning techniques, and system interconnect architectures to evaluate conditions for parallelism. - Apply performance metrics and scalability analysis to assess parallel processing applications using advanced processor and memory technologies. - Design and differentiate linear, non-linear, instruction, and arithmetic pipelines to enhance execution performance in modern processors. - Examine multiprocessor and multicomputer architectures, cache coherence protocols, and synchronization mechanisms for scalable system design. - Evaluate vector and SIMD processing principles through case studies like CM-5 to identify their effectiveness in solving computationally intensive applications.					
UNIT - I	Micro Processors	Lecture Hrs:			
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	Parallel Processing	Lecture Hrs:			
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	Pipeline Processors	Lecture Hrs:			
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	Architecture of Microprocessors	Lecture Hrs:			
Parallel and Scalable Architectures, Multiprocessors 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	Applications	Lecture Hrs:			
Vector Processing Principles, Multi vector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5					
Textbooks:					
1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.					
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.Wellein, 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.					

Course Code	CLOUD COMPUTING	L	T	P	C
C45803b		3	0	0	3
Semester		I			
Course Objectives:					
- Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure. Compare the advantages and disadvantages of various cloud computing platforms. - Investigate how a global storage solution can be optimized so that it can be delivered successfully from the cloud - Evaluate information storage management design in a cloud environment and how it relates to the business objectives of an organization - Analyze how best to provide reliable access to information both locally and remotely using storage technologies - Critically appraise the opportunities and challenges of information management in complex business environments.					
Course Outcomes (CO): Student will be able to					
- Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google App Engine. - Program data intensive parallel applications in the cloud. - Analyze the performance, scalability, and availability of the underlying cloud technologies and software. - Identify security and privacy issues in cloud computing. - Solve a real-world problem using cloud computing through group collaboration.					
UNIT - I		Lecture Hrs:			
Definition, characteristics, components, Cloud service provider, the role of networks in Cloud computing, Cloud deployment models- private, public & hybrid, Cloud service models, multitenancy, Cloud economics and benefits, Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS.					
UNIT - II		Lecture Hrs:			
Virtualization concepts, Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, VMware hypervisors and their features					
UNIT - III		Lecture Hrs:			
Relational databases, Cloud file systems: GFS and HDFS, Bigtable, HBase and Dynamo. MapReduce and extensions: Parallel computing, the map -Reduce model, Parallel efficiency of Map Reduce.					
UNIT - IV		Lecture Hrs:			
Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures; Identity Management and Access control, Autonomic security.					
UNIT - V		Lecture Hrs:			
Issues in cloud computing Implementing real time application over cloud platform, Issues in Inter - cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware.					
Textbooks:					
- Enterprise Cloud Computing by Gautam Shroff, Cambridge publication - Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.					

Reference Books:

1. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley -India
2. Dr. Kumar Saurabh, "Cloud Computing", Wiley Publication
3. Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539], 2010
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw Hill Osborne Media; 1 edition [ISBN: 0071626948], 200
4. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley Publication, 2011
5. Tim Mather, SubraKumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'ReillyMediaInc, 2009

Course Code	APPLIED MACHINE LEARNING	L	T	P	C
C45803c		3	0	0	3
Semester		I			
Course Objectives:					
- To know the fundamental concepts of Machine Learning. - To understand linear, distance based, and decision tree based models - To explore tools and practices for Machine learning in Real world situation. - To know the Artificial Neural Network and Reinforcement Learning.					
Course Outcomes (CO): Student will be able to					
- Understand the fundamental concepts of machine learning - Apply linear, distance based, and decision tree based models - Analyze probabilistic, neural network models - Design a suitable machine learning model for a given scenario					
UNIT - I	Lecture Hrs:				
Introduction to Machine Learning: Introduction. Different types of learning, Examples of Machine Learning Applications Supervised Learning: Learning a Class from Examples, Probably Approximately Correct Learning, Learning multiple classes, Model selection and generalization Regression: Linear regression, Multiple Linear regression, Logistic Regression.					
UNIT - II	Lecture Hrs:				
The ingredients of machine learning: Tasks, Models, Features Binary classification and related tasks: Classification, Assessing classification performance, Visualizing classification performance Beyond binary classification: Multi-class classification, Regression, Unsupervised and descriptive learning					
UNIT - III	Lecture Hrs:				
Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Inductive bias in decision tree, Issues in decision tree learning. Linear models: The least-squares method, Multivariate linear regression, The perceptron, Support vector machines, Soft margin SVM, Going beyond linearity with kernel methods					
UNIT - IV	Lecture Hrs:				
Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification, K-Means algorithms, Clustering around medoids Probabilistic Models: Using Naïve Bayes Model for classification, Expectation Maximization, Gaussian Mixture models					
UNIT - V	Lecture Hrs:				
Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation, Advanced topics in Artificial Neural Networks Reinforcement Learning: Introduction, Learning tasks, Q-learning					
Textbooks:					
1. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012					
2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education					
Reference Books:					
1. AurélienGéron, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition					
2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014					
3. EthemAlpaydin, Introduction to machine learning, second edition, MIT press.					
4. T. Hastie, R. Tibshirani and J. Friedman, “Elements of Statistical Learning”, Springer Series, 2nd edition					

Course Code	NATURAL LANGUAGE PROCESSING	L	T	P	C
C45804a		3	0	0	3
Semester		I			
Course Objectives:					
- Introduce the fundamental concepts of human language, linguistic structures, and their computational representation for Natural Language Processing. - Develop knowledge of grammars, parsing strategies, semantic interpretation, and language modelling techniques for designing NLP systems. - Explore advanced NLP applications such as machine translation, multilingual information retrieval, and cross-lingual language processing.					
Course Outcomes (CO): Student will be able to					
Understand linguistic foundations of English syntax and various levels of language analysis for Natural Language Processing. Apply parsing techniques such as top-down, bottom-up, ATNs, and feature-based systems for grammatical analysis of natural language. Analyse different grammar formalisms and parsing approaches to handle language phenomena like movement, ambiguity, and human preferences in parsing. Construct semantic representations using logical forms, thematic roles, and speech acts, and apply n-gram and statistical models for language modeling. Evaluate and compare machine translation approaches and demonstrate understanding of systems like Anusaraka for multilingual language processing. Implement and analyze multilingual information retrieval systems, applying appropriate pre-processing, evaluation metrics, and tools for cross-lingual retrieval.					
UNIT - I	Lecture Hrs:				
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.					
UNIT - II	Lecture Hrs:				
Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.					
UNIT - III	Lecture Hrs:				
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.					
UNIT - IV	Lecture Hrs:				
Semantic Interpretation: Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory. Language Modelling: Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.					
UNIT - V	Lecture Hrs:				
Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges. Multilingual Information Retrieval: Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.					
Textbooks:					
1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education. 2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.					

3. Natural Language Processing, Apaninian perspective, AksharBharathi, Vineetchaitanya, Prentice–Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999

Course Code	SMART SENSOR NETWORKS & IOT	L	T	P	C
C45804b		3	0	0	3
Semester		I			
Course Objectives:					
- To provide an in-depth understanding of IoT concepts, applications, and research areas in domains such as smart cities, smart health, smart energy, and smart transportation. - To analyze IoT system architectures, design constraints, physical devices, communication protocols, and middleware for advanced implementation. - To explore industrial and commercial IoT applications, including automation, sensor networks, and emerging trends like edge computing, cloud of things, and digital twins.					
Course Outcomes (CO): Student will be able to					
- Explain the fundamental concepts, applications, and research areas of IoT across various domains. - Analyze IoT reference architectures, functional and deployment views, and real-world design constraints including hardware, technical, and operational limitations. - Demonstrate practical knowledge of IoT devices, programming, operating systems, communication protocols, network security, and database management. - Apply IoT principles to industrial automation and enterprise integration using frameworks such as SOCRADES and IMC-AESOP. - Evaluate case studies in commercial building automation and emerging IoT trends, including edge/fog computing, predictive maintenance, and digital twin technologies					
UNIT - I	Lecture Hrs:				
Introduction and Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software Interoperability, Big Data and Big Data Mining, Privacy and Security IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.					
UNIT - II	Lecture Hrs:				
Real-World Design Constraints- Introduction, Technical Design constraints, hardware, Data representation and visualization, Interaction and remote control.					
UNIT - III	Lecture Hrs:				
IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device Board, Linux on Raspberry, Interface and Programming & IOT Device. Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, Routing: Transport Protocols, Network Security, Middleware, Databases					
UNIT - IV	Lecture Hrs:				
Industrial Automation-Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation-Introduction,					
UNIT - V	Lecture Hrs:				
Case study: phase one-commercial building automation today.					
Case study: phase two commercial building automation in the future. Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT.					
Textbooks:					
- Mandler, B., Barja, J., MitreCampista, M.E., Cagáová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio, M., Somov, A., Vieriu, R.-L., Internet of Things. IoT Infrastructures, Springer International Publication - Internet of Things: A Hands-On Approach Paperback – 2015, by ArsheepBahga (Author), Vijay Madiseti (Author) - IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things by Pearson Paperback – 16 Aug 2017 ,by Hanes David (Author), Salgueiro Gonzalo (Author), Grossetete Patrick (Author), Barton Rob (Author).					

Course Code	COMPUTING FOR DATA ANALYTICS	L	T	P	C
C45804c		3	0	0	3
Semester		I			
Course Objectives:					
• Provide knowledge of the data analytics lifecycle, including business understanding, data science roles, and project deliverables. • Develop a strong foundation in statistical methods, probability, and hypothesis testing for data-driven decision-making. • Equip students with skills to apply predictive analytics, regression, time series forecasting, and experimental design techniques to real-world datasets.					
Course Outcomes (CO): Student will be able to					
• Understand the data analytics lifecycle and identify the roles and responsibilities of data scientists in business analytics projects. • Apply statistical techniques such as measures of central tendency, variation, skewness, and kurtosis for data summarization and interpretation. • Analyze probability distributions (binomial, Poisson, normal, exponential, gamma, etc.) and apply them in modeling uncertain events. • Perform hypothesis testing and predictive analytics using t-tests, chi-square tests, regression, correlation, and multiple correlation methods. • Design forecasting models (moving average, exponential smoothing, seasonal trends) and conduct					
UNIT - I	DATA ANALYTICS LIFE CYCLE				Lecture Hrs:
Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.					
UNIT - II	STATISTICS				Lecture Hrs:
Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation - Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis.					
UNIT - III	PROBABILITY AND HYPOTHESIS TESTING				Lecture Hrs:
Random variable, distributions, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poison, Geometric, uniform, exponential, normal, gamma and Erlang - Normal distribution.					
UNIT - IV	PREDICTIVE ANALYTICS				Lecture Hrs:
Sampling distribution – Estimation - point, confidence - Test of significance, 1& 2 tailed test, uses of t-distribution, F-distribution, χ^2 distribution - Predictive modeling and Analysis - Regression Analysis, Correlation analysis, Rank correlation coefficient, Multiple correlation.					
UNIT - V	TIME SERIES FORECASTING AND DESIGN OF EXPERIMENTS				Lecture Hrs:
Forecasting Models for Time series : MA, SES, TS with trend, season - Design of Experiments, one way classification, two way classification, ANOVA, Latin square, Factorial Design.					
Textbooks:					
1. Chris Eaton, Dirk Deroos, Tom Deutsch et al., —Understanding Big Data, Mc Graw Hill, 2012. 2. Alberto Cordoba, —Understanding the Predictive Analytics Lifecycle, Wiley, 2014. 3. Eric Siegel, Thomas H. Davenport, —Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2013.					
Reference Books:					
1. James R Evans,—Business Analytics – Methods, Models and Decisions, Pearson 2013. 2. R. N. Prasad, Seema Acharya, —Fundamentals of Business Analytics, Wiley, 2015. 3. S M Ross, —Introduction to Probability and Statistics for Engineers and Scientists , Academic Foundation, 2011. 4. David Hand, HeikiMannila, Padhria Smyth, —Principles of Data Mining, PHI 2013. 5. Spyros Makridakis, Steven C Wheelwright, Rob J Hyndman, —Forecasting methods and applications Wiley 2013(Reprint). 6. David Hand, HeikkiMannila, Padhraic Smyth, —Principles of Data mining, PHI 2013.					

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB	L	T	P	C
C45805		0	0	4	2
Semester		I			
Course Objectives:					
- To introduce students to the implementation of linear and non-linear data structures using linked representation. - To provide practical knowledge on stack and queue operations and their applications in problem solving. - To enable students to implement tree structures and perform operations like traversal, insertion, deletion, and balancing. - To develop skills in implementing searching and sorting techniques to improve problem- solving efficiency. - To expose students to advanced data structures such as AVL Trees, B-Trees, and Hashing for efficient storage and retrieval. - To enhance the ability to design, test, and analyze algorithms for graph traversal and dictionary					
Course Outcomes (CO):					
Implement linear data structures such as single, double, and circular linked lists to perform insertion, deletion, searching, and traversal operations. Apply stack and queue concepts using linked lists to solve real-world computational problems such as expression evaluation and infix-to-postfix conversion. Develop and test tree-based and Graph-based data structures including Binary Search Trees, AVL Trees, and B-Trees using recursive and iterative approaches, Graph traversals. Implement and compare searching and sorting techniques to analyze their performance and efficiency. Apply hashing techniques for efficient dictionary implementation and collision resolution. Analyze and evaluate the performance of different data structures to select appropriate techniques for given computational problems.					
List of Experiments:					
Experiment 1: Write a program to perform various operations on single linked list Write a program to perform various operations on single linked list Experiment 2: Write a program for the following a) Reverse a linked list b) Sort the data in a linked list c) Remove duplicates d) Merge two linked lists Experiment 3: Write a program to perform various operations on doubly linked list. Experiment 4: Write a program to perform various operations on circular linked list. Experiment 5: Write a program for performing various operations on stack using linked list. Experiment 6: Write a program for performing various operations on queue using linked list. Experiment 7: Write a program for the following using stack a) Infix to postfix conversion. b) Expression evaluation. Experiment 8: Write a program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods. Experiment 9: Write a program to implement the following for a graph. a) BFS b) DFS Experiment 10: Write a program to implement various Sorting Techniques Experiment 11: Write a program to implement various Searching Techniques Experiment 12: Write a program to implement					

various operations on AVL trees.

Experiment 13: Write a program to perform the following operations:

a) Insertion into a B-tree

b) Searching in a B-tree

Experiment 15: Write a program to implement all the functions of Dictionary (ADT) using Hashing.

References:

1. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran – Fundamentals of Computer Algorithms, Universities Press, 2008.
2. Mark Allen Weiss – Data Structures and Algorithm Analysis in C++ / Java, Pearson Education, 4th Edition, 2013.
3. Seymour Lipschutz – Data Structures with C, Schaum's Outline Series, McGraw Hill, 2011.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein – Introduction to Algorithms, MIT Press, 3rd Edition, 2009.

Course Code	DISTRIBUTED OPERATING SYSTEMS LAB	L	T	P	C
C45806		0	0	4	2
Semester		I			
Course Objectives:					
- To provide hands-on experience in implementing synchronization, deadlock detection, and resource management algorithms in distributed and multiprocessor systems. - To develop the ability to design and simulate mechanisms for fault tolerance, load balancing, task migration, and secure communication using cryptographic techniques. - To enable students to apply concurrency control methods in distributed databases and critically analyze the performance of various distributed algorithms.					
Course Outcomes (CO):					
- Implement and analyze synchronization mechanisms in distributed environments. - Develop and evaluate distributed deadlock detection techniques. - Design and implement distributed shared memory models and scheduling algorithms. - Apply security and cryptographic techniques to distributed systems. - Implement concurrency control algorithms in database operating systems. - Gain hands-on experience in developing efficient multiprocessor operating system components.					
List of Experiments:					
Unit I: Architectures & Synchronization					
1. Implementation of Lamport’s Logical Clocks – Simulate logical clock updates in a distributed system. 2. Vector Clocks and Causal Ordering – Implement vector clocks and analyze message ordering. 3. Distributed Mutual Exclusion Algorithms – Implement Ricart-Agrawala and Maekawa’s mutual exclusion algorithms.					
Unit II: Deadlock Detection & Resource Management					
4. Simulation of Distributed Deadlock Detection Algorithms – Implement centralized and distributed deadlock detection techniques. 5. Hierarchical Deadlock Detection – Implement a hierarchical approach to detecting deadlocks in a distributed system.					
Unit III: Shared Memory, Scheduling & Fault Tolerance					
6. Implementation of Load Balancing Algorithms – Compare load balancing techniques (static and dynamic). 7. Task Migration Mechanism – Implement and analyze task migration in a distributed system.					
Unit IV: Security & Cryptography					
8. Access Matrix Model Implementation – Simulate access control using an access matrix. 9. Implementation of Data Encryption Standard (DES) Algorithm – Encrypt and decrypt messages using DES. 10. Public Key Cryptography using RSA – Implement RSA encryption and authentication mechanisms.					
Unit V: Multiprocessor & Database OS					
11. Process Synchronization in Multiprocessor Systems – Implement and analyze thread synchronization. 12. Concurrency Control using Lock-Based Algorithms – Implement two-phase locking protocol. 13. Timestamp-Based Concurrency Control – Develop a timestamp-based concurrency control mechanism.					
Optimistic Concurrency Control Algorithm – Implement an optimistic concurrency control protocol					

References

1. **MukeshSinghal and Niranjan G. Shivaratri** – *Advanced Concepts in Operating Systems: Distributed, Database, and Multiprocessor Operating Systems*, McGraw Hill, 2001.
2. **Andrew S. Tanenbaum and Maarten Van Steen** – *Distributed Systems: Principles and Paradigms*, Pearson Education, 2nd Edition, 2007.
3. **George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair** – *Distributed Systems: Concepts and Design*, Pearson Education, 5th Edition, 2012.
4. **Pradeep K. Sinha** – *Distributed Operating Systems: Concepts and Design*, PHI Learning, 2008.

Course Code	FULL STACK DEVELOPMENT USING MERN	L	T	P	C
C45808		0	1	2	2
Semester		I			
Course Objectives:					
• Provide strong foundations in web development technologies (HTML, CSS, JavaScript, ES6). • Introduce server-side programming with Node.js and Express.js for building scalable applications. • Enable students to work with relational (MySQL) and non-relational (MongoDB) databases. • Impart skills to design and develop interactive user interfaces using ReactJS. • Enhance problem-solvingabilities through full-stack web application development experiments.					
Course Outcomes (CO):					
CO1: Apply fundamental web technologies (HTML, CSS, JavaScript, ES6) to design responsive web pages. CO2: Develop server-side applications using Node.js and Express.js with REST API integration. CO3: Perform database operations using MySQL and MongoDB and integrate them with backend services. CO4:Design and implement dynamic, component-based user interfaces using ReactJS. CO5: Develop and deploy full-stack applications by combining frontend, backend, and database skills. • CO6: Demonstrate problem-solving, debugging, and version control skills in web development projects.					
List of Experiments:					
Module 1: Web Development Fundamentals Fundamentals of Web Design, Webpage and Website, Web application HTML Typography, Images, Tables, Lists, Hyperlinks etc. CSS Syntax and usage, CSS Selectors, CSS on body, CSS on Text, CSS on Links, CSS on Tables, CSS on Lists, CSS on Forms, CSS on Images, CSS on DIV, W3.CSS Framework List of Experiments : • HTML & CSS Basics – Create a personal portfolio webpage using HTML (headings, lists, tables, hyperlinks, forms) and style it with CSS selectors. • Responsive Layout – Develop a responsive webpage using DIV, CSS box model, and W3.CSS framework. • Styled Components – Design a webpage for a college event with images, tables, and styled navigation menu using CSS. Module 2: JavaScript and ECMA Script 6 JavaScript Fundamentals - Grammar and types, Control flow and error handling - Loops, Function - Objects, Arrays, Promises - ES6 Let and const, Template literals - Arrow Function, Default parameter, Async Await List of Experiments : • JavaScript Fundamentals – Build a simple calculator app using functions, loops, and control flow. • Array & Object Manipulation – Write a program using ES6 features (let/const, arrow functions, template literals) to manage student records. • Async Programming – Create a webpage that fetches and displays random user data from a public API using Promises and Async/Await. Module 3: Node.js overview, Node.js - basics and setup - Node.js console, Node.js command utilities - Node.js modules, concepts - Node.js events, database access - Node.js with Express.js, Express.js Request/Response - Express.js Get, Express.js Post - Express.js Routing, Express.js Cookies - Express.js File Upload, Middleware - Express.js Scaffolding, Template					

List of Experiments:

- Node.js Basics – Write a Node.js script to create a local server and display “Hello World” in the browser.
- Express.js Routing – Build a REST API with Express.js that handles GET and POST requests for a student information system.
- File Handling – Develop a Node.js application to upload, read, and display a text/JSON file using Express middleware.

Module 4: MySQL and MongoDB

MySQL Concepts - Create, Read, Update, Delete Operation - SQL and NoSQL concepts - Create and manage MongoDB - Migration of data into MongoDB - MongoDB with NodeJS - Services offered by MongoDB

List of Experiments :

- MySQL CRUD – Create a MySQL database for employee records and perform Create, Read, Update, Delete (CRUD) operations.
- MongoDB CRUD with Node.js – Build a Node.js application that connects to MongoDB and manages student data.
- Migration Project – Write a script to migrate data from MySQL to MongoDB and display it through a Node.js API.

Module 5: React JS

ReactJS introduction and overview - ReactJS installation and environment setup - Introducing JSX, Rendering Elements - Components and Props - State and Lifecycle - Handling Events - Conditional Rendering - Lists and Keys, Forms - Lifting State Up

List of Experiments :

- React Components – Build a React app to display a list of courses using functional components and props.
- State & Events – Create a counter and a form component in React using useState and event handling.

Conditional Rendering & Lists – Develop a React to-do list application with add/delete functionality and conditional rendering of completed tasks.

Textbooks

1. Alex Banks, Eve Porcello – Learning React: Modern Patterns for Developing React Apps, O’Reilly.
2. StoyanStefanov – React Up & Running: Building Web Applications, O’Reilly.
3. Mario Casciaro, Luciano Mammino – Node.js Design Patterns, Packt.
4. Seyed M.M. Iravani – Learning Web Design: A Beginner’s Guide to HTML, CSS, JavaScript, and Web Graphics, O’Reilly.

Reference Books

1. Robin Wieruch – The Road to React, Leanpub.
2. Carl Rippon – React 18 Design Patterns and Best Practices, Packt.
3. KirupaChinnathambi – Learning React: A Hands-On Guide to Building Web Applications, Addison-Wesley.
4. Ethan Brown – Web Development with Node and Express: Leveraging the JavaScript Stack, O’Reilly.
5. Kristina Chodorow – MongoDB: The Definitive Guide, O’Reilly.
6. Ben Forta – SQL in 10 Minutes, Sams Teach Yourself, Sams Publishing.