CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution)

ACADEMIC REGULATION R-18

FOR CBCS BASED M. TECH. (REGULAR) DEGREE PROGRAMMES

(Applicable for the students of M. Tech. programme admitted into I year from Academic Year 2018-19 onwards)

1.0 Eligibility for Admissions

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by Government of Telangana State from time to time.

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

Award of M. Tech. degree

A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work, failing which he shall forfeit his seat in M.Tech. programme.

The M. Tech. degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the degree.

The student shall register for all 68 credits and secure all the 68 credits.

The medium of instruction and examination shall be English.

A. Courses of Study

The following specializations are offered at present for the M. Tech. course of study.

1. Embedded Systems
2. Power Electronics
3. Structural Engineering
4. Computer Science & Engineering

and any other course as approved by the College/ University/AICTE from time to time.

B. Departments offering M.Tech. programmes with specializations mentioned below:

Sl. No.	Department	M.Tech Course
1	ECE	Embedded Systems
2	EEE	Power Electronics
3	Civil	Structural Engineering
4	CSE	Computer Science & Engineering

Course Registration

A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him about the PG Programme, its Course Structure and Curriculum, Choice/Option for Courses, based on his competence, progress, pre-requisites and interest.

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'.

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 the same being retained with Head of Department, Faculty Advisor and the Student).

If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, thereby causing discrepancy, the decision of Head of the Department shall be final. Course Options exercised through ON-LINE Registration are final and cannot be changed /inter-changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Course (subject to offering of such a Course), or for another existing Course (subject to availability of seats), which may be considered. 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. <u>Attendance</u>

The programs are offered on a unit basis with each course t being considered a unit.

The minimum instruction period for each semester shall be 90 clear instruction days.

A student shall be eligible to write semester end examinations of a course if he acquires a minimum of 75% of attendance in that course.

Condonation of shortage of attendance in each Course up to 10% (65% and above and below 75%) in each semester may be granted by the Institute Academic Committee on valid medical reasons.

Shortage of attendance below 65% shall not be condoned.

Students whose shortage of attendance is not condoned in any semester for a course(s) are not eligible to write their end semester examination of those courses and their registration for these courses shall stand cancelled. They have to register for these courses later when offered.

A fee as prescribed by the Institute Academic Committee shall be payable towards condonation of shortage of attendance.

A candidate shall put in a minimum required attendance, in at least 3 theory Courses in I semester for promoting to II semester.

In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the courses, as per the course structure.

A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester as applicable. They may re-register for the semester when offered next. If a candidate fulfils the attendance requirement in the present semester, he shall not be eligible for re- registration into the same class.

Evaluation

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

For the theory courses 70 marks shall be awarded based on the performance in the Semester End Examination and 30 marks shall be awarded based on the Internal Evaluation. For internal evaluation there shall be the two internal examinations conducted-one in the middle of the semester and the other immediately after the completion of instruction period. Each internal examination shall be conducted for a total duration of 120 minutes. The final

marks secured by the student in 'internal evaluation' for the semester are arrived at by giving a weightage of 70% to the best secured 'internal examination' and 30% weightage to the least secured 'internal examination'. A student who is absent for any internal examination for any reason what so ever shall be deemed to have secured 'zero' marks in the test/ examination and no make-up test/ examination shall be conducted.

Question paper pattern for evaluation

I. Internal Examination

Part A (10 Marks)

5 questions of 2 marks each (All questions are compulsory).

Part B (20 Marks)

4 Questions to be answered out of 6 questions, each question carries 5 marks.

II. External Examination

Part A (20 Marks)

5 questions (1 question from each unit) of 4 marks each (Compulsory questions)

Part B (50 Marks)

5 questions (1 question from each unit with internal choice) each question carries 10 marks.

For practical courses, 70 marks shall be awarded based on the performance in the End Semester Examinations. 30 marks shall be awarded for day to day performance in the practicals as internal marks. Laboratory end examination for M. Tech. courses for 70 marks must be conducted with two Examiners, one of them being the Laboratory Course Teacher and the second examiner shall be External Examiner. External Examiner shall be appointed by the Controller of Examinations from other institutions or industry.

There shall be Mini project with seminar presentation during II semester. For Mini project with seminar, a student under the supervision of a faculty member, shall do a mini project and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic

Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will only be internal evaluation for 50 marks. A candidate has to secure for each seminar a minimum of 50% of maximum marks to be declared successful. If he fails to secure minimum marks, he has to re-appear during the supplementary examinations.

Each student shall start the Project Work during the IV Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during III Semester, and Phase – II (Project-II) during IV Semester, and the student has to prepare two independent Project Work Reports – one each during each phase. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation(CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the III Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising

of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the IV Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

d) If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation

also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.

A candidate shall be deemed to have secured the minimum academic requirement in a course if he secures a minimum of 40% marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
In case the candidate does not secure the minimum academic requirement in any course (as specified in 5.9) he has to reappear for the Semester End Examination in that course.

A candidate shall be given one chance to re-register for the Courses if the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the Course(s) and secure the required minimum attendance. The candidate's attendance in the re-registered Course(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those Courses(s). In the event of the student taking another chance, his internal

marks and end examination marks obtained in the previous attempt stand cancelled.

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

Examinations and Assessment – The Grading System

Marks will be awarded to indicate the performance of each student in each Theory Course or Lab/Practical, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in item 6 above, and a corresponding Letter Grade shall be given.

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades

(UGC Guidelines) and corresponding range of percentage of marks shall be followed:

% of Marks Secured (class intervals)	Letter Grade (UGC Guidelines)	Grade Points
80% and above (≥ 80%, ≤ 100%)	**O (Outstanding)**	**10**
Below 80% but not less than 70% (≥ 70%, <80%)	**A^+ (Excellent)**	**9**
Below 70% but not less than 60% (≥ 60%, <70%)	**A (Very Good)**	**8**
Below 60% but not less than 55% (≥ 55%, <60%)	**B^+ (Good)**	**7**
Below 55% but not less than 50% (≥ 50%, < 55%)	**B (above Average)**	**6**
Below 50% (< 50%)	**F (FAIL)**	**0**
Absent	**AB**	**0**

A student obtaining 'F' Grade in any Course shall be considered ' failed ' and is required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Courses will remain the same as those he obtained earlier.

A student not appeared for examination the 'AB' Grade will be allocated in any Course shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

In general, a student shall not be permitted to repeat any Course (s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement'

A student earns Grade Point (GP) in each Course, on the basis of the Letter Grade obtained by him in that Course. The corresponding 'Credit Points '(CP) are computed by multiplying, the Grade Point with Credits for that particular Courses.

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

The Student passes the Course only when he **gets GP ≥ 6 (B Grade or above)**

The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (∑CP) secured from All 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 = { ∑Ni=1 Ci Gj } / { ∑Ni =1 Ci} ….For each Semester.

Where 'i' is the Course indicator index (takes into account all Courses in a Semester), 'N' is the no. of Courses 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), Ci is the no. of Credits allotted to the ith Course, and Gi represent the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Course.

The Cumulative Grade Point Average (CGPA) is 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, as the end of each Semester, as per the formula.

CGPA = {$\sum$M j=1 C j G j } / {$\sum$M j=1 C j} } …. For all S Semester registered

{ it., upto and inclusive of S Semester, S ≥2).

Where 'M' is the TOTAL no. of Subject (as specifically required and listed under the Course Structured of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (Obviously M > N), 'j ' is the Subject indicator index (takes into account all Courses from 1 to S Semesters),C j is the no. of Credits allotted to the jth Courses from Gj represent the Grade Points (GP) corresponding to the Letter Grade awarded for the jth Course. After registration and completion of II Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11. For Calculations listed in item 7.6 – 7.10, performance in failed Courses (securing F Grade) will also be take into account, and the credits of such Courses will also be included in the multiplications and summations.

Evaluation of Project/Dissertation Work

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairperson, Project Supervisor and one senior faculty

member of the Department offering the M.Tech programme as members.

Registration of Project Work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical of I year.

After satisfying 8.2, a candidate has to submit, in consultation with his project Supervisor, the title, objective and plan of action of his project workto the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

If a candidate wishes to change his supervisor or topic of the project, he cando so with the approval of the PRC. However, the PRC shall examine whether or not the changes of topic/supervisor leads to a major changes of his initial plans of project proposal. If yes his date of registration for the project work starts from the date of change of Supervisor or topic as the casemay be.

A candidate shall submit his project status report in two stages at least witha gap of 3 months between them.

The work on the project shall be initiated at the beginning of the III semesterand the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

After approval from the PRC, the soft copy of the thesis should be submittedto the College for ANTI-PLAGIARISM check and the plagiarism report should be included in the final thesis. If the result of above check is less than 24%, then only thesis will be accepted for submission.

Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.

For Project Work,

Review-I will be conducted in III Semester and carries a maximum internal marks of 40. The evaluation should be done by the PRC for 20 marks and Project Supervisor for 20 marks. The Supervisor and PRC will examine the Literature Survey in the same domain, Problem Definition, Objective, Scope of Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review I. If he fails to secure minimum required marks he has to reappear during the supplementary examination.

Project Work Review II in IV Semester carries 40 internal marks. The evaluation should be done by the PRC for 20 marks and the ProjectSupervisor for 20 marks. The PRC will examine the overall progress of theProject Work and decide the eligibility of the Project for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review II. If he fails to fulfill minimum marks,he has to reappear for Review-II during the supplementary examination.

The thesis shall be adjudicated by the committee consisting of one senior faculty selected by the Head of the Department, the guide concerned, Head of the Department and external examiner.

If the report of the committee is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the committee is unfavourable again, the thesis shall be summarily rejected.

For Project Work Evaluation (Viva Voice) will be conducted on acceptanceof the Thesis in IV Semester. This is an external evaluation for 60 marks andwill be evaluated by the committee. The External Examiner for the committee shall be appointed by the Controller of Examinations. Thecandidate has to secure minimum of 50% marks in Project Evaluation (Viva Voice) examination for its successful completion.

If he fails to secure minimum marks as specified in 8.13, he will reappear for the Viva Voice examination only after three months. In the reappeared examination also if the candidate fails to secure minimum prescribed marks

the registration for the programme stands cancelled and he will not be eligible for the award of the degree.

The Head of the Department shall coordinate and make arrangements forthe conduct of Project Viva Voice examination.

Award of Degree and Class

A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secured the required number of 88 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 for which he took admission.

Award of Class

After a student has satisfied the requirements prescribed for the completion of the programme, becomes 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 and Distinction	≥ 7.75
First Class	6.75 ≤ CGPA > 7.75
Second Class	6.00 ≤ CGPA < 6.75

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

10. Withholding of Results

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld and

he will not be allowed into the next semester.

11. Transitory Regulations

For Students detained due to shortage of attendance and credits

i) The Student who has not registered in a particular semester for any reason, or has been detained for want of attendance may be considered eligible for readmission to the same semester in the next Academic Year or subsequent academic years. The student who has been detained for lack of credits can be readmitted to the next Academic Year only on obtaining minimum required credits.

ii) A Student who has been detained in I year I Semester of R15 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R18 Regulations and is required to complete the study MBA/M.Tech programme within the stipulated period of four academic years from the date of first admission in I Year I Semester.

iii) A student who has been detained in II semester of I Year or any semester of II year of R15 regulations for want of attendance shall be permitted to join the corresponding semester of R18 regulations and is required to complete the study of MBA/M.Tech within the stipulated period of four academic years from the date of first admission in I Year I Semester. The R18 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

iv) A student of R15 Regulations who has been detained due to lack of credits shall be promoted to the next Academic Year of R18 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of MBA/M.Tech within the stipulated period of four academic years from the year of first admission.

v) After re-admission the student is required to study the course as prescribed in the new regulations for the re-admitted programme at that level and thereafter.

vi) A student who has failed in any course(s) under any regulation has to

pass those course(s) in the same regulations.

vii) In case the course(s) offered in subsequent semesters are repetitive, substitute courses identified by the BOS for replacement of completed courses by the students will be given. The students will be suggested to register the said substitute course(s) in the new regulation. One Internal examination for the substitute course(s) may be conducted before commencement of end semester examinations.

viii) The marks/credits/SGPA are transferred and converted (as per applicable regulations) for all subjects of old regulation if necessary and treated as successfully cleared in the new prescribed program course structure.

ix) For readmitted students the courses studied and cleared in earlier Regulation and not offered those courses in new applicable Regulation are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

x) The decision of BOS is final in case of any ambiguity in identifying the equivalent/substitute courses

xi) The decision of Academic council is final in case of any ambiguity in transitory regulations

For Transferred Students

i) The students seeking transfer to CMRCET from various other Universities/Institutions have to pass the failed course(s) which are equivalent to the course(s) of CMRCET, and also have to pass the course(s) of CMRCET which the students have not studied at the earlier institution. Further the students have passed some of the course(s) at the earlier institutions, and if the same course(s) are prescribed in different semesters of CMRCET and repeated, then substitute courses(with equal credits) identified by BOS may be given to the students

ii) For not cleared course(s) in the previous Institute, equivalent course(s) will be identified by the BOS for pursuing the same. The students will be

suggested to pursue the course and to register the said equivalent course(s) in the new regulation and to qualify in examinations.

iii) Marks/Grades/Credits obtained in the courses completed in previous Institution are to be converted in to equivalent Grades/Credits/SGPA/CGPA as per CMRCET regulations.

iv) One Internal examination for the course(s) not studied in previous institution and taken as additional/substitute courses in CMRCET may be conducted before commencement of end semester examinations.

v) If necessary the student may be given additional course(s) in place of the course(s) studied in earlier Institution which are not part of CMRCET regulation to balance and meet the credit requirement for the award of degree as per applicable regulation

vi) The students who seek transfer to CMRCET from various other Universities/Institutions, and satisfy credits requirement as per earlier institution but not satisfy the credit requirements as per CMRCET after finalizing equivalent course(s), may be permitted to continue the programme. However such a student has to meet the requirement of credits for promotion to the next year as per CMRCET applicable regulations.

vii) For transferred students the courses studied and cleared in earlier Institution and not offered those courses in CMRCET are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

viii) In case of any ambiguity in identifying the equivalent/substitute courses, the decision of BOS is final.

ix) The decision of Academic council is final in case of any ambiguity in transitory regulations

12. General

Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

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

interpretation.

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

The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR
IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (materialshall 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.
1. (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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the Courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the Courses of the examination (including practicals and project work)

		already appeared and shall not be allowed to appear for examinations of the Remaining Courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester 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 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester 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
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 college or organizes a walk out or instigates others to examination hall walkout, 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-	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 Courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the Courses of that semester/year. The candidates are also 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.

	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.	
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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses 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.	If the student belongs to the college, expulsion from the examination hall an cancellation of performance in that subject and all other Courses hall and all other Courses that candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the

		Courses 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for other remaining examinations of the Courses of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other Courses the candidate has appeared including practical examinations and project work of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

The following procedure is to be followed in case of malpractice cases detected during valuation, scrutiny etc. at spot center.

1 Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.

2 A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.

3 The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

4 Based on the explanation and recommendation of the committee, action may be initiated.

5 <u>Malpractice committee:</u>

i.	Controller of Examinations	Chairman
ii.	Assistant controller of Evaluation	Member
iii.	Chief Examiner of the subject/ subject expert	Member
iv.	Concerned Head of the Department	Member
v.	Concerned Invigilator	Member

****END****

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.Tech(CSE) Course Structure R-18

(Applicable for the Batch admitted from the Academic Year 2018-19 onwards)

I semester							
S.No	**Code**	**Group**	**Subject**	**L**	**T**	**P**	**C**
1	B30501	PC-1	Advanced Data Structures	3	0	0	3
2	B30502	PC-2	Mathematical Foundations of Computer Science	3	0	0	3
3		PSE 1	Program Specific Elective 1	3	0	0	3
4		PSE 2	Program Specific Elective 2	3	0	0	3
5	B30520	Lab-1	Advanced Data Structures Lab	0	0	4	2
6		Lab-2	Based on Program Specific Electives-1	0	0	4	2
7	B30212	PW	Research Methodology & IPR	2	0	0	2
8	C30001	Audit-1	English For Research Paper Writing	2	0	0	0
TOTAL CREDITS				**16**	**0**	**8**	**18**

II Semester							
S.No	**Code**	**Group**	**Subject**	**L**	**T**	**P**	**C**
1	B30503	PC 3	Advanced Algorithms	3	0	0	3
2	B30504	PC 4	Soft Computing	3	0	0	3
3		PSE 3	Program Specific Elective 3	3	0	0	3
4		PSE 4	Program Specific Elective 4	3	0	0	3
5	B30524	Lab 3	Advanced Algorithms Lab	0	0	4	2
6		Lab 4	Based on Program Specific Electives-3	0	0	4	2
7	B30529	PW	MINI PROJECT with Seminar	0	0	4	2
8.	C30002	Audit 2	Value Education	2	0	0	0
TOTAL CREDITS				**14**	**0**	**12**	**18**

III Semester							
S.No	**Code**	**Group**	**Subject**	**L**	**T**	**P**	**C**
1		PSE 5	Program Specific Elective 5	3	0	0	3
2		OEC	Open Elective	3	0	0	3
3	B30530	PW	PROJECT/ DISSERTATION PHASE - I	0	0	20	10
TOTAL CREDITS				**6**	**0**	**20**	**16**

IV Semester							
S.No	**Code**	**Group**	**Subject**	**L**	**T**	**P**	**C**
1	B30531	PW	PROJECT/ DISSERTATION PHASE - II	0	0	32	16
TOTAL CREDITS				**0**	**0**	**32**	**16**

****END****

S.No	Group	Course Code	Course Title
1	PC	B30501	Advanced Data Structures
2		B30502	Mathematical Foundations of Computer Science
3		B30503	Advanced Algorithms
4		B30504	Soft Computing
5	PSE-1	B30505	Machine Learning
6		B30506	Cryptography & Network Security
7		B30507	Internet of Things
8	PSE-2	B30508	Software Architectures
9		B30509	Information Retrieval Systems
10		B30510	Distributed Systems
11	PSE-3	B30511	Digital Forensics
12		B30512	Data Analytics
13		B30513	Parallel Computing
14	PSE-4	B30514	Human Computer Interaction
15		B30515	Computer Vision
16		B30516	Distributed Databases
17	PSE-5	B30517	Optimization Techniques
18		B30518	High Performance Computing
19		B30519	Adhoc and Sensor Networks
20	Lab 1	B30520	Advanced Data Structures Lab
21	Lab 2	B30521	Machine Learning Lab
22		B30522	Cryptography & Network Security Lab
23		B30523	Internet of Things Lab
24	Lab 3	B30524	Advanced Algorithms Lab
25	Lab 4	B30525	Digital Forensics Lab
26		B30526	Data Analytics Lab
27		B30527	Parallel Computing Lab
28	PW	B30212	Research Methodology & IPR
29		B30529	MINI PROJECT with Seminar
30		B30530	PROJECT/ DISSERTATION -PHASE - I
31		B30531	PROJECT/ DISSERTATION-PHASE - II

S. No	Group	Course Code	Course Title
1	AUDIT COURSE -1	C30001	English for Research Paper Writing
2	AUDIT COURSES -2	C30002	Value Education
3	Open Elective	B30532	Big Data and Analytics
4	Open Elective	B30533	Python Programming
5	Open Elective	B30230	Application Specific Integrated Circuits Design
6	Open Elective	B30231	Embedded Systems
7	Open Elective	B30331	Renewable Energy Sources
8	Open Elective	B30332	Industrial Safety
9	Open Elective	B30431	Green Buildings
10	Open Elective	B30432	Construction Project Management

****END****

(B30501) ADVANCED DATA STRUCTURES

M.Tech (CSE) I SEM

L	T	P	C
3	0	0	3

Unit-1

Dictionaries: Definition, Dictionary Abstract Data Type,
Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution, Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit-2

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists,
Deterministic Skip Lists.

Unit-3

Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees.

Unit-4

Text Processing: String Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem

Unit-5

Computational Geometry:

One Dimensional Range Searching, Two-dimensional Range Searching, Constructing a Priority Search Researching Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson,2004.
2. M T Goodrich Roberto Tamassia, Algorithm Design, John Willey, 2002.

Course Outcomes:

After completion of course, students shall be able to:

1. Implement Dictionary using different hashing techniques
2. Perform different operations on skip list
3. Construct and compare Different balanced trees.
4. Solve Text processing problems using various pattern matching techniques.
5. Design and Analyse various computational geometry.

****END****

(B30502) Mathematical Foundations of Computer Science

M.Tech (CSE) I SEM	L	T	P	C
	3	0	0	3

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.

Trees

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

TEXT BOOKS:

1.Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, TMH.

REFERENCE BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science- J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed., Pearson Education.
3. Discrete Mathematics- Richard Johnson Baugh,7Th Edtn., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

Course outcomes

After completion of course, students shall be able to:

1 Describe various methods of proving a logical statement.
2.Identify various sets, functions and relations.
3. Solve mathematical induction and recursion problems.
4. Apply principle of Inclusion and Exclusion technique.
5. State the properties of graphs and trees.

(B30505) MACHINE LEARNING
(PROGRAM SPECIFIC ELECTIVE – I)

M.Tech (CSE) I SEM

L	T	P	C
3	0	0	3

UNIT -I

Introduction-Well-posed learning problems, designing a learning system Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, concept learning as search, Find-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination algorithm, Remarks on Version Spaces and Candidate Elimination, Inductive Bias.

Decision Tree Learning – Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

UNIT -II

Artificial Neural Networks Introduction, Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptions, Multilayer Networks and the Back-propagation Algorithm.

Discussion on the Back-Propagation Algorithm, An illustrative Example: Face Recognition

Evaluation Hypotheses – Motivation, Estimation Hypothesis Accuracy, Basics of Sampling Theory, A General Approach for Deriving Confidence Intervals, Difference in Error of Two Hypotheses, Comparing Learning Algorithms.

UNIT -III

Bayesian learning - Introduction, Bayes Theorem, Bayes Theorem and Concept Learning Maximum Likelihood and Least Squared Error Hypotheses, Maximum Likelihood Hypotheses for Predicting Probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibs Algorithm, Naïve Bayes Classifier, An Example: Learning to Classify Text, Bayesian Belief Networks, EM Algorithm.

Computational Learning Theory – Introduction, Probably Learning an Approximately Correct Hypothesis, Sample Complexity for Finite Hypothesis Space, Sample Complexity for Infinite Hypothesis Spaces, The Mistake Bound Model of Learning.

Instance-Based Learning– Introduction, k-Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

UNIT -IV

Pattern Comparison Techniques, Temporal patterns, Dynamic Time Warping Methods, Clustering, Codebook Generation, Vector Quantization

Pattern Classification: Introduction to HMMS, Training and Testing of Discrete Hidden Markov Models and Continuous Hidden Markov Models, Viterbi Algorithm, Different Case Studies in Speech recognition and Image Processing

UNIT -V

Analytical Learning – Introduction, Learning with Perfect Domain Theories: PROLOG-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operations.

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis.

TEXT BOOKS:

1. Machine Learning – Tom M.Mitchell,-MGH
2. Fundamentals of Speech Recognition By Lawrence Rabiner and Biing – Hwang Juang.

REFERENCE BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

Course Outcomes:

Students shall be able to

1. Understand concept learning and decision tree learning.
2. Analyze the concept of neural networks for learning
3. Learn the concepts in Bayesian analysis from probability models
4. Learn pattern classification technique and Design pattern classification model
5. Combine Inductive and Analytical Learning.

****END****

(B30506) CRYPTOGRAPHY & NETWORK SECURITY
(PROGRAM SPECIFIC ELECTIVE – I)

M.Tech(CSE) I SEM

L	T	P	C
3	0	0	3

UNIT-I:
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:
Conventional Encryption: Principles, Conventional encryption algorithms (DES, AES, RC4, Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT-III:
Number Theory: Modular Arithmetic, Euclid's Algorithm, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

UNIT-IV:
Email privacy: Pretty Good Privacy (PGP) and S/MIME.
IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT-V
Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOKS:

1. "Cryptography and Network Security" by William Stallings 3rd Edition, Pearson Education.
2. "Applied Cryptography" by Bruce Schneider 2nd Edition, Wiley Publisher.

REFERENCE BOOKS:

1. Cryptography and Network Security by Behrouz A.Forouzan, 2nd edition, Tata McGraw-Hill Education.

Course Outcomes:

1. Classify computer and security threats and develop a security model to, prevent, detect and recover from attacks.
2. Describe the concept of Encryption and analyze the various Symmetric algorithms and Asymmetric algorithms.
3. Explain the techniques and algorithms used for message authentication and the need for Kerberos authentication and the techniques.
4. Familiarize the network security design and differentiate the various kinds of malicious software threats.
5. Differentiate various protocols and the principles behind design of firewalls.

****END****

(B30507) INTERNET OF THINGS
(PROGRAM SPECIFIC ELECTIVE – I)

M.Tech (CSE) I SEM	L	T	P	C
	3	0	0	3

Unit I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

Unit II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

Unit III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

Unit IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Unit V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace,

Course Outcomes:

1. Understand the new smart computing technologies like cloud computing technology and Big Data
2. Apply the basic concept of M2M (machine to machine) with necessary protocols
3. Get the skill to program using python scripting language and its appropriate library packages
4. Design programs using Raspberry PI and its interface with external gadgets
5. Illustrate various cloud storage models and web application frameworks

****END****

(B30508) SOFTWARE ARCHITECTURES
(PROGRAM SPECIFIC ELECTIVE – II)

M.Tech(CSE) I SEM

L	T	P	C
3	0	0	3

UNIT I

Envisioning Architecture

The Architecture Business Cycle, what is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. A-7E – A case study in utilizing architectural structures

UNIT II

Creating an Architecture

Understanding Quality Attributes, Achieving qualities, Architectural styles and patterns

Air Traffic Control – a case study in designing for high availability

UNIT III

Designing the Architecture, Documenting software architectures, Reconstructing Software Architecture

Flight Simulation – a case study in Architecture for Integrability

UNIT IV

Analysing Architectures

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

The Nightingale System - a case study in Applying the ATAM

The NASA ECS Project – a case study in Applying the CBAM

UNIT V

Moving from one system to many

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Celsius Tech – a case study in product line development

TEXT BOOKS:

1. Software Architecture in Practice, , Len Bass, Pau Clements & Rick Kazman, second edition Pearson Education,2003.

REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003

Course Outcomes:

1. Design and motivate software architecture for large-scale software systems
2. Recognise major software architectural styles, design patterns, and frameworks
3. Generate architectural alternatives for a problem and selection among them.
4. Identify and assess the quality attributes of a system at the architectural level.
5. Discuss and evaluate the current trends and technologies in architectural level.

****END****

(B30509) INFORMATION RETRIEVAL SYSTEMS
(PROGRAM SPECIFIC ELECTIVE – II)

M.Tech (CSE) I SEM

L	T	P	C
3	0	0	3

UNIT I

Introduction: Motivation, Basic Concepts, Past-Present and Future, the Retrieval Process

Modelling: Introduction, A Taxonomy of Information retrieval Models, Retrieval: Ad hoc and Filtering, A Formal Characteristics of IR Models, Classic Information Retrieval, Alternative Set Theory Models, Alternative Probabilistic Models, Structured Text Retrieval Models, Model for Browsing

UNIT II

Retrieval Evaluation: Introduction, retrieval Performance Evaluation, Reference Collections

Query languages: Introduction, Keyword-Based Querying, Pattern Matching, Structural Queries, Query Protocols

Query Operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic global Analysis

Text Operations: Introduction, Document Pre-processing, Document Clustering, Text Compression, Comparing text Compression Techniques

UNIT III

Indexing and Searching: Introduction, Inverted Files, Other Indices for Text, Boolean queries, Sequential Searching, pattern Matching, Structural Queries, Compression

Searching the Web: Introduction, Challenges, Characterizing the Web, Search Engines, Browsing, Meta searches, Finding the Needle in the Haystack, Searching using Hyperlinks

UNIT IV

User Interfaces and Visualization: Introduction, human-Computer Interaction, The Information Access Process, Starting Points, Query Specification, Context, User Relevance Judgments, Interface Support for the Search Process

UNIT V

Multimedia IR: Models and Languages Introduction, Data Modelling, Query Languages, Multimedia IR: Indexing and |Searching

Introduction, Background-Spatial Access Methods, A Generic Multimedia Indexing Approach, One Dimensional Time Series, Two dimensional Color Images, Automatic Feature Extraction.

TEXT BOOKS:

1. Modern Information Retrieval by Yates and Neto Pearson Education.

REFERENCE BOOKS:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
3. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.

Course Outcomes:

1. Explain the Retrieval Process and different modelling
2. Evaluate retrieval, Query operations and Text operation
3. Analyze the Indexing, searching and search engines
4. Use user interface and visualization knowledge in human computer interaction
5. Demonstrate Multimedia IR indexing searching and data modelling

END

(B30510) DISTRIBUTED SYSTEMS
(PROGRAM SPECIFIC ELECTIVE – II)

M.Tech(CSE) I SEM

L	T	P	C
3	0	0	3

UNIT- I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System Models-Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter process Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT -II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems. Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT III

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement- Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT IV

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

UNIT V

Security-Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS,802.11 WiFi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S .Ghosh,Chapman&Hall/CRC,Taylor&Francis Group,2010.

REFERENCE BOOKS:

1. Distributed Computing, S.Mahajan and S.Shah,Oxford University Press.
2. Distributed Operating Systems Concepts and Design,Pradeep K.Sinha,PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, TMH.
4. Reliable Distributed Systems, K.P.Birman,Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, PearsonEducation.
6. Distributed Operating Systems and Algorithm Analysis,R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum,Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani and Mukesh Singhal,Cambridge,rp 2010.

Course Outcomes:

Students shall be able to

1. Analyse the problem with clock mechanisms in distributed environment
2. Understand the concept of distributed transactions , distributed operating system, and security issues
3. Compare Conventional OS with distributed OS features
4. Knowledge about distributed memory management.
5. understand various Security techniques and Cryptographic algorithms.

****END****

(B30520) ADVANCED DATA STRUCTURES LAB

M.Tech (CSE) I Semester

L	T	P	C
0	0	4	2

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

7. Write a program to perform the following operations
a) Insert an element into a AVL tree.
b) Delete an element from 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.

Course outcomes

Students shall be able to
1. Implement Dictionary using hashing
2. Design programs with different sorting methods
3. Implement programs using different pattern matching techniques
4. Apply methods to construct balanced trees
5. Design programs for the trees.

****END****

(B30521) MACHINE LEARNING LAB

M.Tech (CSE) I SEM

L	T	P	C
0	0	4	2

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Bayes' rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python
3. Implement k-nearest neighbors' classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no ->highRisk
high golf trading married forties yes ->lowRisk
low speedway transport married thirties yes ->medRisk
medium football banking single thirties yes ->lowRisk
high flying media married fifties yes ->highRisk
low football security single twenties no ->medRisk
medium golf media single thirties yes ->medRisk
medium golf transport married forties yes ->lowRisk

high skiing banking single thirties yes ->highRisk
low golf unemployed married forties yes ->highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

Course outcomes:
After the completion of the Machine Learning lab,
Students shall be able to:
1. Apply Bayes' rule and Extract the data from database using python
2. Implement KNN and k-Means algorithm
3. Illustrate the concept of conditional and unconditional probability
4. Implement linear regression and Naïve Bayes theorem for classification
5. Demonstrate genetic algorithm and classification system using Backpropagation

****END****

(B30522) CRYPTOGRAPHY & NETWORK SECURITY LAB

M.Tech (CSE) I SEM

L	T	P	C
0	0	4	2

1. Write a client-server program where client sends a text message to server and server sends the text message to client by changing the case (uppercase and lowercase) of each character in the message.
2. Write a client-server program to implement following classical encryption techniques:
   - ceaser cipher
   - transposition cipher
   - row substitution cipher
   - hill cipher
3. Install JCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management

Tools:

1. Perform an experiment to demonstrate how to sniff for router traffic by using the tool wireshark
2. using nmap
   I. find open ports on a system
   II. find the machines which are active
   III. find the version of remote OS on other systems
   IV. find the version of s/w installed on other system

Ethical hacking:

1. Setup a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate sql injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate dos attacks
5. Install rootkits and study various options available in it.

Course outcomes

After the completion of the course, Students shall be able to
1. Demonstrate packet sniffing
2. Implement encryption algorithms
3. Demonstrate cryptography techniques
4. Demonstrate Ethical Hacking techniques.

****END****

(B30523) INTERNET OF THINGS LAB

M.Tech (CSE) I SEM

L	T	P	C
0	0	4	2

1. Using raspberry pi
    a. Calculate the distance using distance sensor.
    b. Basic LED functionality.
2. Using Arduino
    a. Calculate the distance using distance sensor.
    b. Basic LED functionality.
    c. Calculate temperature using temperature sensor.
3. Using Node MCU
    a. Calculate the distance using distance sensor.
    b. Basic LED functionality.

    Calculate temperature using temperature sensor.

Course Outcomes

Students shall be able to

1. Create simple IOT applications.
2. Demonstrate the usage of raspberry pi in IOT applications
3. Use python to program IOT H/W.

****END****

(B30212) RESEARCH METHODOLOGY & IPR

M. Tech (CSE) I SEM

L	T	P	C
2	0	0	2

UNIT-I

Meaning of research problem, Sources of research problem, 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 problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT-II

Effective literature studies approach, analysis, Plagiarism, Research ethics, 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-III

Nature of Intellectual Property: Patents, Designs, Trademarks 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-IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V

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

Suggested Reading:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”

4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Course Outcomes:

At the end of this course, students will be able to

1. Investigate the solution for research problem
2. Develop the research proposal and paper
3. Describe the process of patenting and development in international scenario
4. Define the patent rights ,licencing and transfer of technology
5. Demonstrate the new development in IPR

****END****

(C30001) ENGLISH FOR RESEARCH PAPER WRITING (AUDIT COURSE)

M.Tech (CSE) I SEM

L	T	P	C
2	0	0	0

Unit-I

1. Planning and Preparation, Word Order, Breaking up long sentences.
2. Structuring Paragraphs and Sentences, Being Concise and Removing, Redundancy.
3. Avoiding Ambiguity and Vagueness

Unit- II

4. Clarifying Who Did What. Highlighting Your Findings.
5. Hedging and Introduction

Unit-III

6. Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit-IV

7. Key skills are needed when writing a Title
8. Key skills are needed when writing an Abstract
9. Key skills are needed when writing an Introduction
10. Skills needed when writing a Review of the Literature

Unit -V

11. Skills are needed when writing the Methods
12. Skills needed when writing the Results
13. Skills are needed when writing the Discussion
14. Skills are needed when writing the Conclusions, useful phrases
15. How to ensure paper is as good as it could possibly be the first-times submission

Suggested Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COURSE OUTCOMES

On completion of the course students will be able to

1. Identify the required word order in sentences.
2. Illustrate meaningful sentence structures.
3. Clarify the findings of his research.
4. Argue and defend his research methods.
5. Predict the outcome of his research and will write meaningful conclusions.

****END****

(B30503) ADVANCED ALGORITHMS

M.Tech (CSE) II SEM	L	T	P	C
	3	0	0	3

Unit-I

Classification of algorithms, Algorithm Specifications,

Mathematical analysis of Recursive Algorithms: – Introduction to recurrence equations, formulation of recurrence equations, Techniques for solving recurrence equations, solving recurrence equations, Solving Recurrence Equations using polynomial reduction, Divide and conquer recurrences

Unit-II

Graphs: – Graph representations, Graph traversals

Brute Force Approaches: - Computational Geometry Problems-Closest pair problem, Convex Hull Problem, Exhaustive Searching- Magic Squares problem, Container Loading problem, Knapsack Problem, Assignment Problem

Unit-III

Divide and Conquer approach: - Multiplication of long integers, Strassen's matrix multiplication, Fourier Transform

Greedy algorithms: - Coin change problem, Scheduling problems, knapsack problem, optimal storage on tapes, optimal tree problems, optimal graph problems

Unit-IV

Transform and Conquer approach: - Matrix operations- Gaussian Elimination method, LU decomposition, Crout's method of decomposition

Dynamic Programming: - Computing binomial coefficients, Multistage graph problem, Transitive Closure and Warshall algorithm, Floyd warshall all pairs shortest path problem, TSP, Flow shop scheduling algorithm

Unit-V

String algorithms: - Basic string algorithms, Longest Common Sub sequences, Naive String-Matching algorithm, Rabin Karp, KMP, Harspool algorithm

Linear Programming, Graphical method for solving LPP, Simplex method, Minimization problems, Principle of Duality, Max Flow problem

TEXT BOOKS:

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

REFERENCES:

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

****END****

(B30504) SOFT COMPUTING

M.Tech (CSE) II SEM	L	T	P	C
	3	0	0	3

Unit-I

INTRODUCTION TO SOFT COMPUTING AND NEURALNETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit-II

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Unit-III

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

Unit-IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

Unit-V

MATLAB/Python Lib: Introduction to MATLAB/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

TEXT BOOKS:

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing,Prentice: Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.
3. MATLAB Toolkit Manual.

Course outcomes

After completion of course, students would be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
3. Understand the concepts of gentic algorithms.
4. Apply genetic algorithms to combinatorial optimization problems
5. Evaluate and compare solutions by various soft computing approaches for a given problem

END

(B30511) DIGITAL FORENSICS
(PROGRAM SPECIFIC ELECTIVE – III)

M.Tech (CSE) II SEM	L	T	P	C
	3	0	0	3

UNIT - I

Computer Forensics Fundamentals: What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

UNIT-II

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration —Practical Implementation.

UNIT - III

Computer Forensics analysis and validation: Determining what data to collect and analyse, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT - IV

Current Computer Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT - V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.
3.

REFERENCE BOOKS

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education
2. Forensic Compiling, A Practitioner's Guide by Tony Sammes and Brian Jenkinson, Springer International edition.
3. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
5. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade, TMH 2005
6. Windows Forensics by Chad Steel, Wiley India Edition.

Course Outcomes

Students shall be able to

1. Describe the applications of Digital Forensics
2. Explain Evidence Collection & Data seizure techniques
3. Classify various Forensics techniques.
4. Descibe Computer Forensic tools.
5. Understand the concepts of windows and dos systems

****END****

(B30512) DATA ANALYTICS
(PROGRAM SPECIFIC ELECTIVE – III)

M.Tech (CSE) II SEM

L	T	P	C
3	0	0	3

UNIT – I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT – II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc., Need for Business Modeling.

UNIT – III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT – IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT – V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Course Outcomes:

After completion of this course students will be able to

1. Understand the data management and data pre-processing
2. understand the tools and environment of modeling techniques and data Imputations
3. understand the tools and environment of modeling techniques and data Imputations
4. Develop approaches to applying forecasting
5. Construct visualizations for effective data analysis

****END****

(B30513) PARALLEL COMPUTING
(PROGRAM SPECIFIC ELECTIVE – III)

M.Tech (CSE) II SEM

L	T	P	C
3	0	0	3

Unit I

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

Unit II

Principles of Parallel Algorithm Design - Analytical Modeling of Parallel Programs

Unit III

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

Unit IV

Dense Matric Algorithms (Matrix-Vector Multiplication, Matrix-Matrix Multiplication) – Sorting Algorithms (Issues, 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)

TEXT BOOKS

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, Michaek J. Quinn, Tata McGraw-Hill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy,PHI.

Course Outcomes:

1. understand the concepts of parallel architectures
2. Design an algorithms using analytical modeling
3. Understand the concepts of message passing methods
4. Solve problems using different Sort methods.
5. Find shortest paths using different shortest path techniques.

END

(B30514) HUMAN COMPUTER INTERACTION
(PROGRAM SPECIFIC ELECTIVE – IV)

M.Tech (CSE) II SEM

L	T	P	C
3	0	0	3

UNIT I

Introduction: Importance of user Interface – definition, importance of good design, Benefits of good design. A brief history of Screen design

The graphical user interface: Popularity of graphics, direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

UNIT II

Design process: Human interaction with computers, important of human characteristics in design, human considerations in design, Human interaction speeds, understanding business junctions.

UNIT III

Screen Designing: Interface design goals, Screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

UNIT IV

Windows: Window characteristics, components of a window, presentation styles, types, management, organizing window functions, operations

Selection of device based and screen-based controls.

UNIT V:

Write clear text and messages, create meaningful Graphics, Icons, Images, Choose proper colours

Interaction Devices:

Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

TEXT BOOKS:

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", Second Edition, Wiley India Edition
2. Ben Sheiderman, "Designing the User Interface", Third Edition, Addison-Wesley

REFERENCE BOOKS:

1. Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd.,2002.

Course Outcomes:

1. Acquire knowledge on principles and components of HCI.
2. Designing process based on human considerations
3. Design an effective user interface for software application using the building tools and techniques
4. Analyse the window components and presentation styles
5. write text and create graphics , images and icons

****END****

(B30515) COMPUTER VISION
(PROGRAM SPECIFIC ELECTIVE - IV)

	L	T	P	C
M.Tech (CSE) II SEM	**3**	**0**	**0**	**3**

UNIT I
IMAGE PROCESSING FOUNDATIONS
Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II
SHAPES AND REGIONS
Binary shape analysis – connectedness – object labelling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion –boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT III
HOUGH TRANSFORM
Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate centre location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location– GHT for feature collation

UNIT IV
3D VISION AND MOTION
Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline based motion – optical flow – layered motion

UNIT V

APPLICATIONS

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

TEXT BOOKS:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.

REFERENCE BOOKS:

1. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
2. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
4. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
5. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

Course Outcomes

Upon Completion of the course, the students will be able

1. Implement fundamental image processing techniques required for computer vision
2. Apply different boundary tracking procedures to shape the image
3. Apply Hough, Transform for line, circle, and ellipse detections
4. Apply 3D vision techniques
5. Develop applications using computer vision techniques

****END****

(B30516) DISTRIBUTED DATABASES
(Program Specific Elective – IV)

M.Tech (CSE) II SEM

L	T	P	C
3	0	0	3

UNIT I

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design

UNIT II

Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.
Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries

UNIT III

The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions
Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT IV

Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection

UNIT V

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects

Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multi-database Concurrency Control, Multi-database Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies

TEXT BOOKS:

1. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti,TMH.
2. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Pearson Education, 2nd Edition.

REFERENCE BOOKS:

1. Distributed Database Systems, Chanda Ray, Pearson.
2. Distributed Database Management Systems, S.K.Rahimi and Frank.S.Haug, Wiley.

Course Outcomes

1. Understand theoretical and practical aspects of distributed database systems..
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object-oriented database system and related development.
4. Ability to write global queries for distributed databases.
5. Understand the Security issues

****END****

(B30524) ADVANCED ALGORITHMS LAB

M.Tech (CSE) II SEM

L	T	P	C
0	0	4	2

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement solution for knapsack problem using Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement Rabin Karp algorithm.
8. Implement KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flow problem.

Course Outcomes:
Students shall be able to

1. Implement programs using divide and conquer
2. Implement programs using different pattern matching techniques
3.Implement programs using greedy method
4.Solve the shortest path using different methods.
5.Solve the problems using gaussian method

****END****

(B30525) DIGITAL FORENSICS LAB

M.Tech (CSE) II SEM	L	T	P	C
	0	0	4	2

List of Experiments

1. Perform email analysis using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. Perform Browser history analysis and get the downloaded content, history, saved logins, searches, websites visited etc using Foxton Forensics tool, Dumpzilla.
3. Perform mobile analysis in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT
4. Perform Registry analysis and get boot time logging using process monitor tool
5. Perform Disk imaging and cloning the using the X-way Forensics tools
6. Perform Data Analysis i.e History about open file and folder, and view folder actions using Last view activity tool
7. Perform Network analysis using the Network Miner tool.
8. Perform information for incident response using the crowd Response tool
9. Perform File type detection using Auto spy tool
10. Perform Memory capture and analysis using the Live RAM capture or any forensic tool

Course Outcomes:

After completion of the course, students shall be able to

1. Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing
2. To Learn the file system storage mechanisms and retrieve files in hidden format
3. Learn the use of computer forensics tools used in data analysis.
4. Learn how to find data that may be clear or hidden on a computer disk, find out the open ports for the attackers through network analysis, Registry analysis.

****END****

(B30526) DATA ANALYTICS LAB
(Data Analytics using R)

M.Tech(CSE) II SEM

L	T	P	C
0	0	4	2

List of Experiments

1. Demonstrate data cleaning – missing values
2. Implement data normalization (min-max, z-score)
3. Implement attribute subset selection for data reduction
4. Demonstrate outlier detection
5. Perform analytics on any standard data set
6. Implement linear regression
7. Implement logistic regression
8. Construct decision tree for weather data set
9. Analyse time-series data
10. Work on any data visualization tool

Course Outcomes

After completion of this course students will be able to

1. Understand different files formats like .csv and .txt and learn how access these files.
2. Work on Data pre-processing methods
3. Understand various Data Sources
4. Carry out statistical analysis
5. Understand various techniques to visualize results of data.

****END****

(B30527) PARALLEL COMPUTING LAB

M.Tech(CSE) II SEM

L	T	P	C
0	0	4	2

Lab 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.

Course Outcomes

After completion of this course students shall be able to

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

****END****

(C30002) VALUE EDUCATION
(AUDIT COURSE)

M.Tech(CSE) II SEM

L	T	P	C
2	0	0	0

UNIT-I

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

Unit–II

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

Unit-III

8. Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.
9. Punctuality, Love and Kindness.
10. Avoid fault Thinking.
11. Free from anger, Dignity of labour.

Unit- IV

12. Universal brotherhood and religious tolerance.
13. True friendship.
14. Happiness Vs suffering, love for truth.
15. Aware of self-destructive habits.
16. Association and Cooperation.
17. Doing best for saving nature

Unit- V

18. Character and Competence –Holy books vs Blind faith.
19. Self-management and Good health.
20. Science of reincarnation.
21. Equality, Nonviolence, Humility, Role of Women.
22. All religions and same message.
23. Mind your Mind, Self-control.
24, Honesty, Studying effectively

Suggested reading

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

COURSE OUTCOMES

On completion of the course students will be able to

1. Identifies the social values and work ethics.
2. Classifies the moral and non-moral values.
3. Demonstrates love and kindness to fellow human beings.
4. Draws inference from the Holy books about the characters and their competence.
5. Able to judge his fellow beings’ character through their behaviour

****END****

(B30517) OPTIMIZATION TECHNIQUES
(PROGRAM SPECIFIC ELECTIVE – V)

M.Tech (CSE) III SEM

L	T	P	C
3	0	0	3

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

ALLOCATION: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II

TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III

SEQUENCING – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines

REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

THEORY OF GAMES: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

INVENTORY: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks – Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V

WAITING LINES: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population

models– Multichannel – Poisson arrivals and exponential service times with infinite population.

DYNAMIC PROGRAMMING:
Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:
1. Operation Research /J.K.Sharma/MacMilan.
2. Introduction to O.R /Taha/PHI

REFERENCE BOOKS:
1. Operations Research: Methods and Problems / Maurice Saseini, ArhurYaspan and Lawrence Friedman.
2. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hillier &Libermann (TMH).

Course Outcomes:

Students shall be able to
1. Gain the knowledge of optimization techniques.
2. Get the skill to apply Optimization techniques to address the real time problems.
3. Solve Job Sequencing problems.
4. Solve problems using Game theory approach
5. Apply Dynamic Programming optimization technique.

****END****

(B30518) HIGH PERFORMANCE COMPUTING
(PROGRAM SPECIFIC ELECTIVE – V)

M.Tech (CSE) III SEM

L	T	P	C
3	0	0	3

Unit I

Grid Computing: Data & Computational Grids, Grid Architectures and Its Relations to Various Distributed Technologies. Autonomic Computing, Examples of The Grid Computing Efforts (Ibm).

Unit II

Cluster Setup & Its Advantages, Performance Models & Simulations; Networking Protocols & I/O, Messaging Systems. Process Scheduling, Load Sharing and Balancing; Distributed Shared Memory, Parallel I/O.

Unit III:

Example Cluster System – Beowlf; Cluster Operating Systems: Compass and Nanos, Pervasive Computing Concepts & Scenarios; Hardware & Software; Human – Machine Interface.

Unit IV

Device Connectivity; Java for Pervasive Devices; Application Examples.

Unit V

Classical Vs Quantum Logic Gates; One, Two & Three Qubit Quantum Gates; Fredkin &Toffoli Gates; Quantum Circuits; Quantum Algorithms.

Text Books:

1. "Selected Topics in Advanced Computing" Edited by Dr. P. Padmanabham And Dr. M.B. Srinivas, 2005 Pearson Education.

References:

1. J. Joseph & C. Fellenstien: 'Grid Computing ', Pearson Education
2. J. Burkhardt et.al: 'pervasive computing' Pearson Education
3. Marivesar:' Approaching quantum computing', pearson Education.
4. Raj kumarBuyya:'High performance cluster computing', pearson Education.

5. Neilsen& Chung L:'Quantum computing and Quantum Information', Cambridge University Press.
6. A networking approach to Grid Computing,Minoli, Wiley

Course Outcomes:

Students shall be able to

1. Understanding the concepts in grid computing
2. Ability to set up cluster and run parallel applications
3. Ability to understand the cluster projects and cluster OS
4. Apply java pervasive devices
5. Understanding the concepts of pervasive computing & quantum computing

****END****

(B30519) ADHOC AND SENSOR NETWORKS
(PROGRAM SPECIFIC ELECTIVE – V)

M.Tech (CSE) III SEM

L	T	P	C
3	0	0	3

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 and Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

UNIT III

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc Basics of Wireless, Sensors and Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV

Data Retrieval in Sensor Networks

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

UNIT V

Security - Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma 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 Kauffman)

Course Outcomes:

1. Understanding the state-of-the-art research in emerging subject of ad hoc and wireless sensor networks (ASN)
2. Apply broad cast and bebroadcast transormations
3. Find Solutions for TCP over Ad hoc Basics of Wireless, Sensors and Applications
4. Understand the Data Retrieval in Sensor Networks
5. Demonstrate the security issues

****END****

(B30230) APPLICATION SPECIFIC INTEGRATED CIRCUITS DESIGN (OPEN ELECTIVE)

M.Tech(CSE) III SEM

L	T	P	C
3	0	0	3

UNIT- I Types of ASICs
Design flow – Economics of ASICs – ASIC cell libraries – CMOS logic cell data path logic cells – I/O cells – cell compilers.

UNIT-II: ASIC Library design:
Transistors as resistors – parasitic capacitance – logical effort programmable ASIC design software: Design system – logic synthesis – half gate ASIC.

UNIT-III: Low level design entry
Schematic entry – low level design languages – PLA tools – EDIF – An overview of VHDL and verilog**.**

UNIT-IV: Logic synthesis
Logic synthesis in Verilog & VHDL simulation.

UNIT-V: ASIC Construction
Floor Planning & Placement Algorithms -Routing

Text Books:
1.Application specific Integrated Circuits", J.S. Smith, Addison Wesley.
2.Principles of CMOS VLSI Design: A System Perspective, N. Westle & K.Eshraghian, Addison – Wesley Pub.Co.1985. Technological Age", 2016

References:
1. Basic VLSI Design: Systems and Circuits, Douglas A. Pucknell & Kamran Eshraghian, Prentice Hall of India Private Ltd., New Delhi, 1989.
2. Introduction to VLSI System, C. Mead & L. Canway, Addison Wesley Pub
3. Introduction to NMOS & VLSI System Design, A. Mukharjee, Prentice Hall,
4. Digital Integrated Circuits: A Design Perspective, Jan A. Rabey, Prentice Hall of India Pvt Ltd

****END****

(B30231) EMBEDDED SYSTEMS
(OPEN ELECTIVE)

M. Tech (CSE) III SEM

L	T	P	C
3	0	0	3

UNIT-I: Embedded Computing & CPU fundamentals
Embedded Computing: Microprocessors, embedded design process, system description formalisms. Instruction sets- CISC and RISC;
CPU fundamentals: programming I/Os, co-processors, supervisor mode, exceptions, memory management units and address translation, pipelining, super scalar execution, caching, CPU power consumption

UNIT-II: Embedded computing platform & Program design and analysis
Embedded Computing platform: CPU bus, memory devices, I/O devices, interfacing, designing with microprocessors, debugging techniques.
Program design and analysis: models of program, assembly and linking, compilation techniques, analysis and optimization of execution time, energy, power and size.

UNIT-III: Processes and operating systems
Multiple tasks and multiple processes, context switching, scheduling policies, inter-process communication mechanisms.

UNIT-IV: Hardware accelerators & Networks
Hardware accelerators: CPUs and accelerators, accelerator system design.
Networks: Distributed embedded architectures, networks for embedded systems, network-based design and Internet-enabled systems

UNIT-V: System design techniques
Design methodologies, requirements analysis, system analysis and architecture design, quality assurance.

TEXT BOOKS:
1. Wolf, W. Computers as components- Principles of embedded computing system design. Academic Press, Indian edition available from Harcourt India Pvt. Ltd.,

REFERENCE BOOKS

1. Manuel, Jiménez, Rogelio, Palomera, Isidoro, Couvertier, "Introduction to Embedded Systems Using Microcontrollers and the MSP430" Springer Publications, 2014.
2. Frank Vahid, Tony D. Givargis, "Embedded system Design: A Unified Hardware/Software Introduction", John Wily & Sons Inc.2002.
3. Peter Marwedel, "Embedded System Design", Science Publishers, 2007.

Course Outcomes

At the end of the course the student will be able to:
1. Expected to understand the selection procedure of Processors in the Embedded domain.
2. Design Procedure for Embedded System.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems
4. Expected to evaluate the architectures & networks for Embedded system.

****END****

(B30331) RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE)

M.Tech (CSE) III Sem

L	T	P	C
3	0	0	3

Unit – I: Solar Energy

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data. Solar energy collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Storage and applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion

Unit-II:

Wind energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Unit-III: Bio-mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

Unit-IV:

Geothermal energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Unit-V: Direct energy conversion: Need for DEC, Carnot cycle, limitations, principles of DEC

TEXT BOOKS

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS

1.Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2.Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3.Non-Conventional Energy Systems / K Mittal /Wheeler
4.Solar Energy /Sukhame

Course Outcomes

On completion of the course, students will be able to
1.Interpret the principles of solar radiation, collection and application.
2.Explain the concepts of Wind energy generation
3.Demonstrate the concepts of Bio-mass energy and operation of IC engines
4.Illustrate the perception of Geo-thermal energy and production in India
5.Elucidate the ideology of direct energy conversion

****END****

(B30332) INDUSTRIAL SAFETY
(OPEN ELECTIVE)

M.Tech(CSE) III SEM

L	T	P	C
3	0	0	3

Unit-I:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's
like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Course outcomes:

Up on the completion of the course students will be able to

1. Demonstrate the concepts of industrial safety, accidents and preventive measures.
2. Explain the Fundamentals of maintenance engineering.
3. Explain Wear and Corrosion and their prevention
4. Interpret the Fault tracing and draw decision tree for problems in machine tools.
5. Explain the concepts of Periodic and preventive maintenance

END

(B30431) GREEN BUILDINGS
(OPEN ELECTIVE)

M.Tech(CSE) III Sem

L	T	P	C
3	0	0	3

Unit-I

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors -Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

Unit-II

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

Unit-III

Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

Unit-IV

End-use, energy utilization and requirements - Lighting and day lighting - End -use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

Unit-V

Energy management options – Energy audit and energy targeting - Technological options for energy management.

REFERENCE BOOKS

1.J. Krieder and A. Rabl, Heating and Cooling of Buildings - Design for Efficiency, McGraw Hill, 1994.
2.S.M. Guinnes and Reynolds, Mechanical and Electrical Equipment for Buildings, Wiley, 1989.

3.Shaw, Energy Design for Architects, AEE Energy Books, 1991.
4.ASHRAE, Handbook of Fundamentals, Atlanta, 1997.
5.Donald W. Abrams, Low Energy Cooling – A Guide to the Practical Application of Passive Cooling and Cooling Energy Conservation Measures, Van Nostrand Reinhold Co., New York, 1986

Course Learning Outcomes

After completing this course, students will be able to:
1.Describe and use the basic terms and concepts used in green buildings.
2.Recognize and analyse green buildings.
3. Identify and define green building systems and materials.
4. Analyze and solve design problems utilizing principles of green building.
5.Assimilate knowledge gained in this course to evaluate green buildings.

****END****

(B30432) CONSTRUCTION PROJECT MANAGEMENT (OPEN ELECTIVE)

M.Tech(CSE) III Sem

L	T	P	C
3	0	0	3

Unit-I

Management process- Roles, management theories, Social responsibilities, planning and strategic management, strategic implementation, Decision making tools and techniques-Organizational structure, Human resource management- motivation performance- leadership

Unit-II

Classification of construction projects, Construction Stages, Resources- Functions of Construction Management and its Applications, Preliminary planning –Collection of Data-Contract planning –Scientific Methods of Management; Network Techniques in construction management- Bar Chart- Grant Chart, CPM- PERT-Cost & Time optimization.

Unit-III

Resource planning – planning for manpower, materials, Cost, equipment, Labour, Scheduling, Forms of, Scheduling-Resource allocation, budget and budgetary control methods.

Unit-IV

Contract-types of contract, contract document, specification, important conditions of contract- tender and tender document- Deposits by contractor – Arbitration, negotiation – M- Book –Muster rolls- stores.

Unit-V

Management information systems- Labour Regulations: Social security-welfare Legislation-laws relating to wages , Bonus and industrial disputes, Labour administration – insurance and safety Regulations- Workmen‘s compensation Act – other labour laws- safety in construction : legal and financial aspects of accidents in construction , occupational and safety hazard assessment , human factors in safety , legal and financial aspects of accidents , occupational and safety hazard assessment.

TEXT BOOKS

1. Ghalot, P.S., Dhir, D.M., Construction planning and Management, Wiley Eastern

limited,1992
2. Chikara, K.K., Construction Project Management, Tata McGraw Hill publishing Co, Ltd New Delhi,1998
3. Punima, B.C., Project planning and Control with PERT and CPM, Laxmi Publications New Delhi 1987.

REFERENCE BOOKS:

1. Construction Management and Planning by Sengupta, B. Guha, H., Tata McGraw Hill Publications

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

1. Explain the importance of construction planning and functioning of various earth moving equipment.
2. Explain of production of aggregate products and concreting.
3. Apply the gained knowledge to project management and construction techniques.

****END****

(B30532) BIG DATA AND ANALYTICS
(OPEN ELECTIVE)

	L	T	P	C
M.Tech (CSE) III Sem	**3**	**0**	**0**	**3**

Unit-I

Types of Digital Data-Classification of Digital Data; Introduction to Big Data-Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data?, Why Big Data?, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment.

Unit-2

Big Data Analytics-What is Big Data Analytics? What Big Data Analytics Isn't?. Classification of Analytics; Data Science, Terminologies Used in Big Data Environments, Top Analytics Tools; The Big Data Technology Landscape-NoSQL (Not Only SQL), Hadoop.

Unit-3

Introducing Hadoop, Why Hadoop? RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview-Use Case of Hadoop, Hadoop Distributors-HDFS (Hadoop Distributed File System)- Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator)- Interacting with Hadoop Ecosystem.

Unit-4

Introduction to MongoDB-What is MongoDB? Why MongoDB? Terms Used in RDBMS and MongoDB-Data Types in MongoDB, MongoDB Query Language Introduction to MAPREDUCE Programming-Introduction-Mapper, Reducer, Combiner, Practitioner, Searching, Sorting, Compression.
Introduction to Hive-What is Hive? Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL).

Unit-5

Introduction to Pig-What is Pig?, The Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators,

Eval Function, Complex Data Types, Piggy Bank, User-Defined Functions (UDF), Parameter Substitution, Diagnostic Operator, Word Count Example using Pig. Machine learning: Introduction to Machine Learning, Machine Learning Algorithms.

TEXT BOOKS:

1. Big Data and Analytics by by Seema Acharya (Author), Subhashini Chellappan, Wiley Publisher.

REFERENCES BOOKS:

1. Big Data, Black Book, by DT Editorial Services, Dreamtech Press (2016).

Course Outcomes:

Students shall be able to

1.Define Big Data and explain the applications of BigData.
2.Describe Analytical tools required to analyse the BigData .
3.Create Big Data Applications using Hadoop frame work.
4.Write Pig Scripts for processing Data.
5.Explain the classification of Machine Learning Algorithms

END

(B30533) PYTHON PROGRAMMING
(OPEN ELECTIVE)

M.Tech(CSE) III Sem

L	T	P	C
3	0	0	3

Unit-I

Introduction to Python Programming: How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations (Operators. Type conversions, Expressions), More about Data Output. Decision Structures and Boolean Logic: if, if-else, if- elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

Unit-2

Functions: Introduction, Defining and Calling a void Function, designing a Program to Use Functions, Local variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions Generating Random Numbers, Writing Our Own Value-Returning Functions, the math Module, Storing Functions in Modules. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

Unit-3

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples. Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms

Unit-4

Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes, Inheritance, Polymorphism.

Unit-5

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and

Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

TEXT BOOKS:

1. Starting Out with Python by Tony Gaddis, Pearson, 3 editions

REFERENCE BOOKS

1. Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford University Press, First edition;
2. Fundamentals of Python, Kenneth A. Lambert, Cengage Learning,1 edition;
3. Foundations for Analytics with Python by Clinton W. Brownley, O'Reilly Media; 1 edition

Course Outcomes:

Students shall be able to

1. Develop simple applications using Python.
2. Write modular programs in python.
3. Work with python instances.
4. Explain the Object-Oriented features of Python
5. Develop GUI applications using python.

****END****