R22

ACADEMIC REGULATIONS,
COURSE STRUCTURE,
AND
DETAILED SYLLABUS

MASTER OF TECHNOLOGY (M.TECH)

Applicable to

M.Tech Regular Two Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

Offered under Choice Based Credit System (CBCS)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH
Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

College

Vision:
Imparting Knowledge and instilling skills to the aspiring students in the field of Engineering, Technology, Science and Management to face the emerging challenges of the society.

Mission:
- Encouraging scholarly activities that transfer knowledge in the areas of Engineering, Technology, Science and Management.

- Ensuring students of all levels, well trained to meet the needs of education and their future endeavors.

- Inculcating human values and ethics into the education system for the all-round development of the students.

Department

About Department:
Department of CSE Established in the year 2005, with an intake of 240, M.Tech in CSE with an intake of 24.It has Sophisticated infrastructural, state-of-art labs and experienced faculty. The department is keen in academic exposure of the students to the latest domain trends by conducting a series of Seminars and workshops are organized regularly to help the faculty and students to update their knowledge about the latest tools and technologies. We give additional inputs to the students to meet the corporate needs and expectations. The training that we give and the syllabus we have designed for training apart from university curriculum fills the gap between the University and the Industry. It is updated regularly to keep up with the growing demands and the changing trends of the software industry and research laboratories. It helps students enhance their skills and leave the campus with a sense of total fulfillment. Whether it is intelligent gaming, mobile applications, IOT, cloud computing, data security, social networks, or bio-informatics the heart of CSE with action rules. In view of all these academic activities, the department has been accredited by NBA.

Vision:
Enhance learning that promotes techno graduates aiming employability and entrepreneurship with human values to face the challenges in the global technological society.

Mission:
- Empowering students for professional career and higher studies by providing hands on experience and value education to become successful technocrats in the society.

- Nurturing students with interpersonal and entrepreneurial skills, so that they gain ability to work as a team.

- Imparting quality education, employability skills and techno ethical values among the students for the benefit of the society.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC Autonomous)

ACADEMIC REGULATIONS - R22

Applicable to

M. Tech (Regular / Full Time) Two Year Programme
(For the Batches admitted from the Academic Year 2022-23)

Offered under Choice Based Credit System (CBCS)

1.0 **P**ost-**G**raduate **D**egree Programmes in **E**ngineering & **T**echnology (PGP in E&T) in Teegala Krishna Reddy Engineering College Hyderabd (TKREC) offers Two Years (Four Semesters) full-time Master of Technology (M.Tech.) programmes, under Choice Based Credit System (CBCS) with effect from the Academic Year 2022-23

2.0 **Eligibility for Admissions**

2.1 Admission to the **PGP in E&T** shall be made subject to eligibility, qualification and specializations prescribed by the University from time to time, for each specialization under each M.Tech programme.

2.2 Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGECET) for M.Tech. programmes or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time

2.3 The medium of instructions for all PG Programmes will be ENGLISH only.

3.0 **M.Tech. Programme (PGP in E&T) Structure**

3.1 The M.Tech. Programs in E&T of TKREC are of Semester pattern, with Four Semesters consisting of Two academic years, each academic year having Two Semesters (First / Odd and

Second / Even Semesters). Each Semester shall be of 22weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.

3.2 The two-year M.Tech. program consists of 68 credits and the student has to register for all 68 credits and earn all 68 credits for the award of M.Tech. degree. There is NO exemption of credits in any case.

3.3 The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Tech. Degree from the date of commencement of first year first semester failing which the student shall forfeit the seat in M.Tech. programme.

3.4 UGC/AICTE specified definitions /descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:

3.4.1 **Semester Scheme**

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

3.4.2 **Credit Courses**

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

- ❖ One credit for one hour /week /semester for theory /lecture (L) courses

- ❖ One credit for two hours /week /semester for laboratory /practical (P) courses or tutorials (T)

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

3.4.3 **Subject Course Classification**

All subjects/ courses offered for the Post-Graduate Programme in E&T (M.Tech. Degree Programme) are broadly classified as follows. The **Dean Academics /Principal** has

followed in general the guidelines issued by AICTE / UGC.

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

4.0 **Course Registration**

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

4.2 The Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject / Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices also will not be considered. However, if the Subject/ Course that has already been listed or Registration by the **college** in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate choice either for a new Subject, if it is offered, or for another existing Subject (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.0 **Attendance Requirements**

The programmes are offered based on a unit system with each subject being considered a unit. Attendance is calculated separately for each subject.

5.1 Attendance in all classes (Lectures/Laboratories) is compulsory. The minimum required attendance in each theory subject (*also mandatory Audit Courses*) including the attendance of mid-term examination/ Laboratory etc. is 75%. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. *This attendance should also be included in the attendance uploaded every fortnight in the College Website. The attendance of mandatory Audit Courses should be uploaded separately to the Examination Branch.* A student shall not be permitted to appear for the Semester End Examinations (SEE), if his /her attendance is less than 75%.

5.2 A student's Seminar report and presentation on Mini Project shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar presentation classes on Mini Project during that Semester.

5.3 **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject (Theory/Lab/Mini Project with Seminar) of a semester shall be

granted by the College Academic Committee on genuine reasons.

5.4   A prescribed fee per subject shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.

5.5   Shortage of Attendance below 65% in any subject shall in **no case be condoned.**

5.6   A Student, whose shortage of attendance is not condoned in any Subject(s) (Theory/Lab/Mini Project with Seminar) in any Semester, is considered as 'Detained in that Subject(s), and is not eligible to write Semester End Examination(s) of such Subject(s), (in case of Mini Project with Seminar, his/her Mini Project with Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek re-registration for those Subject(s) in subsequent Semesters, and attend the same as and when offered.

5.7   A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.

5.8   **a)** A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory (non-credit audit)* course)** in first Year I semester for promotion to first Year II Semester.

        b) A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory (non-credit audit)* course)** in first Year II semester for promotion to second Year I Semester.

6.0   **Academic Requirements**

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

6.1   A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if he secures not less than:

        ❖ 40% of Marks(24 out of 60 marks) in the Semester End Examination;

❖ 40% of Marks in the internal examinations(16 out of 40 marks allotted for CIE);

❖ A minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades this implies securing **'B'** Grade or above in a subject.

6.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini Project with seminar, if student secures not less than 50% marks (i.e. 50 out of 100 allotted marks). The student would be treated as failed, if student (i) does not submit a seminar report on Mini Project or does not make a presentation of the same before the evaluation committee as per schedule or (ii) secures less than 50% marks in Mini Project with seminar evaluation. The failed student shall reappear for the above evaluation when the notification for supplementary examination is issued.

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

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

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

6.4 Marks and Letter Grades obtained in all those subjects covering the above specified **68** credits alones hall be considered for the calculation of final CGPA, which will be indicated in the Grade Card /Marks Memo of second year second semester.

6.5 If a student registers for extra subject(s) (in the parent department or other departments/ branches of Engineering) other than those listed subjects totaling to **68** credits as specified in the course structure, the performance in extra subject(s) (although evaluated and graded using the same procedure as that of the required **68** credits) will not be considered while calculating the SGPA and CGPA. For such extra subject(s) registered, percentage of marks and Letter Grade alone will be indicated in the Grade

Card/Marks Memo, as a performance measure, subject to completion of the attendance and academic requirements as stated in items 5 and 6.1 - 6.3.

6.6   When a student is detained due to shortage of attendance in any subject(s) in any semester, no Grade allotment will be made for such subject(s). However, he is eligible for re-registration of such subject(s) in the subsequent semester(s), as and when next offered, with the academic regulations of the batch into which he is re-registered, by paying the prescribed fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of internal marks and Semester End Examination marks for performance evaluation in such subject (s), and SGPA / CGPA calculations.

6.7   A student eligible to appear for the Semester End Examination in any subject, but absent from it or failed (failing to secure 'B' Grade or above), may reappear for that subject at the supplementary examination as and when conducted. In such cases, his Internal Marks assessed earlier for that subject will be carried over, and added to the marks secured in the supplementary examination, for the purpose of evaluating his performance in that subject.

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

7.0   Evaluation-Distribution and Weightage of Marks

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

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

7.2.   In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Mid-Term examination consists of one part for 30 marks with a total duration of 2 hours as

follows:

1. Mid-term Examination in descriptive mode for30 marks:

The descriptive paper shall contain 5 full questions out of which, the student has to answer all the questions, each carrying 6 marks and internal choice may be given Average of two mid-term examinations (I Mid-Term & II Mid-Term) will be taken as final marks for mid-term examinations (For 30 marks).

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

1. Assignment for 5 marks.(Average of 2 Assignments each for 5marks)

2. Subject Viva-Voce/ PPT / Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

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

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

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

❖ The student, in each subject, shall have to earn 40% of marks(i.e.16 marks out of 40 marks) in CIE, 40% of marks (i.e.24 marks out of 60) in SEE and overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks put together to secure Pass grade (i.e."B") or above.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 continuous Internal Examination (CIE) marks.

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

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

7.3.   The Semester End Examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) Part- A for 10 marks, ii) Part - B for 50 marks.

❖ Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.

❖ Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

❖ The duration of Semester End Examination is 3 hours.

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

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/ procedure, expected outcome) which shall be evaluated for 10 marks

2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.

4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software /Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

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

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

10 marks for write-up

15 for experiment / program

15 for evaluation of results

10 marks for presentation on another experiment / program in the same laboratory course and

10 marks for viva-voce on concerned laboratory course

- The student, in each subject, shall have to earn 40% of marks(i.e.16 marks out of 40 marks) in CIE, 40% of marks (i.e.24 marks out of 60) in SEE and overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks put together to secure Pass grade (i.e."B") or above..

- The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 continuous Internal Examination (CIE) marks.

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

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

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/ procedure, expected outcome) which shall be evaluated for 10 marks

2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.

4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software /Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the

laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the **College**.

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

10 marks for write-up

15 for experiment/ program

15 for evaluation of results

10 marks for presentation on another experiment/ program in the same laboratory course and

10 marks for viva-voce on concerned laboratory course

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

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

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

7.5   For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the HOD concerned and this is to be informed to the Controller of Examinations within two weeks, before commencement of the lab end examinations. The external examiner should be selected from outside the College.

7.6   There shall be Mini Project with Seminar during I year II semester for internal evaluation of 100 marks. The Departmental Academic Committee (DAC) will review the progress of the mini project during the seminar presentations and evaluate the same for 50 marks. Mini Project Viva Voce will be evaluated by the DAC for another 50 marks before the

semester end examinations. Student shall carryout the mini project in consultation with the mini project supervisor which may include critically reviewing the literature, project implementation and submit it to the department in the form of a report and shall make an oral presentation before the DAC consisting of Head of the Department, Mini Project supervisor and two other senior faculty members of the department. The student has to secure a minimum of 50% of marks in i) seminar presentation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same as and when scheduled.

7.7   Every candidate shall be required to submit a dissertation on a topic approved by the Dissertation Review Committee.

7.8   A Dissertation Review Committee (DRC) shall be constituted with the Head of the Department as Chairperson, Dissertation Supervisor and one senior faculty member of the Department offering the M.Tech. Programme.

7.9   Registration of Dissertation Work: A candidate is permitted to register for the Dissertation Work after satisfying the attendance requirement in all the subjects, both theory and laboratory.

7.10   After satisfying 7.9, a candidate must present in *Dissertation Work Review - I*, in consultation with his Dissertation Supervisor, the title, objective and plan of action of his Dissertation work to the Dissertation Review Committee (DRC) for approval *within four weeks* from the commencement of **Second year First Semester**. Only after obtaining the approval of the DRC can the student initiate the Dissertation work.

7.11   If a candidate wishes to change his supervisor or topic of the Dissertation, he can do so with the approval of the DRC. However, the DRC shall examine whether or not the change of topic/ supervisor leads to a major change of his initial plans of Dissertation proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

7.12   A candidate shall submit his Dissertation progress report in two stages at least with a gap of **three** months between them.

7.13   The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit

Dissertation Thesis only after successful completion of all theory and practical courses with the approval of DRC *not earlier than 40 weeks* from the date of approval of the Dissertation work. For the approval of DRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the DRC.

7.14 *The Dissertation Work Review - II* in II Year I Semester carries 100 internal marks. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.

7.15 *The Dissertation Work Review - III* in II Year II Sem. carries 100 internal marks. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The DRC will examine the overall progress of the Dissertation Work and decide whether or not the Dissertation is eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review-III. If he fails to obtain the required minimum marks, he has to reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Dissertation Evaluation (Viva-Voce) examination.

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

7.17   After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the **College** and be included in the final thesis. The Thesis will be accepted for submission, if the similarity index is less than **30%**.If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to *TWO*. The candidate has to register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.

7.18   Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the College/ School /Institute, after submission of a research paper related to the Dissertation work in a UGC approved journal. A copy of the submitted research papers shall be attached to thesis.

7.19   The thesis shall be adjudicated by an external examiner selected by the **Principal**. For this, the HOD of the concerned shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the HOD to the Examination Branch.

7.20   If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission.

7.21   If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate has to secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.

7.22   If he fails to fulfill the requirements as specified in 7.21, he will reappear for the Dissertation

Viva-Voce examination *only after three months*. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit his Dissertation Work by the board within a specified time period (within *four* years from the date of commencement of his first year first semester).

7.23   The Dissertation Viva-Voce External examination marks must be submitted to the **Principal /Controller** on the day of the examination.

7.24   For mandatory non-credit Audit courses, a student has to secure 40 marks out of 100 marks i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject /course. These marks should also be uploaded along with the internal marks of other subjects.

7.25   No marks or letter grades shall be allotted for mandatory non-credit Audit Courses. Only Pass/Fail shall be indicated in Grade Card.

8.0   **Re-Admission/Re-Registration**

8.1   Re-Admission for Discontinued Student

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

8.2   If a student is detained in a subject (s) due to shortage of attendance in any semester, he may be permitted to **re-register** for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he seeks re-registration, with prior permission from the   authorities concerned, subject to item3.2

8.3   A candidate shall be given one chance to re-register and attend the classes for a maximum of two subjects, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work and secure the

required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt are cancelled.

9.0 **Examinations and Assessment -The Grading System**

9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, or Lab/ Practicals, or Mini Project with Seminar, Dissertation, etc., based on the percentage of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 7 above, and a corresponding Letter Grade shall be given.

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

%of Marks Secured in a subject/Course (Class Intervals)	Letter Grade(UGC Guide lines)	Grade Points
90% and above (≥90% ≤ 100%)	O(Outstanding)	10
Below 90 % but not less than 80% (≥80 % < 90%)	A$^+$(Excellent)	9
Below 80% but not less than 70% (≥70 %,< 80%)	A(Very Good)	8
Below 70% but not less than 60% (≥60 %,< 70%)	B$^+$(Good)	7
Below 60% but not less than 50% (≥50 %, < 60%)	B(Above average)	6
Below 50% (<50%)	F(FAIL)	0
Absent	**Ab**	**0**

9.3 A student obtaining **'F'** Grade in any Subject is deemed to have 'failed' and is required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those subjects will remain as obtained earlier.

9.4 If a student has not appeared for the examinations, '**Ab**' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted.

9.5 A Letter Grade does not imply any specific marks percentage; it is only the range of percentage

of marks.

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

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

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

9.8   The student passes the Subject/Course only when he **gets GP≥6 (B Grade or above).**

9.9   The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (∑CP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\textbf{SGPA} = \{\sum_{i=1}^{N} C_i\, G_i\} / \{\sum_{i=1}^{N} C_i\}\textbf{….For each Semester,}$$

where 'i' is the Subject indicator index (taking into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the ith Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

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

$$\textbf{CGPA} = \{\sum_{j=1}^{M} C_j\, G_j\} / \{\sum_{j=1}^{M} C_j\}\textbf{…for all S Semesters registered (i.e., up to and inclusive of S}$$
$$\textbf{Semesters, S} \geq \textbf{2),}$$

Where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the

Course Structure of the parent Department) the Student has 'REGISTERED' for from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (taking into account allSubjectsfrom1toSSemesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade points	Credit Points
Course1	4	A	8	4*8=32
Course2	4	O	10	4*10=40
Course3	4	B	6	4*6=24
Course4	3	B	6	3*6=18
Course5	3	A+	9	3*9=27
Course6	3	B	6	3*6=18
	21			159

SGPA=159/21=7.57

Illustration of calculation of CGPA

Semester	Credits	SGPA	Credits*SGPA
Semester I	24	7	24*7=168
Semester II	24	6	24*6=144
Semester III	24	6.5	24*6.5=156
Semester V	24	6	24*6=144
	96		612

CGPA=612/96=6.37

10.0   Award of Degree and Class

10.1   If a student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **68** Credits (with CGPA $\geq$ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with the specialization that

he was admitted into.

10.2 **Award of Class**

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

Class Awarded	CGPA
First Class with Distinction	≥7.75
First Class	6.75≤CGPA<7.75
Second Class	6.00≤CGPA<6.75

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

11.0 **With holding of Results**

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

12.0 **General**

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

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

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

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

12.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the **Controller/Principal** is final.

12.6 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 **Controller/Principal**.

<div align="center">

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

</div>

S.No	Nature of Malpractices /Improper conduct	Punishment
	If the candidate:	

1.(a)	Possesses or keeps accessible in examination hall, any paper, notebook, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam Hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject to the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and the relevant material will be kept in the Examinations Branch.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all College examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also de barred for two consecutive semesters from class work and all **College** 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that

	misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	subject and allot her subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all **College** examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered Against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the **Controller/Principal** for further action to award suitable punishment.	

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
Medbowli, Meerpet, Balapur, Hyderabad, Telangana-500097
Mob: 9393959597.   Email: info@tkrec.ac.in,deanacademics@tkrec.ac.in

I Semester

Sno.	Course Code	Core/ Elective	Course Title	L	T	P	Credits
1	22MT101PC	PC	Mathematical Foundations of Computer Science	3	0	0	3
2	22MT102PC	PC	Advanced Data Structures	3	0	0	3
3	22MT111PE	PE-I	1.Database Programming with PL/SQL	3	0	0	3
	22MT112PE		2.Deep Learning				
	22MT113PE		3. Natural Language Processing				
4	22MT121PE	PE-II	1.Applied Cryptography	3	0	0	3
	22MT122PE		2.Software Quality Engineering				
	22MT123PE		3.Mining Massive Datasets				
5	22MT103PC	PC	Advanced Data Structures Lab	0	0	4	2
6		PE1-LAB	Professional Elective - I Lab	0	0	4	2
7	22MT104PC	PC	Research Methodology & IPR	2	0	0	2
8		MC	Audit Course- I	2	0	0	0
Total				**16**	**0**	**8**	**18**

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II Semester

Sno.	Course Code	Core/ Elective	Course Title	L	T	P	Credits
1	22MT201PC	PC	Advanced Algorithms	3	0	0	3
2	22MT202PC	PC	Advanced Computer Architecture	3	0	0	3
3	22MT231PE	PE-III	1. Enterprise Cloud Concepts	3	0	0	3
	22MT232PE		2. Advanced Computer Networks				
	22MT233PE		3. Edge Analytics				
4	22MT241PE	PE-IV	1.Bioinformatics	3	0	0	3
	22MT242PE		2.Nature Inspired Computing				
	22MT243PE		3. Robotic Process Automation				
5	22MT203PC	PC	Advanced Algorithms Lab	0	0	4	2
6		PE-III LAB	Professional Elective - III Lab	0	0	4	2
7	22MT201PW	PW	Mini Project with Seminar	0	0	4	2
8			Audit Course- II	2	0	0	0
			Total	**14**	**0**	**12**	**18**

III Semester

Sno.	Course Code	CORE/ELECTIVE	Course Title	L	T	P	Credits
1	22MT351PE	PE-V	1. Digital Forensics	3	0	0	3
	22MT352PE		2. High Performance Computing				
	22MT353PE		3. Quantum Computing				
2		OE	Open Elective	3	0	0	3
3	22MT301PW	PW	Dissertation Work Review - II	0	0	12	6
		Total		**6**	**0**	**12**	**12**

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IV Semester

Sno.	Course Code	CORE/ELECTIVE	Course Title	L	T	P	Credits
1	22MT401PW	PW	Dissertation Work Review - III	0	0	12	6
2	22MT402PW	PW	Dissertation Viva-Voce	0	0	28	14
			Total	**0**	**0**	**40**	**20**

Professional Elective -I

22MT111PE		1.Database Programming with PL/SQL
22MT112PE	PE-I	2.Deep Learning
22MT113PE		3.Natural Language Processing
22MT114PE		1.Database Programming with PL/SQL
22MT115PE	PE-I LABS	2.Deep Learning
22MT116PE		3.Natural Language Processing

Professional Elective -II

22MT121PE		1. Applied Cryptography
22MT122PE	PE-II	2. Software Quality Engineering
22MT123PE		3. Mining Massive Datasets

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Professional Elective -III

22MT231PE	PE-III	1. Enterprise Cloud Concepts
22MT232PE		2. Advanced Computer Networks
22MT233PE		3. Edge Analytics
22MT234PE	PE-III LABS	1. Enterprise Cloud Concepts
22MT235PE		2. Advanced Computer Networks
22MT236PE		3. Edge Analytics

Professional Elective -IV

22MT241PE	PE-IV	1. Bioinformatics
22MT242PE		2. Nature Inspired Computing
22MT243PE		3. Robotic Process Automation

Professional Elective -V

22MT351PE	PE-V	1. Digital Forensics
22MT352PE		2. High Performance Computing
22MT353PE		3. Quantum Computing

Audit –I & II

22MT101AC	Audit-I & II	English for Research Paper Writing
22MT102AC		Disaster Management
22MT103AC		Sanskrit for Technical Knowledge
22MT104AC		Value Education
22MT105AC		Constitution of India
22MT106AC		Pedagogy Studies
22MT107AC		Stress Management by yoga
22MT108AC		Personality Development Through Life Enlightenment Skills

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Open Electives -CSE Department

Course Code	CORE/ELECTIVE	Course Title
22MT301OE	OPEN ELECTIVE	1. IPR
22MT302OE		2. Fault Tolerance Systems
22MT303OE		3. Intrusion Detection Systems
22MT304OE		4. Digital Forensics
22MT305OE		5. Optimization Techniques
22MT306OE		6. Cyber Physical Systems
22MT307OE		7. Graph Analytics

Course Code	Core/Elective	Course Title	L	T	P	Credits
22MT101PC	PC	Mathematical Foundations of Computer Science	3	0	0	3
22MT102PC	PC	Advanced Data Structures	3	0	0	3
22MT111PE	Professional Elective-I	1. Database Programming with PL/SQL	3	0	0	3
22MT112PE		2. Deep Learning				
22MT113PE		3. Natural Language Processing				
22MT121PE	Professional Elective-II	1. Applied Cryptography	3	0	0	3
22MT122PE		2. Software Quality Engineering				
22MT123PE		3. Mining Massive Datasets				
22MT103PC	PC	Advanced Data Structures Lab	0	0	4	2
	PE1-LAB	Professional Elective - I Lab	0	0	4	2
22MT104PC	PC	Research Methodology & IPR	2	0	0	2
	MC	Audit Course- I	2	0	0	0
Total			**16**	**0**	**8**	**18**

PROFESSIONAL ELECTIVE-I

22MT111PE	Professional Elective-I Theory	1.	Database Programming with PL/SQL
22MT112PE		2.	Deep Learning
22MT113PE		3.	Natural Language Processing
22MT114PE	Professional Elective-I- Labs	1.	Database Programming with PL/SQL
22MT115PE		2.	Deep Learning
22MT116PE		3.	Natural Language Processing

PROFESSIONAL ELECTIVE-II

22MT121PE	Professional Elective-II	1. Applied Cryptography
22MT122PE		2. Software Quality Engineering
22MT123PE		3. Mining Massive Datasets

AUDIT -1 & II		
22MT101AC	Audit-I	English for Research Paper Writing
22MT102AC		Disaster Management
22MT103AC		Sanskrit for Technical Knowledge
22MT104AC		Value Education
22MT105AC		Constitution of India
22MT106AC		Pedagogy Studies
22MT107AC		Stress Management by yoga
22MT108AC		Personality Development Through Life Enlightenment Skills

22MT101PC: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (PC-I)

M.Tech CSE I Year I Sem.   **L   T   P   C**
                                                                       3   0   0   3

Pre-requisites: An understanding of Math in general is sufficient.

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

Course Outcomes: After learning the contents of this paper the student must be able to
1. Ability to understand and construct precise mathematical proofs.
2. Ability to use logic and set theory to formulate precise statements.
3. Ability to analyze and solve counting problems on finite and discrete structures.
4. Ability to describe and manipulate sequences.
5. Ability to apply graph theory in solving computing problems.

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

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

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

UNIT-IV:
Discrete Probability and Advanced Counting Techniques:
An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques:
Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT-V:
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.
Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.

2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel,Teodore
    P. Baker, Prentis Hall of India, 2nd ed.

REFERENCES:

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

22MT102PC: ADVANCED DATA STRUCTURES (PC-II)

M.Tech CSE I Year I Sem.   **L   T   P   C**
                                                                  3   0   0   3

Prerequisites: A course on "Data Structures"

Course Objectives
1. Introduces the heap data structures such as leftist trees, binomial heaps, Fibonacci and min- max heaps
2. Introduces a variety of data structures such as disjoint sets, hash tables, search structures and digital search structures

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

UNIT - I
Heap Structures
Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT - II
Hashing and Collisions
Introduction, Hash Tables, Hash Functions, different Hash Functions: Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

UNIT - III
Search Structures: OBST, AVL trees, Red-Black trees, Splay trees,
Multiway Search Trees: B-trees, 2-3 trees

UNIT - IV
Digital Search Structures
Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

UNIT - V
Pattern matching
Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

TEXT BOOKS:
1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.

2. Introduction to Algorithms, TH Cormen, PHI

REFERENCES:
1. Design methods and analysis of Algorithms, SK Basu, PHI.

2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.

3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

22MT111PE: DATABASE PROGRAMMING WITH PL/SQL
(Professional Elective-I)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:
1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

Course Outcomes:
1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

UNIT - I
PL/SQL Basics: Block Structure, Behavior of Variables in Blocks, Basic Scalar and Composite Data Types, Control Structures, Exceptions, Bulk Operations, Functions, Procedures, and Packages, Transaction Scope.

UNIT - II
Language Fundamentals & Control Structures: Lexical Units, Variables and Data Types, Conditional Statements, Iterative Statements, Cursor Structures, Bulk Statements, Introduction to Collections, Object Types: Varray and Table Collections, Associative Arrays, Oracle Collection API.

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

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

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

TEXT BOOKS:
1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGrawHill Education

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

22MT112PE: DEEP LEARNING (Professional Elective-I)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: students will be able
1. To understand complexity of Deep Learning algorithms and their limitations
2. To be capable of performing experiments in Deep Learning using real-world data.

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

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

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

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

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

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

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.

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

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.

2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.

4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

22MT113PE: NATURAL LANGUAGE PROCESSING (Professional Elective - I)

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

Prerequisites:
1. Data structures, finite automata and probability theory.
Course Objectives:
1. Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

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

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models. Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

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

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

UNIT - IV
Predicate-Argument Structure, Meaning Representation Systems, Software.

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

TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zaloumi, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary
REFERENCE:
1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

22MT121PE: APPLIED CRYPTOGRAPHY (Professional Elective-II)

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

Course Objectives:
Knowledge on significance of cryptographic protocols and symmetric and public key algorithms.

Course Outcomes:
1. Understand the various cryptographic protocols
2. Analyze key length and algorithm types and modes
3. Illustrate different public key algorithms in cryptosystems
4. Understand special algorithms for protocols and usage in the real world.

UNIT - I
Foundations: Terminology, Steganography, Substitution Ciphers and Transposition Ciphers, Simple XOR, One-Time Pads, Computer Algorithms, Large Numbers,
Cryptographic Protocols: Protocol Building Blocks: Introduction to Protocols, Communications Using Symmetric Cryptography, One-Way Functions, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation

UNIT - II
Cryptographic Techniques: Key length: Symmetric Key length, Public key length, comparing symmetric and public key length.
Algorithm types and modes: Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Cipher, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mod, Counter Mode, Other Block-Cipher Modes.

UNIT - III
Public-Key Algorithms: Background, Knapsack Algorithms, RSA, Pohlig-Hellman, Rabin, ElGamal, McEliece, Elliptic Curve Cryptosystems, LUC, Finite Automaton Public-Key Cryptosystems
Public-Key Digital Signature Algorithms: Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, ESIGN

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

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

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

22MT122PE: SOFTWARE QUALITY ENGINEERING (Professional Elective - II)

M.Tech CSE I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:
Knowledge on significance of Quality, quality assurance, quality engineering.

Course Outcomes:
1. Understand software quality and its perspectives
2. Analyze defect prevention and defect reduction in software quality assurance
3. Illustrate software quality engineering activities and its process

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

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

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

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

UNIT - V
Coverage and usage testing based on checklist and partitions: Checklist based testing and its limitations, Testing for partition Coverage, Usage based Statistical testing with Musa's operational profiles, Constructing operational profiles
Case Study: OP for the cartridge Support Software

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

22MT123PE: MINING MASSIVE DATASETS (Professional Elective - II)

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

Prerequisites:
Students should be familiar with Data mining, algorithms, basic probability theory and discrete math.

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

Course Outcomes:
1. Handle massive data using Map Reduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large datasets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT - I:
Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,
Map Reduce and the New Software Stack-Distributed File Systems, Map Reduce, Algorithms Using Map Reduce.

UNIT - II:
Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, Filtering Streams.

UNIT - III:
Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism.

UNIT - IV:
Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation.
Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

UNIT - V:
Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles.

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

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

22MT103PC: ADVANCED DATA STRUCTURES LAB (Lab-I)

M.Tech CSE I Year I Sem.	L	T	P	C
	0	0	4	2

Prerequisites:
1. A course on Computer Programming & Data Structures
Course Objectives:
1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
4. Introduces sorting and pattern matching algorithms.

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

List of Programs
1. Write a program to perform the following operations:
 a) Insert an element into a binary search tree.
b) Delete an element from a binary search tree.
c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
 a) Merge sort
b) Heap sort
c) Quick sort

3. Write a program to perform the following operations:
a) Insert an element into a B- tree.
b) Delete an element from a B- tree.
c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
 a) Insert an element into a Min-Max heap
b) Delete an element from a Min-Max heap
c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
a) Insert an element into a Lefiist 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.

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

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

22MT114PE: DATABASE PROGRAMMING WITH PL/SQL LAB (Lab-II)

M.Tech CSE I Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**4**	**2**

Course Objectives:
1. Knowledge on significance of SQL fundamentals.
2. Evaluate functions and triggers of PL/SQL
3. Knowledge on control structures, packages in PL/SQL and its applications

Course Outcomes:
1. Understand importance of PL/SQL basics
2. Implement functions and procedures using PL/SQL
3. Understand the importance of triggers in database

List of Experiments:
1. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.

2. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID), write a cursor to select the five highest paid employees from the table.

3. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.

4. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.

5. Write a PL/SQL program to demonstrate Exceptions.

6. Write a PL/SQL program to demonstrate Cursors.

7. Write a PL/SQL program to demonstrate Functions.

8. Write a PL/SQL program to demonstrate Packages.

9. Write PL/SQL queries to create Procedures.

10. Write PL/SQL queries to create Triggers.

22MT115PE: DEEP LEARNING LAB (Lab - II)

M.Tech CSE I Year I Sem.

L	T	P	C
0	0	4	2

Course Objectives:
1. To Build The Foundation Of Deep Learning.
2. To Understand How To Build The Neural Network.
3. To enable students to develop successful machine learning concepts.

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

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

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

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

Extensive Reading:
- • http://www.deeplearning.net
- • https://www.deeplearningbook.org/
- • https://developers.google.com/machine-learning/crash-course/ml-intro
- • www.cs.toronto.edu/~fritz/absps/imagenet.pdf
- • http://neuralnetworksanddeeplearning.com/

22MT116PE : NATURAL LANGUAGE PROCESSING LAB (Lab - II)

M.Tech CSE I Year I Sem.   **L   T   P   C**
                                                                         0   0   4   2

Prerequisites: Data structures, finite automata and probability theory
Course Objectives:
1. To Develop and explore the problems and solutions of NLP.

Course Outcomes:
1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
3. Able to design, implement, and analyze NLP algorithms

List of Experiments
Implement the following using Python
1. Tokenization
2. Stemming
3. Stop word removal (a, the, are)
4. Word Analysis
5. Word Generation
6. Pos tagging
7. Morphology
8. Chunking
9. N-Grams
10.N-Grams Smoothing

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

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

22MT104PC: RESEARCH METHODOLOGY & IPR

M.Tech CSE I Year I Sem.   **L   T   P   C**
                                                          2   0   0   2

Prerequisite: None

Course Objectives:
1. To understand the research problem
2. To know the literature studies, plagiarism and ethics
3. To get the knowledge about technical writing
4. To analyze the nature of intellectual property rights and new developments
5. To know the patent rights

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

UNIT - I:
Meaning of research problem, Sources of research 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 approaches, analysis, Plagiarism, Research ethics

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

UNIT - IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International

Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - V:

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

TEXT BOOKS:

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

REFERENCES:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

M.TECH II SEMESTER

FOR
M. TECH COURSE
(Applicable for the batches admitted 2023-2024)

M.Tech II Semester

Course Code		Course Title	L	T	P	Credits
22MT201PC	PC	Advanced Algorithms	3	0	0	3
22MT202PC	PC	Advanced Computer Architecture	3	0	0	3
22MT231PE 22MT232PE 22MT233PE	Professional Elective-III	1.Enterprise Cloud Concepts 2.Advanced Computer Networks 3.Edge Analytics	3	0	0	3
22MT241PE 22MT242PE 22MT243PE	Professional Elective-IV	1.Bioinformatics 2.Nature Inspired Computing 3.Robotic Process Automation	3	0	0	3
22MT203PC	PC	Advanced Algorithms Lab	0	0	4	2
	PE-III LAB	Professional Elective - III Lab	0	0	4	2
22MT201PW	PW	Mini Project with Seminar	0	0	4	2
		Audit Course- II	2	0	0	0
		Total	**14**	**0**	**12**	**18**

PROFESSIONAL ELECTIVE-III

22MT231PE	Professional Elective-III THEORY	1.	Enterprise Cloud Concepts
22MT232PE		2.	Advanced Computer Networks
22MT233PE		3.	Edge Analytics
22MT234PE	Professional Elective-III LAB	1.	Enterprise Cloud Concepts
22MT235PE		2.	Advanced Computer Networks
22MT236PE		3.	Edge Analytics

PROFESSIONAL ELECTIVE-IV

22MT241PE	Professional Elective-IV	1.	Bioinformatics
22MT242PE		2.	Nature Inspired Computing
22MT243PE		3.	Robotic Process Automation

AUDIT - I & II

22MT101AC	Audit-I	English for Research Paper Writing
22MT102AC		Disaster Management
22MT103AC		Sanskrit for Technical Knowledge
22MT104AC		Value Education
22MT105AC		Constitution of India
22MT106AC		Pedagogy Studies
22MT107AC		Stress Management by yoga
22MT108AC		Personality Development Through Life Enlightenment Skills

22MT201PC: ADVANCED ALGORITHMS (PC - III)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: UG level course in Algorithm Design and Analysis

Course Objectives:
1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advancedalgorithmic problems.
4. Students should be able to understand different classes of problems concerning theircomputation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes: After completion of course, students would be able to:
1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.

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

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

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

UNIT - IV
Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.
Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion

between base- representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm.

UNIT - V

Linear Programming: Geometry of the feasibility region and Simplex algorithm
NP-completeness: Examples, proof of NP-hardness and NP-completeness.

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applyingrecently proposed data structures.

REFERENCES:

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

22MT202PC: ADVANCED COMPUTER ARCHITECTURE (PC - III)

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Computer Organization

Course Objectives:
1. To impart the concepts and principles of parallel and advanced computer architectures.
2. To develop the design techniques of Scalable and multithreaded Architectures.
3. To Apply the concepts and techniques of parallel and advanced computer architectures todesign modern computer systems

Course Outcomes: Gain knowledge of
1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers.

UNIT - V

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

TEXT BOOK:
1.   Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

REFERENCES:

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

22MT231PE: ENTERPRISE CLOUD CONCEPTS
(Professional Elective - III)

M.Tech CSE I Year II Sem.
 L   T   P   C
 3   0   0   3

Course Objectives: Knowledge on significance of cloud computing and its fundamental conceptsand models.

Course Outcomes:
1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

UNIT - I

Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goalsand Benefits, Risks and Challenges.

Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud DeliveryModels, Cloud Deployment Models.

UNIT - II

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data CenterTechnology, Virtualization Technology.

Cloud Computing Mechanisms:

Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device,Cloud Usage Monitor, Resource Replication.

UNIT - III

Cloud Management Mechanisms: Remote Administration System, Resource Management System,SLA Management System, Billing Management System, Case Study Example

Cloud Computing Architecture

Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example

UNIT - IV

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

UNIT - V

Transitioning to Cloud-Centric Enterprises: The Tuning Methodology, Contract Management in theCloud

Cloud-Instigated IT Transformations

Introduction, Explaining Cloud Infrastructures, A Briefing on Next-Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure Solutions, Clouds for Business Continuity, The Relevance of Private Clouds, The Emergence of Enterprise Clouds

TEXT BOOKS:
1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press

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

22MT232PE: **ADVANCED COMPUTER NETWORKS (Professional Elective - III)**

M.Tech CSE I Year II Sem.   **L   T   P   C**
                                                                  3   0   0   3

Prerequisites: Data Communication, Basic Networking Principles, Computer Networks

Course Objective: This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

Course Outcomes:
1. Understanding of holistic approach to computer networking
2. Ability to understand the computer network protocols and their applications
3. Ability to design simulation concepts related to packet forwarding in networks.

UNIT - I

Data-link protocols: Ethernet, Token Ring and Wireless (802.11). Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs), Multiple access schemes Routing andInternetworking: Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer.

UNIT - II

Transport and Application Layer Protocols: Client-Server and Peer-To-Peer Application Communication, Protocols on the transport layer, reliable communication. Routing packets through a LAN and WAN. Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP),Mobile Transport Protocols, TCP Congestion Control. Principles of Network Applications,

UNIT- III

The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, building a Simple Web Server Creating simulated networks and passing packets through them using different routing techniques. Installing and using network monitoring tools.

UNIT - IV

Wireless and Mobile Networks: Introduction, Wireless links and Network Characteristics - CDMA, Wifi:
802.11 Wireless LANS, Cellular internet access, Mobility management: Principles

UNIT - V

Multimedia networking: Multimedia networking applications, streaming stored video, Voice-over-IP, Protocols for real-time conversational applications.

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson,6th Edition, 2012.
2. Computer Networks and Internets, Duglas E. Comer, 6th Edition, Pearson.

REFERENCES:

1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and Piyasat Nilkaew, Pearson,3rd Edition, 2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Prentice Hall.

22MT233PE: **EDGE ANALYTICS (Professional Elective - III)**

M.Tech CSE I Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisites
- A basic knowledge of "Python Programming"

Course Objectives
1. The aim of the course is to introduce the fundamentals of Edge Analytics.
2. The course gives an overview of – Architectures, Components, Communication Protocols andtools used for Edge Analytics.

Course Outcomes
1. Understand the concepts of Edge Analytics, both in theory and in practical application.
2. Demonstrate a comprehensive understanding of different tools used at edge analytics.
3. Formulate, Design and Implement the solutions for real world edge analytics .

UNIT - I
Introduction to Edge Analytics
What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

UNIT - II
Basic edge analytics components, Connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics, Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long- distance communication using LoRa and Signfox for edge analytics.

UNIT - III
Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure ioT Hub, Using the Raspberry Pi with Azure IoT edge, Connecting our Raspberry Pi edgedevice, adding a simulated temperature sensor to our edge device.

UNIT - IV
Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

UNIT - V
Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code,creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protectingour edge analytics applications

TEXT BOOK:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edgeanalytical solutions including Azure IoT Edge by Colin Dow

REFERENCES:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source usingMicrosoft Azure by Ashish Mahajan

22MT241PE: **BIOINFORMATICS (Professional Elective - IV)**

M.Tech CSE I Year II Sem.   **L   T   P   C**
                                                                                    3   0   0   3

Course Objectives: Knowledge on concepts of bioinformatics and biological motivations of sequence analysis

Course Outcomes:
1. Understand the Central Dogma & XML (Bio XML) for Bioinformatics
2. Analyze Perl (Bioperl) for Bioinformatics
3. Illustrate Databases technology, architecture and its interfaces
4. Understand Sequence Alignment Algorithms, Phylogenetic Analysis

UNIT -I:

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

UNIT -II:

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

UNIT -III:

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

UNIT -IV:

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

UNIT -V:

Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor- Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Othermethods, Tree evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

TEXT BOOKS:
1. S.C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications,2004
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001

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

22MT242PE: **NATURE INSPIRED COMPUTING (Professional Elective - IV)**

M.Tech CSE I Year II Sem.	L	T	P	C
	3	0	0	3

Course Objectives: Knowledge on significance of intelligence, genetic algorithms Ant Colony algorithms

Course Outcomes:
1. Familiar with Genetic algorithm and its applications.
2. Compare different Ant Colony Optimization algorithmic models.
3. Compare different Artificial Bee Colony Optimization algorithmic models.
4. Illustrate Particle swam optimization algorithm with an example.

UNIT - I:
Models of Life and Intelligence - Fundamentals of bio-inspired models and bio-inspired computing. Evolutionary models and techniques, Swarm models and its self-organization, swarm and evolutionary algorithms. Optimisation problems – single and multi-objective optimisation, heuristic, meta-heuristic and hyper heuristic functions.

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

UNIT - III:
Ant Colony Algorithms - Ant colony basics, hybrid ant system, ACO in combinatorial optimisation, variations of ACO, case studies.

UNIT - IV:
Particle Swarm algorithms - particles moves, particle swarm optimisation, variable length PSO, applications of PSO, case studies. Artificial Bee Colony algorithms - ABC basics, ABC in optimisation,multi-dimensional bee colony algorithms, applications of bee algorithms, case studies.

UNIT - V:
Selected nature inspired techniques - Hill climbing, simulated annealing, Gaussian adaptation, Cuckoo search, Firey algorithm, SDA algorithm, bat algorithm, case studies. Other nature inspired techniques - Social spider algorithm, Cultural algorithms, Harmony search algorithm, Intelligent water drops algorithm, Artificial immune system, Flower pollination algorithm, case studies.

TEXT BOOKS:
1. Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006
2. Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence: Theories, methods, and Technologies" IT Press, 2008

REFERENCES:

1. Leandro Nunes de Castro - " Fundamentals of Natural Computing, Basic Concepts, Algorithmsand Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Marco Dorrigo, Thomas Stutzle -" Ant Colony Optimization", Prentice Hall of India, New Delhi,2005
3. Vinod Chandra S S, Anand H S - "Machine Learning: A Practitioner's Approach", Prentice Hallof India, New Delhi, 2020

22MT243PE: **ROBOTIC PROCESS AUTOMATION (Professional Elective - IV)**

M.Tech CSE I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: Aim of the course is to make learners familiar with the concepts of Robotic Process Automation.

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

UNIT - I

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

UNIT - II

 Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials)

UNIT - III

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

UNIT - IV

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

UNIT - V

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

TEXT BOOKS:
1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPAtool – UiPath Kindle Edition.

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

22MT203PC: ADVANCED ALGORITHMS LAB (Lab - III)

M.Tech CSE I Year II Sem.   **L   T   P   C**
                                                                      0   0   4   2

Course Objective: The student can able to attain knowledge in advanced algorithms.

Course Outcomes: The student can able to analyze the performance of algorithms

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

TEXT BOOK:
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

22MT234PE: ENTERPRISE CLOUD CONCEPTS LAB (Professional Elective - III Lab)

M.Tech CSE I Year II Sem.	L	T	P	C
	0	0	4	2

Course Objectives: Knowledge on significance of cloud computing and its fundamental concepts and models.

Course Outcomes:
1. Understand importance of cloud architecture
2. Illustrating the fundamental concepts of cloud security
3. Analyze various cloud computing mechanisms
4. Understanding the architecture and working of cloud computing.

List of Experiments:
1. Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java..
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
6. Install Hadoop single node cluster and run simple applications like word count.

E-Resources:
1. https://www.iitk.ac.in/nt/faq/vbox.htm
2.https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjqrNG0za73Ah XZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu%2F~sedwards%2F   classes%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz
3. https://www.cloudsimtutorials.online/cloudsim/
4.https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/
5. https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster

22MT235PE: **ADVANCED COMPUTER NETWORKS LAB (Professional Elective - III Lab)**

M.Tech CSE I Year II Sem.

L	T	P	C
0	0	4	2

Prerequisites: Data communication, Basic networking principles, Computer Networks

Course Objectives:
1. Understand and analyze the existing protocols
2. Understand the use of network packet capturing tools

Course Outcomes: Ability of acquiring the practical exposure to existing protocols

List of Experiments:
1. Implement the IP fragmentation and reassembly algorithm.

2. Implement the IP forwarding algorithm.

3. Implement the simplest sliding window protocol of TCP.

4. Connect two systems using a switch and configure private IP addresses to the systems and ping them from each other. Using Wireshark, capture packets and analyze all the header information in the packets captured.

5. Install Telnet on one of the systems connected by a switch and telnet to it from the other system. Using Wireshark, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.

6. Start packet capture in wireshark application and then open your web browser and type in an URL of the website of your choice. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received for the web page you visited in your web browser.

22MT236PE: **EDGE ANALYTICS LAB (Professional Elective - III Lab)**

M.Tech CSE I Year II Sem.	L	T	P	C
	0	0	4	2

Course Objectives:
1. Understand the concept of edge computing
2. Understand the Edge computing Architecture
3. Implement the edge computing in IOT
4. Understand the concept of multi-access edge computing
5. Implement edge computing in MEC

Course Outcomes:
1. Identify the benefits of edge computing
2. Develop the microservices in iofog
3. Develop user defined services in the edge
4. Create use cases in IOT with edge computing
5. Develop services in MEC
6. Implement use cases in MEC

List of Experiments:
1. Set up the Arduino IDE for ESP8266-12 module and program it to blink a LED light.

2. Installation tools to create and manage ECN's

3. Deploy micro services and writing your own microservices

4. Setup the Communication Parameters

5. Implement any two Communications protocols

6. Deploy modules to a Windows IoT Edge device

7. Create an IoT hub.

8. Register an IoT Edge device to your IoT hub.

9. Install and start the IoT Edge for Linux on Windows runtime on your device.

10. Remotely deploy a module to an IoT Edge device and send telemetry.

11. Python based basic programs using Raspberry Pi.

12. Deploy a module Manage your Azure IoT Edge device from the cloud to deploy a module thatsends telemetry data to IoT Hub.

13. Publishing Data using HTTP.

14. Sensor Interfacing and Logging using MQTT.

15. File IO Example - # Example code to demonstrate writing and reading data to/from files

16. write code to turn on one of the LEDs on the board (Breadboard)

Additional Exercises on IOT Edge Analytics Applications
17. Temperature Logger

18. Home Automation

TEXT BOOKS:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edge analytical solutions including Azure IoT Edge by Colin Dow

2. MicroPython for the Internet of Things A Beginner's Guide to Programming with Python on Microcontroller, Charles Bell, A Press.

REFERENCE BOOKS:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source using Microsoft Azure by Ashish Mahajan
2. Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018
3. John C. Shovic, "Raspberry Pi IoT Projects: Prototyping Experiments for Makers", Packt Publishing, 2016
4. Python for Microcontrollers: Getting Started with MicroPython Paperback – 16 December 2016,by Donald Norris, McGraw-Hill Education TAB
5. Programming with MicroPython: Embedded Programming with Microcontrollers and Python, by Nicholas H. Tollervey, OReilly
6. R. Buyya, S.N. Srirama (2019), Fog and Edge Computing: Principles and Paradigms, Wiley-Blackwell, 2019.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

M.TECH III SEMESTER

FOR
M. TECH COURSE
(Applicable for the batches admitted 2023-2024)

M.Tech III Semester

Course Code	CORE/ELECTIVE	Course Title	L	T	P	Credits
22MT351PE	Professional Elective-V	1.Digital Forensics	3	0	0	3
22MT352PE		2.High Performance Computing				
22MT353PE		3. Quantum Computing				
	OE	Open Elective	3	0	0	3
22MT301PW	PW	Dissertation Work Review - II	0	0	12	6
Total			**6**	**0**	**12**	**12**

OPEN ELECTIVES

Course Code	CORE/ELECTIVE	Course Title
22MT301OE	OPEN ELECTIVE	1. IPR
22MT302OE		2. Fault Tolerance Systems
22MT303OE		3. Intrusion Detection Systems
22MT304OE		4. Digital Forensics
22MT305OE		5. Optimization Techniques
22MT306OE		6. Cyber Physical Systems
22MT307OE		7. Graph Analytics

22MT351PE: DIGITAL FORENSICS (Professional Elective - V)

M.Tech CSE II Year I Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Cybercrime and Information Warfare, Computer Networks

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

Course Outcomes: On completion of the course the student should be able to
1. Understand relevant legislation and codes of ethics.
2. Computer forensics and digital detective and various processes, policies and procedures.
3. E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Email and web forensics and network forensics.

UNIT - I
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

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

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

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

UNIT - V
Mobile Forensics: mobile forensics techniques, mobile forensics tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.
Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

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

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

22MT352PE: **HIGH PERFORMANCE COMPUTING (Professional Elective - V)**

M.Tech CSE II Year I Sem　　　　　　　　　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

Prerequisites:
1. Computer Organization & Architecture
2. Operating System Programming

Course Objectives:
1. To Improve the system performance
2. To learn various distributed and parallel computing architecture
3. To learn different computing technologies

Course Outcomes:
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. Understanding the concepts of pervasive computing & quantum computing.

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 Computing at a Glance: Introduction, A Cluster Computer and its Architecture, Cluster Classifications, Commodity Components for clusters, Network Services/Communication SW, Cluster Middleware and SSI, RMS, Programming Environments and Tools, Cluster Applications.

Lightweight Messaging Systems: Introduction, Latency Bandwidth Evaluation of Communication performance, Traditional Communication Mechanisms for clusters, Lightweight Communication Mechanisms.

UNIT - III

Job and Resource Management Systems: Need of Job management, Components and Architecture. **Scheduling Parallel Jobs on Clusters:** Introduction, Rigid Jobs with process migration, Malleable Jobs with Dynamic Parallelism, Communication-Based Coscheduling, Batch Scheduling.

Cluster Operating Systems: COMPaS.

UNIT - IV

Pervasive Computing Concepts & Scenarios: Hardware & Software; Human – Machine Interface.

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. Grid Computing, J. Joseph & C. Fellenstien, Pearson Education
2. High Performance Cluster Computing, Raj kumar Buyya, pearson Education.
3. Pervasive Computing, J. Burkhardt et.al, Pearson Education
4. Approaching Quantum Computing Marivesar, Pearson Education.

REFERENCES:
1. The Grid 2: Blue Print for a New Computing Infrastructure, Ian Foster and Carl Kesselman, 2nd Edition, The Elsevier Series.
2. Quantum computing and Quantum Information, Neilsen & Chung L, Cambridge UniversityPress.
3. A networking approach to Grid Computing, Minoli, Wiley

22MT352PE: QUANTUM COMPUTING (Professional Elective - V)

M.Tech CSE II Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:
1. To introduce the fundamentals of quantum computing
2. The problem-solving approach using finite dimensional mathematics

Course Outcomes:
1. Understand basics of quantum computing
2. Understand physical implementation of Qubit
3. Understand Quantum algorithms and their implementation
4. Understand The Impact of Quantum Computing on Cryptography

UNIT - I

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory.

Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers.

UNIT - II

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE.

UNIT - III

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, TheD-Wave Quantum Architecture.

Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

UNIT - IV

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

UNIT - V

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve

The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCES:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.Basic Concepts, Vol

   Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

22MT301OE: **IPR (Open Elective)**
M.Tech CNIS/CN/CYS II Year I Sem.   **L   T   P   C**
                                                                           3   0   0   3

Course Objectives:
1. To explain the art of interpretation and documentation of research work
2. To explain various forms of intellectual property rights
3. To discuss leading International regulations regarding Intellectual Property Rights

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand types of Intellectual Property
2. Analyze trademarks and its functionality
3. Illustrate law of copy rights and law of patents

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

UNIT - II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter,selecting, and evaluating trade mark, trade mark registration processes.

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

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

UNIT - V
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES:
1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd.

22MT302OE: FAULT TOLERANCE SYSTEMS (Open Elective)

M.Tech CNIS/CN/CYS II Year I Sem.   **L   T   P   C**
                                                                 3   0   0   3

Course Objectives:
1. To know the different advantages and limits of fault avoidance and fault tolerance techniques.
2. To impart the knowledge about different types of redundancy and its application for the design of computer system being able to function correctly even under presence of faults and data errors.
3. To understand the relevant factors in evaluating alternative system designs for a specific set of requirements.
4. To understand the subtle failure modes of "fault-tolerant" distributed systems.

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Become familiar with general and state of the art techniques used in design and analysis offault tolerant digital systems.
2. Be familiar with making system fault tolerant, modeling and testing, and benchmarking to evaluate and compare systems.

UNIT - I
Introduction to Fault Tolerant Computing: Basic concepts and overview of the course; Faults and their manifestations, Fault/error modeling, Reliability, availability and maintainability analysis, System evaluation, performance reliability tradeoffs.

UNIT - II
System level fault diagnosis: Hardware and software redundancy techniques. Fault tolerant system design methods, Mobile computing and Mobile communication environment, Fault injection methods.

UNIT - III
Software fault tolerance: Design and test of defect free integrated circuits, fault modeling, built in self-test, data compression, error correcting codes, simulation software/hardware, fault tolerant system design, CAD tools for design for testability.

UNIT - IV
Information Redundancy and Error Correcting Codes: Software Problem. Software Reliability Models and Robust Coding Techniques, Reliability in Computer Networks Time redundancy. Re execution in SMT, CMP Architectures, Fault Tolerant Distributed Systems, Data replication.

UNIT - V
Case Studies in FTC: ROC, HP Non-Stop Server. Case studies of fault tolerant systems and current research issues.

TEXT BOOK:
1. Fault Tolerant Computer System Design by D. K. Pradhan, Prentice Hall.

REFERENCES:
1. Fault Tolerant Systems by I. Koren, Morgan Kauffman.
2. Software Fault Tolerance Techniques and Implementation by L. L. Pullum, Artech House Computer Security Series.
3. Reliability of Computer Systems and Networks: Fault Tolerance Analysis and Design by M. L. Shooman, Wiley.

22MT303OE : INTRUSION DETECTION SYSTEMS (Open Elective)

M.Tech CNIS/CN/CYS II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: Computer Networks, Computer Programming

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

Course Outcomes: After completion of the course, students will be able to:
1. Possess a fundamental knowledge of Cyber Security.
2. Understand what vulnerability is and how to address most common vulnerabilities.
3. Know basic and fundamental risk management principles as it relates to Cyber Security andMobile Computing.
4. Have the knowledge needed to practice safer computing and safeguard your information usingDigital Forensics.
5. Understand basic technical controls in use today, such as firewalls and Intrusion Detectionsystems.
6. Understand legal perspectives of Cyber Crimes and Cyber Security.

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

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

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

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

UNIT - V
Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detection -

Obfuscation, polymorphism- Document vectors.
Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero-day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Online Websites/Materials:

1. https://www.intechopen.com/books/intrusion-detection-systems/

Online Courses:

1. https://www.sans.org/course/intrusion-detection-in-depth
2. https://www.cybrary.it/skill-certification-course/ids-ips-certification-training-course

22MT304OE: DIGITAL FORENSICS (Open Elective)

M.Tech CNIS/CN/CYS II Year I Sem.

	L	T	P	C
	3	0	0	3

Pre-Requisites: Cybercrime and Information Warfare, Computer Networks

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

Course Outcomes: On completion of the course the student should be able to
1. Understand relevant legislation and codes of ethics.
2. Computer forensics and digital detective and various processes, policies and procedures.
3. E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Email and web forensics and network forensics.

UNIT - I
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

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

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

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

UNIT - V

Mobile Forensics: mobile forensics techniques, mobile forensics tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.
Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

TEXT BOOKS:

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

REFERENCES:

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

22MT305OE : OPTIMIZATION TECHNIQUES (Open Elective)

M.Tech CNIS/CN/CYS II Year I Sem.   L T P C
                                                              3 0 0 3

Prerequisite: Mathematics –I, Mathematics –II

Course Objectives:
1. To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
2. Constrained and unconstrained optimization techniques for solving and optimizing electrical and electronic engineering circuits design problems in real world situations.
3. To explain the concept of Dynamic programming and its applications to project implementation.

Course Outcomes: After completion of this course, the student will be able to:
1. explain the need of optimization of engineering systems.
2. understand optimization of electrical and electronics engineering problems.
3. apply classical optimization techniques, linear programming, simplex algorithm, transportation problem.
4. apply unconstrained optimization and constrained non-linear programming and dynamicprogramming.
5. Formulate optimization problems.

UNIT - I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surface
- classification of Optimization problems.

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT - II

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.Degeneracy.

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

UNIT - III

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints: Kuhn – Tucker conditions.

Single Variable Nonlinear Unconstrained Optimization: Elimination methods: Uni Model function-its importance, Fibonacci method & Golden section method.

UNIT - IV

Multi variable nonlinear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hooke - Jeeves, Rosenbrock's search methods. Gradient methods:Gradient of function & its importance, Steepest descent method, Conjugate direction

methods: Fletcher- Reeves method & variable metric method.

UNIT - V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:
1. Optimization Techniques & Applications by S.S.Rao, New Age International.
2. Optimization for Engineering Design by Kalyanmoy Deb, PHI

REFERENCES:
1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in Operations Research 3rd edition, 2003.
2. H. A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Optimization Techniques by Belegundu & Chandrupatla, Pearson Asia.
4. Optimization Techniques Theory and Practice by M.C. Joshi, K.M. Moudgalya, NarosaPublications

22MT306OE : **CYBER PHYSICAL SYSTEMS (Open Elective)**

M.Tech CNIS/CN/CYS II Year I Sem.	L	T	P	C
	3	0	0	3

Course Objective: To learn about design of cyber-physical systems

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand the core principles behind CPS
2. Identify Security mechanisms of Cyber physical systems
3. Understand Synchronization in Distributed Cyber-Physical Systems

UNIT - I
Symbolic Synthesis for Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of Symbolic Models, Continuous-Time Controllers, Software Tools

UNIT - II
Security of Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches

UNIT - III
Synchronization in Distributed Cyber-Physical Systems: Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time-Triggered Architecture, Related Technology, Advanced Techniques

UNIT - IV
Real-Time Scheduling for Cyber-Physical Systems
Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty

UNIT - V
Model Integration in Cyber-Physical Systems
Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, ForSpec, The Syntax ofCyPhyML, Formalization of Semantics, Formalization of Language Integration.

TEXT BOOKS:
1. Raj Rajkumar, Dionisio De Niz, and Mark Klein, Cyber-Physical Systems, Addison-Wesley Professional.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015

22MT307OE: GRAPH ANALYTICS (Open Elective)

M.Tech CNIS/CN/CYS II Year I Sem.

	L	T	P	C
	3	0	0	3

Course Objectives:
1. To explore the concept of Graphs and related algorithms.
2. To learn new ways to model, store, retrieve and analyze graph-structured data.
3. To be aware of advanced concepts in graph analytic techniques and its applications.

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:
1. Understand Large-scale Graph and its Characteristics
2. Analyze Breadth-First Search Algorithm
3. Illustrate Recent Advances in Scalable Network Generation

UNIT - I
Introduction and Application of Large-scale Graph: Characteristics, Complex Data Sources - SocialNetworks, Simulations, Bioinformatics; Categories- Social, Endorsement, Location, Co-occurrence graphs; Graph Data structures, Parallel, Multicore and Graph Algorithms

UNIT - II Algorithms: Search and Paths
A Work-Efficient Parallel Breadth-First Search Algorithm (or How To Cope With the Nondeterminism of Reducers), Multi-Objective Shortest Paths

UNIT - III Algorithms: Structure
Multicore Algorithms for Graph Connectivity Problems, Distributed Memory Parallel Algorithms for Massive Graphs, Massive-Scale Distributed Triangle Computation and Applications

UNIT - IV Models
Recent Advances in Scalable Network Generation, Computational Models for Cascades in Massive Graphs, Executing Dynamic Data-Graph Computations Deterministically Using Chromatic Scheduling.

UNIT - V Frameworks and Software
Graph Data Science Using Neo4j, A Cloud-Based Approach to Big Graphs, Interactive Graph Analyticsat Scale in Arkouda

TEXT BOOKS:
1. David A. Bader, Massive Graph Analytics, CRC Press

REFERENCES:
1. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods and Applications", (Structural Analysis in the Social Sciences), Cambridge University Press, 1995.
2. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press, 2010.
3. Tanja Falkowski, "Community Analysis in Dynamic Social Networks", (Dissertation), University Magdeburg, 2009.

22MT301PW: DISSERTATION WORK REVIEW – II

M.Tech II Year I Sem.   **L   T   P   C**
                                                                     0   0   12   6

Each student is required to submit a report of first part of project work i.e. about the problem definition, literature review and methodology to be adopted including experiments and tests to be performed on topic of project as per the guidelines decided by the department. The project work is to be evaluated through Presentations and Viva-Voce during the semester end.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

M.TECH IV SEMESTER

FOR
M. TECH COURSE
(Applicable for the batches admitted 2023-2024)

M.Tech IV Semester

Course Code	CORE/ELECTIVE	Course Title	L	T	P	Credits
22MT401PW	PW	Dissertation Work Review - III	0	0	12	6
22MT402PW	PW	Dissertation Viva-Voce	0	0	28	14
Total			**0**	**0**	**40**	**20**

22MT401PW: DISSERTATION WORK REVIEW - III

M.Tech II Year II Sem.   **L   T   P   C**
                                                               0   0   12 6

Each student is required to submit a detailed project report about the work on topic of project as per the guidelines decided by the department. The project work is to be evaluated through Presentations and Viva-Voce during the semester. The candidate shall present/publish one paper in national/international conference/seminar/journal of repute. However candidate may visit research labs/institutions with the due permission of chairperson on recommendation of supervisor concerned.

22MT402PW: DISSERTATION VIVA-VOCE

M.Tech II Year II Sem.   **L   T   P   C**
                                                              0   0   28   14

Each student is required to submit a detailed project report about the work on topic of project as per the guidelines decided by the department. Final evaluation will be done at the end of semester as per the guidelines decided by the department from time to time. The project evaluation is to be evaluated through Presentations and Viva-Voce.

M.Tech CSE - AUDIT COURSES I & II

22MT101AC	Audit-I & II	English for Research Paper Writing
22MT102AC		Disaster Management
22MT103AC		Sanskrit for Technical Knowledge
22MT104AC		Value Education
22MT105AC		Constitution of India
22MT106AC		Pedagogy Studies
22MT107AC		Stress Management by yoga
22MT108AC		Personality Development Through Life Enlightenment Skills

22MT101AC: English for Research Paper Writing

M.Tech CSE

L	T	P	C
2	0	0	0

COURSE OBJECTIVES: The students will try to learn:
1. How to improve the writing skills and level of readability.
2. The methodology that what to write in each section
3.The skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

MODULE – I: PLANNING AND PREPARATION (04)
Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

MODULE – II: ABSTRACT (05)
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing andPlagiarism, Sections of a Paper, Abstracts. Introduction

MODULE – III: DISCUSSION AND CONCLUSIONS (05)
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check. Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills areneeded when writing an Introduction, skills needed when writing a Review of the Literature.

MODULE – IV: DISCUSSION AND CONCLUSIONS (05)
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when
writing the Discussion, skills are needed when writing the Conclusions.

MODULE – V: QUALITY AND TIME MAINTENANCE (05)
Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

TEXT BOOKS:
1. Goldbort R, "Writing for Science", Yale University Press. 2011.
2. Adrian Wallwork, "English for Writing Research Papers", Springer New York Dordrecht Heidelberg
London, 2011.

REFERENCE BOOKS:
1. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM Highman's Book.

22MT102AC: **DISASTER MANAGEMENT**

M.Tech CSE   **L   T   P   C**
                                                                   2   0   0   0

COURSE OBJECTIVES: The students will try to learn:
1. How to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. How critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. The understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. The strengths and weaknesses of disaster management approaches, planning and programming indifferent countries, particularly their home country or the countries they work in.

MODULE – I: INTRODUCTION (04)
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural andManmade Disasters: Difference, Nature, Types and Magnitude.

MODULE – II: REPERCUSSIONS OF DISASTERS AND HAZARDS (05)
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters:Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides andAvalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills,Outbreaks of Disease and Epidemics, War and Conflicts.

MODULE – III: DISASTER PRONE AREAS IN INDIA (05)
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Proneto Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases andEpidemics.

MODULE – IV: DISASTER PREPAREDNESS AND MANAGEMENT (05)
Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental andCommunity Preparedness.

MODULE – V: RISK ASSESSMENT & DISASTER MITIGATION (05)
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster RiskSituation. Techniques Of Risk Assessment, Global Co-Operation in Risk Assessment and Warning,People's Participation in Risk Assessment. Strategies for Survival. Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS:
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies",

New Royal
Book Company.

REFERENCE BOOKS:
1. Sahni, PardeepEt.Al, "Disaster Mitigation Experiences and Reflections", Prentice Hall of India, NewDelhi.
2. Goel S. L. "Disaster Administration and Management Text and Case Studies", Deep & DeepPublication Pvt. Ltd., New Delhi.

WEB REFERENCE:
1. http://nptel.ac.in/courses/105101010/downloads/Lecture37.pdf
VI. E-TEXT BOOKS:
1. Disaster management by Vinod k. Sharma

22MT103AC: SANSKRIT FOR TECHNICAL KNOWLEDGE

M.Tech　CSE　　　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　2　0　0　0

COURSE OBJECTIVES: The students will try to learn:
1. A working knowledge in illustrious Sanskrit, the scientific language in the world.
2. The Sanskrit to improve brain functioning.
3. The Sanskrit language to develop the logic in mathematics, science & other subjects enhancing the memory power.
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

MODULE – I: INTRODUCTION (06)
Alphabets in Sanskrit, Past/Present/Future Tense.

MODULE – II: SENTENCES (04)
Simple Sentences

MODULE – III: ROOTS (04)
Order, Introduction of roots

MODULE – IV: SANSKRIT LITERATURE (04)
Technical information about Sanskrit Literature

MODULE – V: TECHNICAL CONCEPTS (06)
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS:
1. Suresh Soni, "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi.

REFERENCE BOOKS:
1. Dr. Vishwas, "Abhyaspustakam", Samskrita-Bharti Publication, New Delhi

WEB REFERENCES:

http://learnsanskritonline.com/
E-TEXT BOOKS:1. Prathama Deeksha-Vempati Kutumb Shastri, "Teach Yourself Sanskrit", Rashtriya SanskritSanthanam,
New Delhi Publication.

22MT104AC: VALUE EDUCATION

M.Tech CSE   **L   T   P   C**
                                                                                 2   0   0   0

COURSE OBJECTIVES:
The students will try to learn:
1. The value of education and self- development.
2. Imbibe good values in students.
3. The importance of character.

MODULE – I: VALUES AND SELF-DEVELOPMENT (04)
Values and self-development. Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments.

MODULE – II: CULTIVATION OF VALUES (06)
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration.Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

MODULE – III: PERSONALITY AND BEHAVIOR DEVELOPMENT (06)
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity anddiscipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labor.Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Awareof self-destructive habits. Association and Cooperation. Doing best for saving nature.

MODULE – IV: CHARACTER AND COMPETENCE (04)
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science ofreincarnation. Equality, Nonviolence, Humility, Role of Women.

MODULE – V: SELF CONTROL (04)
All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

TEXT BOOKS:
1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

WEB REFERENCES:
1. http://www.best-personal-development-books.com/personal-value-development.html
2. http://nptel.ac.in/courses/109104068/

 E-TEXT BOOKS:1. R.P. Shukla, "Value education and human rights"

22MT105AC: CONSTITUTION OF INDIA

M.Tech CSE   **L   T   P   C**
                                                                         2   0   0   0

COURSE OBJECTIVES: The students will try to learn:
1. The premises informing the twin themes of liberty and freedom from a civil right perspective.
2. The growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitle mentto civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. The role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

MODULE – I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION & PHILOSOPHY OFTHE INDIAN CONSTITUTION (08)
History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working)Philosophy of the Indian Constitution: Preamble, Salient Features.

MODULE – II: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES (04)
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom ofReligion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of StatePolicy, Fundamental Duties.

MODULE – III: ORGANS OF GOVERNANCE (04)
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President,Governor, Council of Minister.Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

MODULE – IV: LOCAL ADMINISTRATION (04)
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role ofElected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat.Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: OrganizationalHierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance ofgrass root democracy.

MODULE – V: ELECTION COMMISSION (04)
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners.State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBCand women.

TEXT BOOKS:
1. Dr. S. N. Busi, "Dr. B. R. Ambedkar framing of Indian Constitution", 1st Edition, 2015.
2. M. P. Jain, "Indian Constitution Law", Lexis Nexis, 7th Edition, 2014.

REFERENCE BOOKS:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.

WEB REFERENCES:
1. http://www.constitution.org/cons/india/p18.html
VI. E-TEXT BOOKS:
1. https://www.india.gov.in/my-government/constitution-india/constitution-india-full-text.

22MT106AC: PEDAGOGY STUDIES

M.Tech CSE   **L   T   P   C**
                                                                                     2   0   0   0

COUSE OBJECTIVES: The students will try to learn:
1. Review existing evidence on the review topic to inform program design and policy making undertaken bythe DFID, other agencies and researchers.
2. The critical evidence gaps to guide the development.

MODULE – I: INTRODUCTION (04)
Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework andterminology. Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions.Overview of methodology and searching.

MODULE – II: THEMATIC OVERVIEW (04)
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms indeveloping countries. Curriculum, Teacher education.

MODULE – III: PEDAGOGICAL PRACTICES (06)
Evidence on the effectiveness of pedagogical practices. Methodology for the in-depth stage: qualityassessment of included studies. How can teacher education (curriculum and practicum) and the schoolcurriculum and guidance materials best support effective pedagogy? Theory of change.Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory andpedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

MODULE – IV: PROFESSIONAL DEVELOPMENT (05)
Professional Development: alignment with classroom practices and follows up Support. Peer support. Supportfrom the head teacher and the community. Curriculum and assessment Barriers to learning: limited resourcesand large class sizes.

MODULE – V: RESEARCH GAPS (05)
Research gaps and future directions, Research design, Contexts, Pedagogy. Teacher education. Curriculum and assessment. Dissemination and research impact.

TEXT BOOKS:
1. Ackers J, Hardman F, "Classroom interaction in Kenyan primary schools", Compare, 31 (2), 245-261.
2. Agrawal M, "Curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies,36 (3): 361-379.

REFERENCE BOOKS:
1. AkyeampongK, "Teacher training in Ghana - does it count?" Multi-site teacher education research project(MUSTER) country report 1. London: DFID.
2. Akyeampong K, Lussier K, Pryor J, Westbrook J, "Improving Teaching and Learning of Basic

Maths andreading in Africa: Does teacher preparation count?" International Journal Educational Development, 33(3): 272–282.

WEB REFERENCE:
1. www.pratham.org/images/resource%20working%20paper%202.pdf.
2. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education Oxford and
Boston: Blackwell

 E-TEXT BOOKS:
1. www.pratham.org/images/resource%20working%20paper%202.pdf

22MT107AC: STRESS MANAGEMENT BY YOGA

M.Tech CSE   **L   T   P   C**
                                                                2   0   0   0

COURSE OBJECTIVES: The students will try to learn:
1. How to achieve overall health of body and mind.
2. How to overcome stress.

MODULE – I: INTRODUCTION (06)
Definitions of Eight parts of yog. (Ashtanga)

MODULE – II: YAM AND NIYAM (04)
Yam and Niyam. Do`s and Don'ts's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha.

MODULE – III: SHAUCHA (05)
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

MODULE – IV: ASAN AND PRANAYAM (05)
Asan and Pranayama. Various yog poses and their benefits for mind & body

MODULE – V: BREATHING TECHNIQUES (04)
Regularization of breathing techniques and its effects-Types of pranayama

TEXT BOOKS:
1. Swami Vivekananda, "Rajayoga or conquering the Internal Nature", Advaita Ashrama (PublicationDepartment), Kolkata.

REFERENCE BOOKS:
1. Janardan Swami, "Yogic Asanas for Group Training-Part-I", Yogabhyasi Mandal, Nagpur.

WEB REFERENCES:
1. https://americanyoga.school/course/anatomy-for-asana/
2. https://www.yogaasanasonline.com/

E-TEXT BOOKS:
1. Todd A. Hoover, M. D. D., Ht, "Stress Management by Yoga"

22MT107AC: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

M.Tech CSE   **L   T   P   C**
                                                                   2   0   0   0

COURSE OBJECTIVES: The students will try to learn:
1. How to achieve the highest goal happily.
2. How a person become with stable mind, pleasing personality and determination.
3. Awaken wisdom in students.

MODULE – I: HOLISTIC DEVELOPMENT (08)
Neetisatakam-Holistic development of personality, Verses- 19,20,21,22 (wisdom), Verses-29,31,32(pride & heroism), Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (dont's),Verses-71,73,75,78 (do's)

MODULE – II: BHAGWAD GEETA (04)
Approach to day-to-day work and duties. Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48. Chapter3- Verses 13, 21, 27, 35.

MODULE – III: BHAGWAD GEETA (04)
Shrimad BhagwadGeeta: Chapter 6-Verses 5, 13, 17, 23, 35, Chapter 18-Verses 45, 46, 48.

MODULE – IV: BASIC KNOWLEDGE (04)
Statements of basic knowledge. Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68. Chapter 12 -Verses 13, 14, 15, 16,17, 18

MODULE – V: ROLE MODEL (04)
Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,Chapter 4-Verses 18, 38,39. Chapter18 – Verses 37,38,63

TEXT BOOKS:
1. Gopinath, "Bhartrihari's Three Satakam (Niti-sringar-vairagya)", Rashtriya Sanskrit Sansthanam, New Delhi.

REFERENCE BOOKS:
Swami Swarupananda, "Srimad Bhagavad Gita", Advaita Ashram (Publication Department), Kolkata.

WEB REFERENCES:
http://openlearningworld.com/section_personality_development.html

E-TEXT BOOKS:
http://persmin.gov.in/otraining/UNDPProject/undp_UNITs/Personality%20Dev%20N%20DLM.pdf

Program Educational Objectives (PEO's):

PEO 1: To Master the Fundamental Content in the Functional Domains of Management to solve the analytical problem through Research and Development.

PEO 2: To make Decisions Effectively with Quantitative and Behavioral Tools of Business Analysis by utilizing the resources effectively and efficiently.

PEO 3: To Demonstrate effective communication to penetrate the Economical and Social Connectivity.

PEO4: To nurture the critical thinking analytical skills to make strategic and tactical business decisions

Programme Outcomes (PO's) :

PO1: To use the Principles of management wherever necessary to get work done by other.

PO2: To understand the business Process and apply domain content from accounting, economics, finance, marketing, management, computer information systems, and business law.

PO3: To Perform a critical thinking analysis to make strategic business decisions by understanding the Organizational Dynamism and Interpersonal relations.

PO4: To develop management and leadership competencies and behaviors, including teamwork, communication, drive for success, hard work, discipline and creativity

PO5: To prepare students for acquiring Business Communication and improve their employability skills.

Institutes Under

TKR EDUCATIONAL SOCIETY

Teegala Krishna Reddy Engineering College(TKEM)

TKR College of Engineering and Technology(TKRC)

TKR Institute of Management and Science(TKRB)

TKR College of Pharmacy(TKRP)