ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2018-19 onwards

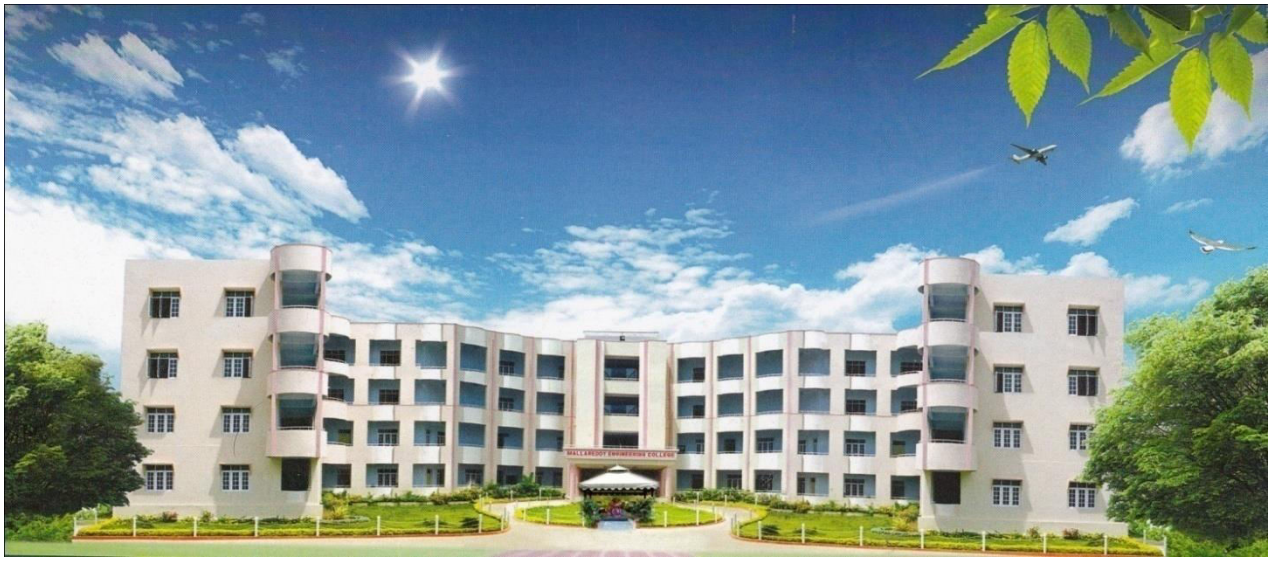
M. Tech. Two Year Degree Course

(MR18 Regulations)

in

Computer Science and Engineering (CSE)

Department of Computer Science and Engineering



MALLA REDDY ENGINEERING COLLEGE (Autonomous)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH Hyderabad, Recognized under 2(f) &12 (B) of UGC Act 1956, Accredited by NAAC with 'A' Grade (II Cycle)

Maisammaguda, Dhulapally (Post Via Kompally), Secunderabad-500 100

www.mrec.ac.in E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR18 ACADEMIC REGULATIONS (CBCS)
For M. Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of M. Tech. (Regular) programme admitted from the Academic Year ***2018-19*** and onwards.

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

INSTITUTION VISION

A Culture of excellence , the hallmark of MREC as world class education center to impart Technical Knowledge in an ambience of humanity, wisdom, intellect, creativity with ground breaking discovery, in order to nurture the students to become Globally competent committed professionals with high discipline, compassion and ethical values.

INSTITUTION MISSION

Commitment to progress in mining new knowledge by adopting cutting edge technology to promote academic growth by offering state of art Under graduate and Post graduate programmes based on well-versed perceptions of Global areas of specialization to serve the Nation with Advanced Technical knowledge.

DEPARTMENT VISION

The Computer Science and Engineering Department attempts for excellence in developing, implementing, and imparting wisdom in computer science and engineering discipline through extensive educational programs, Research and Development in collaboration with industries and government agencies, scholarly publications and professional activities to the community, the state, and the nation.

DEPARTMENT MISSION

- Provide a learning environment to enhance problem-solving skills, innovations, leadership characteristics, team-spirit and ethical responsibilities.
- Provide quality education to meet the needs of Profession and Society.
- To enhance the entrepreneurship skills by establishing Industry Institute Interaction program
- Provide exposure to latest tools and technologies in the area of engineering and technology.
- To promote research-based activities in the emerging technological domains.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To make the Post Graduates expertise in Computing Profession, solving engineering problems by understanding the core knowledge and research activities.

PEO2: To have sufficient breadth and depth of understanding regarding the professional development throughout their career.

PEO3: To demonstrate their creativity in all the engineering domains using analysis, strategic design thinking, planning and implementation.

PEO4: To make the graduates communicate, recognize and incorporate societal needs in their professional endeavors, and practice about legal and ethical responsibilities.

PROGRAMMEOUTCOMES(POs)

PO1: An ability to independently carry out research /investigation and development work to solve practical problems

PO2: An ability to write and present a substantial technical report/document

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4: Ability to learn by oneself by being dynamic and engage in life-long learning.

PO5: Ability to construct optimal solutions for various problems by creative thinking with awareness of public health safety, culture, society and environmental aspects.

PO6: An ability to devise, develop innovative applications to meet the customized needs of industry and society.

1.0 **Post-Graduate Degree Programmes in Engineering & Technology (PGP in E&T) Malla Reddy Engineering College (Autonomous) (MREC-A)** offers **Two** Year (**Four** Semesters) full-time **Master of Technology (M. Tech.)** Post Graduate programmes, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.

2.0 **Eligibility for Admissions:**

2.1 Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the Affiliating University from time to time. Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the Government of Telangana or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

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

3.0 **M.Tech. Programme (PGP in E&T) Structure and Award of Degree:**

3.1 **The M.Tech. Programmes in E & T are of Semester pattern, with Four Semesters consisting of Two academic years, each academic year having Two Semesters (First/ Odd and Second/ Even Semesters). Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.**

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

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

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 'Seminar', or 'Project', or "Technical Paper Writing" 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) / tutorials (T) courses
- One credit for two hours/ week/semester for laboratory/ practical (P) courses

Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations, and identified mandatory/audit courses, if any, will not carry 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 Institution has followed in general, the guidelines issued by AICTE/UGC.

S.No	Broad Course Classification	Course Group/ Category	Course Description
1	**Core Courses (CC)**	**PC- Professional Core**	**Includes subjects related to the parent discipline/ department/ branch of Engineering**
		Project Work	**M.Tech Project / Dissertation**
		Seminar	**Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering**
2	**Elective Courses (EC)**	**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	Audit Courses (AC)	Audit Courses	These courses are non-credit courses without evaluation.
Total number of Credits – 68 credits			

3.4.4 Courses of Study:

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

S.No.	Dept.	Specialization Code	Specialization	Intake
1	CE	11	Structural Engineering (SE)	24
2	EEE	24	Electrical Power Systems (EPS)	24

3	ME	31	Thermal Engineering (TE)	18
4		33	Machine Design (MD)	24
5	CSE	51	Computer Science and Engineering (CSE)	18

Any other programme as approved by the University from time to time.

4 Course Registration:

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him 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 for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'SUBSEQUENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the 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 will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5 Attendance Requirements:

The programmes are offered on a module basis with each subject/course being considered as a module.

5.1 Attendance in all classes (Theory/Laboratories/Seminar/Project Work) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the attendance of mid-term examination / Laboratory and the days of attendance in sports, games, NCC and NSS activities for appearing for the Semester End Examination (SEE). A student shall not be permitted to appear for the Semester End Examinations (SEE) if his attendance is less than 75%.

5.2 Condonation of shortage of attendance in each subject up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic

Committee (CAC).

5.3 Shortage of Attendance below 65% in each subject shall not be condoned.

5.4 Students whose shortage of attendance is not condoned in any subject are not eligible to write their Semester End Examination of that subject and their registration shall stand cancelled.

5.5 A stipulated fee prescribed by the CAC, shall be payable towards Condonation for shortage of attendance.

5.6 A Candidate shall put in a minimum required attendance in atleast three (3) theory subjects in I Year I semester for promoting to I Year II Semester. In order to qualify for the award of the M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

5.7 A student shall not be promoted to the next semester unless the student satisfies the attendance requirement of the present Semester, as applicable. The student may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, the student shall not be eligible for readmission into the same class.

6 Academic Requirements:

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item 5.

6.1 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together. In case the candidate does not secure the minimum academic requirement in any subject he has to reappear for the Semester End Examination in that subject. A candidate shall be given one chance to re-register for the subject if the internal marks secured by the candidate are less than 50% and failed in that subject. This is allowed for a maximum of three subjects and should register within two weeks of commencement of that semester class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, the student's Continuous Internal Evaluation (CIE) marks and Semester End Examination (SEE) marks obtained in the previous attempt stands cancelled.

6.2 If the student secured 'F' grade in any subject he/she can apply for recounting / revaluation by paying prescribed fee. If the student is not satisfied after the results declaration of recounting / revaluation he/she can apply for challenge valuation with the prescribed fee. College appoints a faculty member; student can bring another faculty member who taught the respective subject at least once (proof should be

provided). The faculty member should be from any autonomous college affiliated to JNTUH or JNTUH constituent colleges.

7 Evaluation - Distribution and Weightage of Marks:

The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned) for 100 marks for Theory, Practicals, Seminar, Drawing / Design, Project, and Minor Courses etc.,. The Theory / Practical courses are evaluated with two components. 1. Continuous Internal Evaluation (CIE), 2. Semester End Examination (SEE). The distribution shall be 30 marks for CIE and 70 marks for SEE decided in the Academic Council.

7.1 Theory Courses :

7.1.1 Continuous Internal Evaluation (CIE):

CIE shall be conducted for all courses of PG Programmes twice in a semester (2 Midterm examinations) with the help of objective, subjective evaluation and regular assignments. Each midterm examination consists of objective, subjective paper and one assignment. The objective and subjective test shall be evaluated to 40 % and 50 % for duration of 120 mins and the assignment evaluated for 10 % of the allocated internal marks.

The division of marks for CIE is as given below:

Mid – Term Examination				
Part	**Type of Questions**	**No. of questions**	**Marks per question**	**Total**
Part A	Multiple-choice questions	10	1	10
	Fill-in the blanks	10	1	10
	Sub-Total			20
Part B	Compulsory questions	5	2	10
Part C	Choice questions [3 out of 5]	3	5	15
			Mid-Term Exam Total	45
			Assignment	05
			Grand Total	50

*The CIE will be conducted for 50 marks and scaled to 30 marks.

The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. First Assignment should be submitted before the

conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. The weightage for the midterm examination shall be given as 70% of the best performing midterm examination and 30% of the other performing midterm examination. The student shall appear for both midterm examinations. In case for any specific reason the student appears only for one midterm examination, only 70% weightage of that examination shall be considered.

7.1.2 Semester End Examination (SEE):

Semester End Examination (SEE) shall be conducted for all courses of PG Programmes at the end of the Semester. Duration of the examination is 3 hours. The paper setting and evaluation of all courses carried out by external examiners. The examiners will be selected by the chief controller of examination/Principal.

Semester End Examination - PG				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Compulsory Questions	5	4	20
Part - B	Choice Questions: For each question there will be an 'either or choice', which means that there will be two questions from each module and the student should answer either of the two questions.	5	10	50
Total				70

7.2 Practical Courses:

7.2.1 Continuous Internal Evaluation (CIE):

CIE marks shall be awarded with a distribution of 40% for day - to-day performance and timely submission of lab records, 40% for internal lab exam (best out of two exams) and 20% for viva-voce.The CIE will be conducted for 50 marks and scaled to 30 marks.

7.2.2 Semester End Examination (SEE):

SEE marks shall be awarded with a distribution of 20% for design/procedure/schematic diagram of the given experiment, 40% for conduction of experiment, 20% for results and 20% for viva - voce. For conducting SEE (with duration of 3 hours), one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations/Principal of the college. The external examiner should be selected from outside the college among the autonomous / reputed institutions from a

panel of three examiners submitted by the concerned Head of the Department.

7.3 Seminar:

There shall be a seminar presentation during III semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Department PG Coordinator, Supervisor and two other senior faculty members of the department. For Seminar there will be only internal evaluation. Out of the total allocated marks distribution of marks shall be 30% for the report, 50% for presentation and 20% for the queries. A candidate has to secure a minimum of 50% of marks to be declared successful. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examinations. There shall be no semester end examinations for the seminar.

7.4 Evaluation of Project/ Dissertation Work :

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

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

7.4.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

7.4.3 After satisfying 7.4.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and action plan of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

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

7.4.5 A candidate shall submit his project status report in two stages at least with a gap of 2 months between them.

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

Note: *The project supervisor/guide has to ensure that the student has to publish*

a minimum of one paper related to the thesis in a National/International Conference/Journal.

7.4.7 For the final approval by the PRC, the soft copy of the thesis should be submitted for ANTI-PLAGIARISM check for the quality and the plagiarism report should be included in the final thesis. If the similarity information is less than 24%, then only thesis will be accepted for submission.

7.4.8 Three copies of the Project Thesis certified by the supervisor, HOD shall be submitted to the Chief Controller of Examinations /Principal for project evaluation (Viva Voce).

7.4.9 For Project/Dissertation phase-I in III Semester is internal evaluation only. The evaluation marks shall be carried out with a distribution of 70% evaluated by the PRC and 30% by Supervisor. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work and Literature Survey in the same domain. A candidate has to secure a minimum of 50% of the allocated marks to be declared successful for Project work part-I. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examination.

7.4.10 For Project/Dissertation phase-II in IV Semester is an external evaluation. The evaluation shall be carried out by the External examiner appointed by the Chief Controller of Examinations/Principal. For this, the Head of the Department shall submit a panel of 3 examiners, eminent in that field, with the help of the supervisor/guide concerned. The distribution of marks followed by Quality of the work (Plagiarism), Paper publication, nature of the work (Tools & software used and Innovative ideas), presentation and Viva-Voce - each for 20% of allocated marks. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

7.4.11 If the student fails to fulfill as specified in 7.4.10, based on the recommendation of the external examiner, the student will reappear for the Viva-Voce examination with the revised thesis only after three months. In the reappeared examination also, fails to fulfill, the student will not be eligible for the award of the degree.

7.4.12 The Head of the Department shall coordinate and make necessary arrangements for the conduct of Project Viva-Voce examination.

7.5 Non-Credit Courses:

7.5.1 Audit Courses:

Audit Courses offered in any Semester, a '**Satisfactory Participation Certificate**' shall be issued to the student from the concerned authorities, only

after securing ≥ 65% attendance in such a course. No marks or Letter Grade shall be allotted for these activities.

8 Examinations and Assessment - The Grading System:

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

8.2 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 (Class Intervals)	**Grade Points**	**Letter Grade (UGC Guidelines)**
≥ 90%,	10	O (Outstanding)
(≥ 80%, <90%)	9	A+ (Excellent)
(≥ 70%, < 80%)	8	A (Very Good)
(≥ 60%, < 70%)	7	B+ (Good)
(≥ 55%, < 60%)	6	B (Average)
(≥ 50%, < 55%)	5	C (Pass)
(< 50%)	0	F(Fail)
Absent	0	Ab

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

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

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

8.6 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'.

8.7 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) is computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

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

8.8 The Student passes the Subject/ Course only when he gets GP ≥ 5(C Grade or above).

8.9 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:

$$\mathbf{SGPA} = \left\{\sum_{i=1}^{N} C_i G_i\right\} / \left\{\sum_{i=1}^{N} C_i\right\} \ldots \textbf{ For each Semester}$$

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

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

$$\mathbf{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\} \textbf{ … for all S semesters registered}$$

(i.e., upto and inclusive of S semesters, S ≥ 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' from the 1stSemester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP)corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade points	Credit Points

Course 1	3	A	8	3X8=24
Course 2	3	O	10	3X10=30
Course 3	3	B	6	3X6=18
Course 4	3	A+	9	3X9=27
Course 5	2	B+	7	2X7=14
Course 6	2	A	8	2X8=16
Course 7	2	B	6	2X6=12
	18			141
SGPA = 141/18 = 7.83				

Illustration of calculation of CGPA

Semester	**Credits**	**SGPA**	**Credits X SGPA**
Semester I	18	7	18 X 7 = 126
Semester II	18	6	18 X 6 = 108
Semester III	16	6.5	16 X 6.5 = 104
Semester IV	16	7.25	16 X 7.25 = 116
	68		454
CGPA = 454/68 = 6.67			

8.11 For Calculations listed in Item 8.6 – 8.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations.

9. Award of Degree and Class:

9.1 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 ≥ 5.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 Award of Class

After a student has satisfied 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	≥ 8.00
First Class	≥ 6.50 and < 8.00
Second Class	≥ 5.00 and < 6.50

9.3 A student with final CGPA (at the end of the PGP) < 5.00 will not be eligible for the Award of Degree.

9.4 Students will be eligible for the award of '**Gold Medal**', if he/she passes all the subjects /courses in first appearance within the first academic years (or four sequential semesters) from the date of commencement of first year first semester and should have secure
CGPA ≥ 8.00 at the end of four sequential semesters.

10 Withholding of Results:

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

11 Transitory Regulations:

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of two earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject;

otherwise, he has to identify an equivalent subject as per MR18 Academic Regulations.

12. Student Transfers:

12.1 There shall be no Branch/Specialization transfers after the completion of Admission Process.

12.2 The students seeking transfer to MALLA REDDY ENGINEERING COLLEGE (Autonomous)- MREC(A) from various other Universities/ institutions have to pass the failed subjects which are equivalent to the subjects of MREC(A), and also pass the subjects of MREC(A) which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of MREC (A), the students have to study those subjects in MREC (A) in spite of the fact that those subjects are repeated.

12.3 The transfer students from other Universities / Institutions to MREC (A) who are on rolls will be provided one chance to write internal examinations in the failed subjects and/or subjects not studied as per the clearance letter issued by the JNTUH.

13. General:

13.1 **Credit**: A module 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.

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

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

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

13.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Committee headed by the Principal is final.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

Sl.No.	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	**Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the SEE)**	**Expulsion from the examination hall and cancellation of the performance in that course 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 course 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 that course of the examination (theory or practical) in which the candidate is appearing.**	**Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate shall be cancelled.**
3	**Impersonates any other candidate in connection with**	**The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and**

	the examination.	**forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course.**
6	**Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations**	**In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the**

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

		programme 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. 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.**	**Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.**
11	**Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.**	**Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that SEE.**
12	**If any malpractice is detected which is not covered in the**	

	above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.	

Note: ***The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.***

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

MALLA REDDY ENGINEERING COLLEGE (Autonomous)
COMPUTER SCIENCE AND ENGINEERING (CSE)

Approved Course Structure for PG - M.Tech. (Computer Science and Engineering) Programme

I YEAR I SEMESTER

S. No	Category	Course Code	Name of the Course	Contact Hours/Week			Credits
				L	T	P	
1	PCC	85101	Advanced Data Structures	3	-	-	3
2	PCC	85102	Machine Learning	3	-	-	3
3	PEC-I	85113	Data Science	3	-	-	3
		85114	Introduction to Intelligent Systems				
		85115	Advanced Data Mining				
4	PEC-II	85116	Cyber Forensics	3	-	-	3
		85117	Software Architecture and Design Patterns				
		85118	Mobile Cloud				
5	HSMC	80H18	Research Methodology and IPR	2	-	-	2
6	PCC	85103	Advanced Data Structures Lab	-	-	4	2
7	PCC	85104	Machine Learning using Python Lab	-	-	4	2
8	AC	80A04	English for Research Paper Writing	2	-	-	-
Total				**16**	**-**	**8**	**18**
Contact Hours: 24							

I YEAR II SEMESTER

S. No	Category	Course Code	Name of the Course	Contact Hours/Week			Credits
				L	T	P	
1	PCC	85105	Web Services	3	-	-	3
2	PCC	85106	Soft Computing	3	-	-	3
3	PCC	85107	Advanced Databases	2	-	-	2
4	PEC-III	85119	Big Data Analytics	3	-	-	3
		85120	Software Process and Project Management				
		85121	Network Programming				
5	PEC-IV	85122	Software Quality Assurance and Testing	3	-	-	3
		85123	Computer Vision				
		85124	Storage Area Networks				
6	PCC	85108	Web Services Lab	-	-	4	2
7	PCC	85109	Soft Computing Lab	-	-	4	2
8	AC	80A05	Value Education	2	-	-	-
Total				**16**	**-**	**8**	**18**
Contact Hours: 24							

II YEAR I SEMESTER

S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	PEC-V	85125	Parallel and Distributed Algorithms	3	-	-	3
		85126	Wireless Sensor Networks				
		85127	Information Retrieval Techniques				
2	OEC	85128	Business Analytics	3	-	-	3
		80B20	Advanced Optimization Techniques				
		85129	Introduction to Block chain Technology				
3	PROJ	85110	Seminar	-	-	4	2
4	PROJ	85111	Project / Dissertation Phase - I	-	-	16	8
Total				**6**	**-**	**20**	**16**
Contact Hours: 26							

II YEAR II SEMESTER

S. No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
1	PROJ	85112	Project / Dissertation Phase - II	-	-	32	16
Total				**-**	**-**	**32**	**16**
Contact Hours: 32							

- PCC - Professional Core Course
- PEC - Professional Elective Course
- OEC - Open Elective Course
- PROJ - Project

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85101	ADVANCED DATA STRUCTURES	L	T	P
Credits: 3		3	-	-

Prerequisites: Data structures and Object Oriented Programming

Course Objectives:

This course provides the students to learn and understand the theoretical and practical solutions for the fundamental design, analysis, and implementation of basic data structures like Stacks, Queues, Heaps, Searching, Sorting, Trees and Graphs, Significance of algorithms in the computer field, various aspects of algorithm development.

Module I: Introduction to Algorithms and Representations [10 Periods]

Algorithms Notations: Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation, Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures and Repre sentations: Linear List ADT, Array representation, Linked representation, Vector representation, Singly Linked Lists: Insertion-Deletion-Search operations, Doubly Linked Lists: Insertion-Deletion operations, Circular lists, Representation of 1D and 2D arrays, sparse matrices and their representation.

Module II: Linear Data Structures [9 Periods]

Stack and Queue: Stack and Queue ADTs, array and linked list representations, infix to Postfix Conversion using Stack, Implementation of recursion, Circular Queue: Insertion-Deletion, Dequeue ADT, Array and Linked List Representations, Priority Queue ADT.

Heap: Implementation using Heaps, Insertion into Max Heap, Deletion from Max Heap, java.util package: Array List, Linked List, Vector classes, Stacks and Queues, Iterator.

Module III: Searching and Sorting [9 Periods]

A: Searching

Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util- HashMap, HashSet, Hash table.

B: Sorting

Bubble, Insertion, Quick, Merge, Heap, Radix, Comparison of sorting methods.

Module IV: Non-Linear Data Structures-I [10 Periods]

Trees: Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non-recursive traversals, Threaded binary trees.

Graphs: Graphs terminology, Graph ADT, Representations, Graph Traversals/Search Methods-DFS and BFS, Java code for Graph Traversals, Applications of Graphs-

Minimum Cost Spanning Tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

Module V: Non-Linear Data Structures-II **[10 Periods]**

Search Trees: Binary search tree, Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees, Definition and examples.

B-Trees: Definition, insertion and searching operations, Trees in java.util- Tree Set, Tree Map Classes, Tries (examples only), Comparison of Search trees. Text compression, Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS

1. S. Sahni, "**Data structures Algorithms and Applications in Java"**, Universities Press.
2. Clifford A. Shaffer, "**Data structures and Algorithm analysis in Java"**, 3rd Edition, Courier Corporation.

REFERENCES

1. Deitel and Deitel, "**Java for Programmers**", Pearson Education.
2. R. Lafore, "**Data structures and Algorithms in Java"**, Pearson Education.

E-RESOURCES

1. https://www.cise.ufl.edu/~sahni/cop3530/presentations.htm
2. https://books.google.co.in/books?id=KK3DAgAAQBAJ&printsec=frontcover&dq=data+structures+and+algorithm+analysis+in+java
3. https://www.cse.msu.edu/~cse802/Papers/sammon.pdf
4. http://nptel.ac.in/courses/106102064/1/

Course Outcomes:

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

1. **Understand** the fundamental concepts related to basic data structures.
2. **Design** and Analyze the implementation of linear data structures.
3. **Apply** the concept related to different searching and sorting techniques.
4. **Learn** and implement the concept of non linear data structures.
5. **Acquire** knowledge regarding search trees and applications.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3		2	3		
CO2	2		3		3	2
CO3	2		3	2		
CO4	2		3	2		
CO5	2		3	2		3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			M.Tech I Sem
Code: 85102	MACHINE LEARNING	L	T	P
Credits: 3		3	-	-

Prerequisites: Artificial Intelligence

Course Objectives:

This course provides the students to learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes, design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances, explore supervised and unsupervised learning paradigms of machine learning and to investigate Deep learning technique and various feature extraction strategies.

Module I: Supervised Learning (Regression/Classification) [10 Periods]

Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

Module II: Unsupervised Learning [9 Periods]

Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

Module III: Machine Learning algorithms [9 Periods]

A: Machine Learning Algorithms

Evaluating Machine Learning algorithms and Model Selection.

B: Ensemble Methods.

Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random forests)

Module IV: Sparse Models [9 Periods]

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.

Module V: Learning techniques [11 Periods]

Scalable Machine Learning (Online and Distributed Learning), A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference - Recent trends in various learning techniques of machine learning and classification methods for IOT applications, various models for IOT applications.

TEXT BOOKS

1. Tom M. Mitchell, "**Machine Learning**", MGH, 1st Edition, 2013.

2. Stephen Marsland, "**Machine Learning: An Algorithmic Perspective**", Chapman and Hall / CRC, 2nd Edition, 2014.

REFERENCES

1. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman," The Elements of Statistical Learning", Springer 2009 (freely available online)
3. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.

E-RESOURCES

1. http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
2. http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
3. www.fxpal.com/publications/a-genetic-algorithm-for-video-segmentation-and-summarization.pdf
4. http://nptel.ac.in/courses/106106139/
5. http://nptel.ac.in/courses/106105152/

Course Outcomes:

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

1. **Identify** the way of extracting features that can be used for a particular machine learning approach in various IOT
2. **Explore** unsupervised learning techniques
3. **Compare** and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
4. **Analyze** various machine learning approaches and paradigm mathematically.
5. **Investigate** various learning approaches.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	2			2	
CO2	3		2			
CO3	2		2			
CO4	2			2		1
CO5	2					

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85113	DATA SCIENCE (Professional Elective – I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Probability and Statistics

Course Objectives:

This course will make the students to provide with the knowledge and expertise to become a proficient data scientist, demonstrate an understanding of statistics and machine learning concepts that are vital for data science, produce Python code to statistically analyze a dataset and critically evaluate data visualizations based on their design and use for communicating stories from data.

Module I: Fundamentals of Data science [9 Periods]

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Module II: Maintenance of Data [10 Periods]

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

Module III: Data analysis [9 Periods]

A: Basics of Data Analysis

Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT.

B: Algorithms

Basic machine learning algorithms, Linear regression, SVM, Naive Bayes**.**

Module IV: Data visualization [10 Periods]

Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Module V:**Data Science-Applications [10 Periods]**

Applications of Data Science, Technologies for visualisation, Bokeh (Python), Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

TEXT BOOKS

1. Alberto Boschetti, Luca Massaron, "**Python Data Science Essentials**", Packt Publications, 2nd Edition, 2016.
2. Davy Cielen, Arno Meysman, Mohamed Ali, "**Introducing Data Science: Big Data, Machine Learning, and more, using Python tools**", Manning Publications; First Edition, 2016.

REFERENCES

1. Cathy O'Neil and Rachel Schutt. "**Doing Data Science, Straight Talk From The Frontline**". O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman." **Mining of Massive Datasets**" . v2.1,Cambridge University Press.

E-RESOURCES

1. https://www.analyticsvidhya.com/blog/2016/02/complete-tutorial-learn-data-science-scratch/
2. https://www.edureka.co/blog/learn-python-for-data-science/

Course Outcomes:

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

1. **Understand** the fundamentals of data science.
2. **Explain** how data is collected, managed and stored for data science.
3. **Analyze** the data by applying various techniques.
4. **Explore** data visualization techniques.
5. **Investigate** several applications in data science.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2					
CO2		2		3		
CO3	2		2			
CO4					2	
CO5	3					2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85114	INTRODUCTION TO INTELLIGENT SYSTEMS (Professional Elective - I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Artificial Intelligence, Data Structures

Course Objectives:

The aim of the course is to introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behaviour including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

Module I: Fundamentals of Intelligent systems-I [9 Periods]

Biological foundations to intelligent systems I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks.

Module II: Foundations to Intelligent systems-II 10 Periods]

Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.

Module III: Search Techniques [9 Periods]

A: Search Techniques-I

Search Methods Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search.

B: Search Techniques-II

Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search,Optimization and search such as stochastic annealing and genetic algorithm.

Module IV: Knowledge Representation [10 Periods]

Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.

Module V: Learning and evolutionary algorithms [10 Periods]

Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning. Recent trends in Fuzzy logic, Knowledge Representation.

TEXT BOOKS

1. James M. Keller, Derong Liu, David B. Fogel, "**Fundamentals of Computational Intelligence: Neural Networks, Fuzzy Systems, and Evolutionary Computation**", John Wiley & Sons, 13-Jul-2016.
2. Elaine Rich, "**Artificial Intelligence**", Tata McGraw-Hill Education, 2004.

REFERENCES

1. Luger G.F. and Stubblefield W.A. (2008)," **Artificial Intelligence: Structures and strategies for Complex Problem Solving**". Addison Wesley, 6th edition.
2. Russell S. and Norvig P. (2009). "**Artificial Intelligence: A Modern Approach**". Prentice-Hall, 3rd edition.

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1. https://books.google.co.in/books?id=c1fzgQj5lhkC&printsec=frontcover&dq=intelligent+systems&hl=en&sa=X&ved=0ahUKEwilrbLv0LncAhUKaI8KHVO2Cd8Q6AEIKDAA#v=onepage&q=intelligent%20systems&f=false
2. http://www.nptelvideos.in/2012/11/intelligent-systems-and-control.html
3. https://freevideolectures.com/course/2348/intelligent-systems-and-control

Course Outcomes:

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

1. **Demonstrate** knowledge of the fundamental principles of intelligent systems.
2. **Understand** the algorithms and its applications
3. **Analyze** and compare the relative merits of a variety of AI problem solving techniques. and indexes.
4. **Explore** various knowledge representation techniques**.**
5. **Learn and apply** the evolutionary and learning algorithms**.**

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			3			2
CO2		2				
CO3	2		2	2	2	
CO4	3		2			
CO5	2		2			2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85115	ADVANCED DATA MINING (Professional Elective - I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Data Mining

Course Objectives:
This course aims the students to develop the abilities of critical analysis to data mining systems and applications, to implement practical and theoretical understanding of the technologies for data mining and to understand the strengths and limitations of various data mining models.

Module I: Data mining Overview and Advanced Pattern Mining [9 Periods]
Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis , outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

Module II: Advance Classification [10 Periods]
Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzzy set approach.

Module III: Advance Clustering [10 Periods]
A: Density - based methods
DBSCAN, OPTICS, DENCLUE
B: Grid-Based methods
STING, CLIQUE; Exception – maximization algorithm; clustering High- Dimensional Data; Clustering Graph and Network Data.

Module IV: Web and Text Mining [9 Periods]
Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering

Module V: Temporal and Spatial Data Mining [10 Periods]
Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

TEXT BOOKS

1. Jiawei Hang Micheline Kamber, Jian pei, Morgan Kaufmannn, "**Data Mining Concepts and Techniques**.
2. Arun K Pujari, "**Data Mining Techniques**", Universities Press.

REFERENCES

1. Pang-Ning Tan, Vipin kumar, "**Introduction to Data Mining**", Michael Steinbach, Pearson.
2. T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, "**Data Mining Principles & Applications**", Elsevier.

E-RESOURCES

1. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf.
2. https://books.google.co.in/books?id=O6F9iwsqZQwC&printsec=frontcover&dq=temporal+and+spatial+data+mining+%2Bpdf&hl=en&sa=X&ved=0ahUKEwimv9qA1LncAhWIr48KHTIfAK0Q6AEITzAF#v=onepage&q&f=false
3. http://nptel.ac.in/courses/106106093/35
4. https://freevideolectures.com/course/2280/database-design/35

Course Outcomes

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

1. **Understand** the fundamentals in data mining.
2. **Explore** various classification techniques.
3. **Implement** clustering techniques and to apply it on various datasets.
4. **Investigate** several web and text mining techniques.
5. **Describe** temporal and spatial data mining process.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			3			2
CO2		2				
CO3	2		2	2	2	
CO4	3		2			
CO5	2		2			2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85116	CYBER FORENSICS (Professional Elective - II)	L	T	P
Credits: 3		3	-	-

Prerequisites: Cryptography and Network Security

Course Objectives:
The objective of this course is to make the students to study about the security issues in network layer and transport layer, be exposed to security issues of the application layer, learn computer forensics, be familiar with forensics tools and to acquire knowledge in analyzing and validating forensics data.

Module I: Network Layer Security &Transport Layer Security [9 periods]
IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec .Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

Module II: E-Mail Security & Firewalls [9 periods]
PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

Module III: Introduction To Computer Forensics [11 periods]
A: Computer Forensics
Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation.
B: Incident Response
Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

Module IV: Evidence Collection And Forensics Tools [10 periods]
Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

Module V: Analysis And Validation [9 periods]
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

TEXT BOOKS:

1. Man Young Rhee, "**Internet Security: Cryptographic Principles, Algorithms and Protocols**", Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, "**Computer Forensics and Investigations**", Cengage Learning, India Edition, 2008.

REFERENCES

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
2. Richard E.Smith, "Internet Cryptography", 3 rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

E-RESOURCES

1. http://ebook.eqbal.ac.ir/Security/Forensics/Guide%20to%20Computer%20Forensics%20and%20Investigations.pdf.
2. http://cybersd.com/sec2/lect/Chapter%207.pdf
3. http://nptel.ac.in/courses/106105031/

Course Outcomes

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

1. **Discuss** the security issues network layer and transport layer
2. **Apply** security principles in the application layer.
3. **Explain** computer forensics.
4. **Use** forensics tools
5. **Analyze** and validate forensics data

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2					2
CO2	2					3
CO3				3	2	2
CO4	3		2	2		
CO5	3		2	3		3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85117	SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (Professional Elective-II)	L	T	P
Credits: 3		3	-	-

Prerequisites: Software Engineering

Course Objectives:
This course makes the students to learn the different types of Software Architectures and analyze various architectures such as Comprehensive and Quantitative approaches to implement the different types of Design patterns such as Creational, Structural and Behavioral patterns.

Module I: Introduction to Software Architecture [10 Periods]
Envisioning Architecture: Architecture Business Cycle, Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.
Creating Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, Designing Architecture, Documenting Software Architectures, Reconstructing Software Architecture.

Module II: Analyzing Architectures [9 Periods]
Comprehensive Approach: Architecture Evaluation, Architecture design decision making ATAM.
Quantitative Approach: Decision Making Context, Basics of CBAM, Implementing CBAM, Case Study.

Module III: Moving from one to many system [9 Periods]
A: Software Product Lines
Overview, Software Product Lines, Scoping, Building Systems from Off-the-Shelf Components.
B: Architecture
What Makes Software Product Lines Difficult?, Software Architecture in Future.

Module IV: Design Pattern Catalog-1 [10 Periods]
Patterns: Pattern Description, Organizing catalogs, role in solving design problems, selection and usage.
Creational and Structural Patterns: Abstract factory builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight, Proxy.

Module V: Design Pattern Catalog-2 [10 Periods]
Behavioral Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor. Case Studies: A-7E–A case

study in utilizing architectural structures.

World Wide Web: A Case study in interoperability, Air Traffic Control-Case Study in designing for high availability, Celsius Tech – Case Study in product line development.

TEXT BOOKS

1. Len Bass, Paul Clements & Rick Kazman, "**Software Architecture in Practice**", Third Edition, Pearson Education, 2013.
2. Erich Gamma, "**Design Patterns**", Pearson Education, 1995.

REFERENCES

1. Luke Hohmann, "**Beyond Software Architecture**", Addison Wesley, 2003.
2. Partha Kuchana, "**Software Architecture Design Patterns in Java**", Auerbach Publications; 1st Edition, 2004.

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1. http://disi.unal.edu.co/dacursci/sistemasycomputacion/docs/SWEBOK/Addison%20Wesley%20-%20Software%20Architecture%20In%20Practice%202nd%20Edition.pdf
2. https://goo.gl/XHf4Skr
3. http://handbookofsoftwarearchitecture.com
4. http://technav.ieee.org/tag/1570/software-architecture
5. http://www.springer.com/in/book/9783319658308#otherversion=9783319658315
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-YWRHK2WM4hGzyP-7P1EGjmLQteaTTfT9e5x3lNfo1dkNFKA2TH8BFRA34WT93f7vOClg
7. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-YWRHHjhOkwn-Nw1F1n-B5L9QQwwLxs5C_RQWWA-I82gWvUowtpyPjqm26fq2PVA1VaOg

Course Outcomes:

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

1. **Analyze** the Computer architecture and different processor architectures
2. **Explore** and analyze the architectures
3. **Illustrate** organization and operation of current generation parallel computer systems, including multiprocessor and multi-core systems
4. **Understand** patterns descriptions and solving problems and use of creational and structural patterns.
5. **Apply** design patterns, behavioral patterns and World Wide Web to case studies.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3					
CO2	2					
CO3			2			
CO4	2		3			
CO5	2			3		3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85118	MOBILE CLOUD (Professional Elective-II)	L	T	P
Credits: 3		3	-	-

Prerequisites: Cloud Computing

Course Objectives:
This course enables the students to learn the basic fundamentals in mobile cloud, architecture, classification and associated cooperation approaches, study the utilization of resources in mobile clouds, study about the maintenance, simulate and develop mobile cloud applications.

Module I: Fundamentals of Mobile cloud **[10 Periods]**
Mobile Connectivity Evolution: From Single to Multiple Air Interface Devices, Network Evolution: The Need for Advanced Architectures.

Module II: Approaches **[9 Periods]**
Mobile Clouds: An Introduction, Cooperation and Cognition in Mobile Clouds, Mobile Cloud Classification and Associated Cooperation Approaches.

Module III: Utilization of resources **[9 Periods]**
A: Resource sharing
Sharing Device Resources in Mobile Clouds.
B: Enabling technologies
Wireless Communication Technologies, Building Mobile Clouds.

Module IV: Maintenance of Mobile Cloud **[10 Periods]**
Mobile Cloud Formation and Maintenance, Cooperative Principles by Nature, Social Mobile Clouds, Green Mobile Clouds: Making Mobile Devices More Energy Efficient.

Module V: Mobile apps **[10 Periods]**
Mobile Clouds Applications, Future Developments of Mobile Clouds.

TEXT BOOKS
1. Frank H. P. Fitzek, Marcos D. Katz, "**Mobile Clouds: Exploiting Distributed Resources in Wireless, Mobile and Social Networks**", Wiley Publications, ISBN: 978-0-470- 97389-9, Jan 2014.
2. Dijiang Huang Huijun Wu, "**Mobile Cloud Computing: Foundations and Service Models**", Morgan Kaufmann, First Edition, 2018.

REFERENCES

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, and Michael Morgano, **Android for Programmers: An App-Driven Approach**, Prentice Hall, November 3, 2011.

2. Richard Rodger, "**Beginning Mobile Application Development in the Cloud**", Wiley, 2011.

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1. https://leseprobe.buch.de/images-adb/8d/01/8d01a05a-1854-4e56-ae54-ce8fcd5c6237.pdf
2. https://onlinelibrary.wiley.com/doi/book/10.1002/9781118801338
3. http://nptel.ac.in/courses/106105167/31

Course Outcomes:

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

1. **Understand** the fundamentals of Mobile cloud.
2. **Analyze** classification and associated cooperation approaches.
3. **Investigate** several technologies and implement the way of sharing resources.
4. **Explore** the formation of mobile cloud and know about its maintenance.
5. **Develop** Mobile applications.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2					3
CO2	2					2
CO3			3	2		
CO4				2	2	
CO5	2				2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech. I Semester		
Code: 80H18	RESEARCH METHODOLOGY AND IPR	L	T	P
Credits: 2		2	-	-

PREREQUISITES: Nil

Course Objectives: The objective of the course is to make students familiar with the basics of research methodology and various types of Intellectual Properties, IPR legislations and policies.

Module I: Research Problem **[6 Periods]**

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

Module II: Technical Writing and Research Proposal **[7 Periods]**

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Module III: Intellectual Property Rights **[6 Periods]**

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

Module IV: Patent Rights **[6 Periods]**

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

Module V: Case Studies **[7 Periods]**

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.

References:

1. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw –Hill, New Delhi
2. M.Ashok Kumar and Mohd.Iqbal Ali: “Intellectual Property Right” Serials Pub.
3. Carlos M.Correa- ‘‘Intellectual property rights , The WTO and Developing countries”-Zed books
4. Law relating to patents, trademarks, copyright designs, Wadehra, B.L. & 2 ed.

Universal Law Publishing 2000.
5. C.R.Kothari, "Research Methodology" New Age International Publishers, Fourth edition, 2018.
6. Donald Cooper & Pamela Schindler, "Business Research Methods", TMGH, 9th edition.
7. Alan Bryman & Emma Bell, "Business Research Methods", Oxford University Press.

E Resources:

1. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
2. https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm7_e.htm
3. http://nptel.ac.in/courses/110999906/
4. http://nptel.ac.in/courses/109105112/

Course Outcomes:

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

1. Comprehend the concepts of research methodology and its concepts.
2. Realize the concepts of literature review and developing a research proposal.
3. Understand the basic concepts of Intellectual property rights.
4. Understand the types of patents and their procedures.
5. Recognize the recent developments in IPR administration.

CO-PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Program Outcomes (POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3			3	3
CO2	3	3			3	3
CO3	3	3			3	3
CO4	3	3			3	3
CO5	3	3			3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			M.Tech I Sem
Code: 85103	ADVANCED DATA STRUCTURES LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: Computer Programming

Course Objectives:

This objective of the course is to provide the students to implement the applications using Linear Data Structures, Non-linear Data Structures, Searching and Sorting techniques, and deploy the shortest path algorithms.

List of experiments:

1. Write Java programs to implement the following (using arrays and linked lists):
   a) List ADT, b) Stack ADT, c) Queue ADT
2. Write a Java program to read an infix expression and convert into postfix using stacks ADT.
3. Write a Java program to implement circular queue ADT using an array
4. Write a Java program using stack and queue to test the given string is a palindrome or not.
5. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT, b) Queue ADT, c) priority queue ADT
6. Write Java programs to implement the deque (double ended queue) ADT using
   a) Array, b) Singly linked list, c) Doubly linked list.
7. Write a Java program to perform the following operations in binary search tree: a) Creation, b) Insert a key, c) Search for a key, c) Delete an element.
8. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
9. Write a Java program to implement the following:
   a) Dijkstra's algorithm for Single source shortest path problem.
   b) Kruskal's algorithm to generate minimum cost spanning tree.
   c) KMP algorithm for Pattern matching.
10. Write Java programs for the implementation of BFS and DFS for a given graph.
11. Write Java programs for implementing the following sorting methods:
    a) Bubble, b) Insertion, c) Quick, d) Merge, e) Heap, f) Radix, g) Binary Tree
12. Write a Java program to perform the following operations in B-tree: a) Insertion b) Searching.

REFERENCES

1. S.Sahni, "**Data Structures Algorithms and Applications in Java**", Universities Press.
2. Clifford Shaffer, "**Data structures and Algorithm analysis in Java**", 3rd Edition, Courier Corporation.

Course Outcomes:

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

1. **Design** and analyze the implementation of linear data structures and applications.

2. **Apply** the concepts related to different searching techniques.
3. **Implement** the sorting techniques.
4. **Learn** and implement the concept of non linear data structures and applications.
5. **Study** and deploy the shortest path algorithms.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		2			
CO2	2	3	2			
CO3	2		2	3		
CO4					2	3
CO5			2	3		1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech I Sem		
Code: 85104	MACHINE LEARNING USING PYTHON LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: Computer Programming

Course Objectives:

This objective of the course is to provide the students to implement the various supervised and unsupervised learning techniques along with the clustering and classification methods.

List of experiments:

1. Implement simple linear regression.
2. Implement the multivariate linear regression.
3. Implement simple logistic regression and multivariate logistics regression.
4. Implement decision trees.
5. Implement a classification algorithm.
6. Implement random forests algorithm
7. Implement K-means with example
8. Implement KNN algorithms with example.
9. Implement SVM on any applicable datasets.
10. Implement neural networks
11. Implement PCA.
12. Implement anomaly detection and recommendation.

REFERENCES

1. Willi Richert, Luis Pedro Coelho," Building Machine learning with python", Packt Publishing, 2013.

Course Outcomes:

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

1. **Study** of various statistical methods.
2. **Deploy** classification techniques for a real time data set.
3. **Implement** clustering algorithms for any data set.
4. **Explore** the dimensionality reduction procedures.
5. **Examine** the anomaly detection methods.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	2		3			
CO2	2		3			
CO3	1	1	1		2	2
CO4		1	1			1
CO5	1		1		2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			M.Tech I Sem
Code: 80A04	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P
Credits: Nil		2	-	-

Prerequisites: Nil

Course Objectives: The objective of the course is to provide the knowledge on structuring paragraphs, paraphrasing and preparation of research documents related to abstract, literature review, methods and results.

Module I **[6 Periods]**
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Module II **[7 Periods]**
Clarifying Who Did What, Highlighting Your Findings, Hedging and criticising, paraphrasing and plagiarism, sections of a paper, abstracts. Introduction.

Module III **[6 Periods]**
Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Module IV **[6 Periods]**
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Module V **[7 Periods]**
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. Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

References:

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

Course Outcomes:
At the end of the course, students will be able to
1. **Structure** the sentences and paragraphs.
2. **Elaborate** the various sections of research papers.

3. **Explore** the check list in research documents.
4. **Apply** the key skills to coin the title, abstract, introduction and literature review.
5. **Inspect** the skills required for preparing experimental results and discussions.

CO- PO Mapping						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1		2			1	
CO2		2		1		
CO3		2				2
CO4		2			1	
CO5		2			1	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85105	WEB SERVICES	L	T	P
Credits: 3		3	-	-

Prerequisites: Java Programming

Course Objectives:
This course enables the students to learn, understand the basic concepts of web services, implementation model, study the architecture and its standards, illustrate the concepts of XML documents, SOAP for registering and discovering services and discuss SOA services and its security.

Module I: Distributed Computing and Web Services [9 Periods]
Introduction Evolution and Emergence of Web Services, Evolution of distributed computing. Core distributed computing technologies–client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).
Web Services: Introduction, Basic operational model of Web services, Tools and technologies enabling web services, Benefits and Challenges of using web Services.

Module II: Web Service Architecture and WSDL [10 Periods]
Web Services: Web Service Architecture –Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, and basic steps of implementing web services, Describing Web Services.
WSDL: WSDL introduction, non functional service description, WSDL 1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

Module III: XML and SOAP [10 Periods]
A: XML
Brief overview of XML–XML Document structure, XML name spaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation.
B: Simple Object Access Protocol (SOAP)
Introduction, Inter-application communication and wire protocols, SOAP as a Messaging protocol, Structure of a SOAP message, SOAP Envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, Enterprise Service Bus, SOA Development Life Cycle, SOAP HTTP binding, Communication model, Error handling.

Module IV: Services and UDDI [10 Periods]

Registering and Discovering Services: Registering and Discovering Services: Role of Service Registries, Service discovery, Universal Description, Discovery and Integration.

UDDI: UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

Module V: Web Services and Service Management [9 Periods]

Web Services: SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, Semantic interoperability problem, Role of Meta Data, Service Meta Data.

Service Management: Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frame works, Web service management, Richer schema languages, WS-Meta data Exchange.

TEXT BOOKS

1. Michael P. Papazoglou, "**Web Services & SOA Principles and Technology**", Second Edition.
2. S. Chatterjee, J. Webber, "**Developing Enterprise Web Services**", Pearson Education.

REFERENCES

1. S. Graham and others, "**Building web Services with Java**", Pearson Education,2nd Edition.
2. Sunil Mathew, Michael Stevens, Sameer Tyagi, James McGovern, "**Java web Services Architecture**", Elsevier Science, Morgan Kaufmann Publishers, 2005.

E-RESOURCES

1. https://www.abebooks.com/Web-Services-SOA-Principles-Technology-2nd/12698437230/bd
2. http://notes.specworld.in/web-services-notes-pdf-ws-notes-pdf/
3. http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=4629386
4. http://dl.acm.org/citation.cfm?id=1088876
5. https://www.coursera.org/learn/python-network-data/lecture/0CpCx/video-service-oriented-architectures
6. http://nptel.ac.in/courses/105102015/11

Course Outcomes:

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

1. **Understand** the fundamental theoretical concept related to web services such as Client server, CORBA, JAVA RMI, Microsoft DCOM, MOM and Service oriented architectures.

2. **Develop** a web application architectures characteristics and applying WSDL concept to develop a web application.
3. **Design** and develop a web application using SOAP protocol, XML and Inter communication protocols.
4. **Apply** the concepts for UDDI registries, addressing and notifications.
5. **Analyze** a secure web application using network security mechanisms like, .NET, J2EE and Richer schema languages.

COS	**CO- PO Mapping** **(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		2			
CO2					3	2
CO3			1		1	
CO4					1	
CO5				3	1	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85106	SOFT COMPUTING	L	T	P
Credits: 3		3	-	-

Pre-Requisites Basic knowledge of mathematics

Course Objectives:
This course makes the students to learn soft computing concepts and techniques, foster their abilities in designing appropriate technique for a given scenario, implement soft computing based solutions for real-world problems, give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms and to provide student a hand-on experience on MATLAB to implement various strategies.

Module I: Introduction to Soft Computing and Neural Networks [8 Periods]
Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Module II: Fuzzy Logic [8 Periods]
Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Module III: Neural Networks and Advanced Learning Techniques [10 Periods]
A: Neural Networks
Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks:

B: Reinforcement Learning
Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks.

Module IV: Genetic Algorithms [7 Periods]
Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning, Machine Learning Approach to Knowledge Acquisition.

Module V: Matlab/Python Lib & Deep Learning [15 Periods]
Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.
Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

TEXT BOOKS

1. S.N.Sivanandam & S.N.Deepa, "**PRINCIPLES OF SOFT COMPUTING**", John Wiley & Sons, 2007.
2. N. P. Padhy, S. P. Simon, **"Soft Computing:** With MATLAB Programming"

Oxford University Press, 2015.

REFERENCES

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

E-RESOURCES

1. https://bookboon.com/en/introduction-to-soft-computing-ebook
2. http://www.vssut.ac.in/lecture_notes/lecture1423723637.pdf
3. https://onlinecourses.nptel.ac.in/noc18_cs13/preview

Course Outcomes:

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

1. **Identify** and describe soft computing techniques and their roles in building intelligent machines
2. **Implement** fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. **Employ** genetic algorithms to combinatorial optimization problems.
4. **Evaluate** and compare solutions by various soft computing approaches for a given problem.
5. **Investigate** recent trends in deep learning.

COS	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	1	1	1	1	1
CO2	1		1		2	
CO3	2		2		3	
CO4	2	1	2		3	1
CO5	1	1	1		2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85107	ADVANCED DATABASES	L	T	P
Credits: 2		2	-	-

Prerequisites: Database Management Systems

Course Objectives:
This course enables the students to learn the modeling and design of databases, acquire knowledge on parallel and distributed databases and its applications, Study the usage and applications of Object Oriented database, and understand the principles of intelligent databases, usage of advanced data models, learn emerging databases such as XML, Cloud and Big Data and acquire inquisitive attitude towards research topics in databases.

Module I: Parallel And Distributed Databases [10 Periods]
Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed query processing –case studies.

Module II : Object And Object Relational Databases [9 Periods]
Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

Module III: Intelligent Databases [10 Periods]
A: Active Databases
Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules- Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL
B: Spatial Databases
Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

Module IV: Advanced Data Models [10 Periods]
Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

Module V: Emerging Technologies **[9 Periods]**

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages-Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases-Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models-Query Languages- Introduction to Big Data-Storage-Analysis.

TEXT BOOKS

1. Thakare Jadhav Kedar**,** "**Advance Database Management**", **Technical Publications, 2008.**
2. S. K. Singh, "**Database Systems:** Concepts, Design and Applications", Pearson Education India, 2011.

REFERENCES

1. R. Elmasri, S.B. Navathe, "**Fundamentals of Database Systems**", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "**Database Systems, A Practical Approach to Design, Implementation and Management**", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "**Database System Concepts**", Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan, **"An Introduction to Database Systems**", Eighth Edition, Pearson Education, 2006.
5. Raghu Ramakrishnan, Johannes Gehrke, "**Database Management Systems**", McGraw Hill, Third Edition 2004.

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1. https://books.google.co.in/books?id=qNCmBRufKBAC&dq=Parallel+Systems-+Distributed+Systems+%E2%80%93+Parallel+Databases:+I/O+Parallelism+%E2%80%93+Inter+and+Intra+Query+Parallelism&hl=en&sa=X&ved=0ahUKEwj83K-18bncAhUMLY8KHX2qCI8Q6AEIKDAA.
2. http://www.inf.ed.ac.uk/teaching/courses/adbs/slides/adbs.pdf
3. https://books.google.co.in/books?id=qNCmBRufKBAC&dq=Parallel+Systems-+Distributed+Systems+%E2%80%93+Parallel+Databases:+I/O+Parallelism+%E2%80%93+Inter+and+Intra+Query+Parallelism&hl=en&sa=X&ved=0ahUKEwj83K-18bncAhUMLY8KHX2qCI8Q6AEIKDAA.
4. http://nptel.ac.in/courses/106104135/

Course Outcomes:

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

1. **Select** the appropriate high performance database like parallel and distributed database.
2. **Aware** of representing the model and real world data using object oriented database.
3. **Design** a semantic based database to meaningful data access
4. **Embed** the rule set in the database to implement intelligent databases

5. **Represent** the data using XML database for better interoperability and to solve the issues related to the data storage and retrieval.

COs	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1					
CO2	1		1		2	
CO3	1		1		1	
CO4	1		2		3	2
CO5	1		2		3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85119	BIG DATA ANALYTICS (Professional Elective – III)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Data Mining

Course Objectives:
This course provides the students to understand big data for business intelligence, learn business case studies for big data analytics, understand nosql big data management and to perform map-reduce analytics using Hadoop and related Tools.

Module I: Introduction to Big data **[10 Periods]**
What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Module II: NoSQL **[10 Periods]**
Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer peer replication, sharding and replication, consistency, relaxing consistency,
version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

Module III: HDFS **[10 Periods]**
A: Hadoop
Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts,
B: I/O
Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

Module IV: Mapreduce **[10 Periods]**
MapReduce workflows, Module tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

Module V: Data Models **[8 Periods]**
Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration. Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

TEXT BOOKS

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "**Big Data, Big Analytics: Emerging"**
2. Tom White, "**Hadoop: The Definitive Guide**" 3rd Edition, O'reilly.

REFERENCES

1. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
6. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
7. Alan Gates, "Programming Pig", O'Reilley, 2011.

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1. http://newton.uam.mx/xgeorge/uea/Lab_Prog_O_O/materiales_auxiliares/Big_Java_4th_Ed.pdf
2. http://www.isical.ac.in/~acmsc/WBDA2015/slides/hg/Oreilly.Hadoop.The.Definitive.Guide.3rd.Edition.Jan.2012.pdf
3. https://static.googleusercontent.com/media/research.google.com/en//archive/mapreduce-osdi04.pdf
4. http://www.comp.nus.edu.sg/~ooibc/mapreduce-survey.pdf
5. http://freevideolectures.com/Course/3613/Big-Data-and-Hadoop/18

Course Outcomes:

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

1. **Develop** simple applications using concepts like stack, queues and classes.
2. **Analyze** file systems such as GFS and HDFS.
3. **Design** applications by applying Map reduce concepts.
4. **Build** up programs by making use of I/O.
5. **Explore** and inspect the big data using programming tools like Pig and Hive.

COS	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1			
CO2	1		1	2	2	1
CO3	1		2	2	2	1
CO4	1	1				1
CO5	1		1		2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85120	SOFTWARE PROCESS AND PROJECT MANAGEMENT (Professional Elective – III)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Software Engineering

Course Objectives:
This course provides the students to understand the importance of process models, learn about project management, phases in software process, make them to know about the different organization structures and study about several project management tools.

Module I: Software Process Models **[10 Periods]**
Software Process Maturity: Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.
Process Reference Models: Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

Module II: Project Management **[10 Periods]**
Software Project Management Renaissance: Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.
Life-Cycle Phases and Process artifacts: Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

Module III: Workflows and Planning **[10 Periods]**
A: Workflows
Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.
B: Process Planning
Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

Module IV: Project Organization **[10 Periods]**
Project Organizations: Line-of- business organizations, project organizations, evolution of organizations, process automation.
Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

Module V: Case Study **[8 Periods]**

CCPDS-R Case Study and Future Software Project Management Practices: Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Watts S. Humphrey, "**Managing the Software Process**", Pearson Education.
2. Walker Royce, "**Software Project Management**", Pearson Education.

REFERENCES:

1. Robert Wysocki ,"**Effective Project Management: Traditional, Agile, Extreme**", Sixth edition, Wiley India, reprint 2011.
2. Watts S. Humphrey, "**An Introduction to the Team Software Process**", Pearson Education, 2000
3. James R. Persse ,"**Process Improvement essentials**" , O'Reilly, 2006
4. Bob Hughes & Mike Cotterell ,"**Software Project Management**", fourth edition, TMH, 2006
5. Andrew Stellman & Jennifer Greene,"**Applied Software Project Management**", O'Reilly, 2006.
6. Scott Berkun ,"**The Art of Project Management**" , SPD, O'Reilly, 2011.
7. Andrew Stellman & Jennifer Greene ,"**Applied Software Project Management**", SPD, O'Reilly, reprint 2011.
8. Jim Highsmith ,"**Agile Project Management**", Pearson education, 2004.

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1. http://moosehead.cis.umassd.edu/cis365/reading/Defining-the-Software-Process.pdf.
2. www.philadelphia.edu.jo/.../pdf/file3840fd5c6eab47be9d52c06c2e974886.pdf
3. http://nptel.ac.in/courses/106101061/29.

Course Outcomes:

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

1. **Describe** and determine the purpose and importance of project management
2. **Analyze** the project management methods.
3. **Design** checkpoints and planning process.
4. **Compare** and **differentiate** organization structures and project structures.
5. **Implement** a project to manage project schedule, expenses and resources with the application of suitable project management tools.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	2	2		
CO2	1	1	1	2	2	2
CO3	1	1	1	2	2	2
CO4	1		1	2	2	2
CO5	1	1	1	2	2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85121	NETWORK PROGRAMMING	L	T	P
Credits: 3	(Professional Elective – III)	3	-	-

Prerequisites: Operating Systems

Course Objectives:
This course makes the students to learn and understand the concepts of Linux and C programming, to study the Shell programming, file concepts and directory management in network programming for inter process communication using pipes, FIFOs, signals, semaphores, message queues and explain socket programming to design the client/server environment, to examine network Programming for performing TCP, and UDP connections.

Module I: Introduction to Linux and Shell Programming [9 Periods]
Introduction to Linux: Linux Utilities, File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities, Backup utilities. Bourne again shell (bash).
Shell Programming: Introduction, Pipes and Redirection, Running a Shell Script, Shell as a Programming Language, Shell meta characters, File name substitution, Shell variables, Command substitution, Shell commands, Environment, Quoting, Test command, Control & Arithmetic structures, Shell script examples. Review of C Concepts: Arrays, Strings, Pointers, Function pointers, Structures, Unions.

Module II: Files and Directory Management [9 Periods]
Files: Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink.
Directory Management: File and Directory management, Directory contents, Scanning Directories, Directory file APIs. Process concept, Kernel support for process, Process Attributes, Control and Creation, Replacing a process image, Waiting for process, Process termination, Zombie process, Orphan process.

Module III: Signals and IPC [10 Periods]
A: Signals
Introduction to Signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.
B: Interprocess Communication (IPC)
Introduction, Pipes creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes), differences

between unnamed and named pipes, popen and pclose library functions, Message queues, semaphores and shared memory. Message Queues, Kernel support, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

Module IV: Shared Memory and Sockets [10 Periods]

Shared Memory: Shared Memory, Kernel support, UNIX system V APIs for Shared memory, Client/Server example.

Sockets: Network IPC, Introduction to Unix Sockets, IPC over a network, Client-Server model, Address formats, Socket system calls for Connection Oriented, Communication, Socket system calls for Connectionless, Communication, Example, Client/Server Programs, Single Server-Client connection, Multiple simultaneous clients, Socket options, Set sock opt, get sock opt, fcntl.

Module V: Network Programming and Remote Method Invocation [10 Periods]

Network Programming: Network Programming in Java, Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs to handle one and multiple connections (using multithreaded server).

RMI: Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS

1. T. Chan, "**Unix System Programming using C++**", PHI.
2. Sumitabha Das, "**Unix Concepts and Applications**", TMH, 4th Edition.

REFERENCES

1. W.R.Stevens, "**Advanced Programming in the UNIX environment**", Pearson Education, 2nd Edition.
2. W. R. Stevens, Bill Fenner, A. M. Rudoff, "**Unix Network Programming The Sockets Networking API**", Pearson Education, Vol.-I.

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1. https://openlibrary.org/books/OL24607430M/UNIX_system_programming_using_C
   https://zimslifeintcs.files.wordpress.com/2011/12/sumitabahdas.pdf
2. http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=414638
3. http://www.springer.com/in/book/9781447152538
4. http://nptel.ac.in/courses/117106113/

Course Outcomes:

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

1. **Learn** the basic set of commands and utilities in Linux/UNIX systems.
2. **Originate** file and directories in UNIX programming.
3. **Devise** the signals, Inter process communication systems.
4. **Make use of** socket to implement client/server environment.
5. **Explore** the Network Programming and RMI in detail.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1			
CO2	1		1			
CO3			1		1	
CO4			1		2	1
CO5	1		1	1	2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85122	SOFTWARE QUALITY ASSURANCE AND TESTING (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Prerequisites: Software Engineering

Course Objectives:
This course provides the students to learn, describe and determine the purpose, importance of Software Quality Assurance (SQA) Framework and its Standards, state the metrics, measurements and methodology in quality assurance, study the Standards, metrics, methodologies, establishing policies, SDLC process, techniques and software testing tools like automated testing tools, Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, J Meter testing, assessing, project management in Client / Server and web applications by providing security.

Module I: SQA Framework and Quality Standards [10 Periods]
SQA Framework and Standards: What is Quality in SQA, Components, SQA Plan, Steps to develop and implement a SQA Plan.
Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma and 6 Sigma.

Module II: Metrics and Methodologies [10 Periods]
SQA Metrics and Measurement Software Quality Metrics: Product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs
Software Quality Metrics methodology: Establish Quality Requirements, Identify Software quality metrics, Implement software quality metrics, Analyze software metrics results, Validate Software Quality Metrics, Software Quality Indicators, Fundamentals in Measurement theory.

Module III: Software Testing Methodologies [9 Periods]
A: Software Testing Strategy and Environment
Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing.
B: Software Testing Methodology
Defect shard to find, verification and validation, functional and structural testing, work bench concept, eight considerations in developing testing methodologies, testing tactics checklist.

Module IV: Techniques and Tools [10 Periods]
Software Testing Techniques: Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured Walkthroughs, Thread Testing, Performance Testing, White-Box Testing.
Software Testing Tools: Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Silk test,

Java Testing Tools, J Meter, J MODULE and Cactus.

MODULE V: Testing Process and Applications [9 Periods]

Testing Process: Eleven Step Testing Process: Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report test results, testing software installation, Test software changes, Evaluate Test Effectiveness.

Testing Specialized Systems and Applications: Testing Client/Server and Web applications, testing off the Shelf Components, Testing Security, Testing a data Warehouse.

TEXT BOOKS

1. William E. Perry, "**Effective Methods for Software Testing**", Wiley India, 2nd Edition, 2006.
2. Mordechai Ben-Menachem Garry S. Mar Liss, "**Software Quality**", Thomson Learning Publication, 1997.
3. K.V.K.K. Prasad, "**Software Testing Tools**", Dream Tech Publishers, Third Edition 2009.

REFERENCES

1. Bories Beizer, "**Software Testing Techniques**", 2nd Edition, Dream Tech Press.
2. G.Gord on Schulmeyer, James I. Mc Manus, "**Hand book of Software Quality Assurance**", International Thomson Computer Press, 2nd Edition.

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2. http://www.softwaretestinggenius.com/download/EMFST.pdf
3. https://www.adturtle.biz/LP_TA/index.cfm?T=436379
4. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=32
5. http://dl.acm.org/citation.cfm?id=2597724
6. http://nptel.ac.in/courses/106101061/18
7. http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKB j79VQPP0_ZQHLqcOopPDoaFWhZybCrPg_joTbBU8ZpGA

Course Outcomes:

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

1. **Define** state-of-the-art, and apply their findings to framework for software testing and quality assurance.
2. **Analyze** different approaches to software testing and quality assurance, metrics measurement, and select optimal solutions for different situations and projects.
3. **Demonstrate** software testing & quality assurance and apply that knowledge in SDLC, functional, structural testing, other testing methods their future research & its practice.
4. **Evaluate** different testing tools and techniques
5. **Justify** the testing process and its applications in quality assurance for client/server, web applications with security.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	1				
CO2	1		1		3	1
CO3	1		2		2	
CO4	1		2	1	2	1
CO5	1		2	2	2	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85123	COMPUTER VISION	L	T	P
Credits: 3	(Professional Elective-IV)	3	-	-

Pre-Requisites: Linear algebra, Vector calculus, Data Structures and Programming.

Course Objectives:

This course makes the students to understand both the theoretical and practical aspects of computing with images, study the foundation of image formation, measurement, and analysis, recognize the geometric relationships between 2D images and the 3D world and know the principles of state-of-the-art deep neural networks.

Module I: Introduction to Image Analysis [9 periods]

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis

Module II: Processing of Image [9 periods]

Edge detection, Edge detection performance, Hough transform, corner detection

Module III: Introduction to Segmentation and Filtering [9 periods]

A: Segmentation- Active contours, Split and Merge, Mean shift and Mode finding, Normalized cuts, Graph cuts and Energy based methods, Morphological filtering

B: Fourier transform- Fourier Transform pairs, Two-dimensional Fourier transforms, Weiner filtering, Application: Sharpening, blur and noise removal.

Module IV: Introduction to Feature Extraction [9 periods]

Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing

Module V: Pattern Analysis [12 periods]

Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semisupervised Classifiers: Bayes, KNN, ANN models;

Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods. Recent trends in Activity Recognition, computational photography, Biometrics

TEXT BOOKS

1. Martin A. Fischler, Oscar Firschein, "Readings in Computer vision: Issues, Problems, Principles, and Paradigms", Morgan Kaufmann,1987.
2. William K. Pratt, "Introduction to Digital Image Processing", CRC Press, 2013

REFERENCES

1. Richard Szeliski,"Computer Vision: Algorithms and Applications", Springer London, 05-Nov-2010.
2. S. Nagabhushana," Computer Vision and Image Processing", New Age International, 2005.

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1. http://web.itu.edu.tr/hulyayalcin/Signal_Processing_Books/2010_Szeliski_Computer Vision.pdf
2. http://www.cse.iitm.ac.in/~vplab/courses/CV_DIP/PDF/LECT_EDGE_DET.pdf
3. http://nptel.ac.in/courses/112101098/25

Course Outcomes:

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

1. **Understand** the concepts in Image Analysis.
2. **Explore** the processing techniques in Image.
3. **Investigate** several techniques in segmentation and filtering.
4. **Comprehend** and apply feature extraction techniques.
5. **Developed** the practical skills necessary to build computer vision applications

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		1	1		
CO2	1		1		1	
CO3	1		2		2	3
CO4	1	1	2	1	3	1
CO5	1		2	2	3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 85124	STORAGE AREA NETWORKS	L	T	P
Credits: 3	(Professional Elective-IV)	3	-	-

Prerequisites: Computer Networks

Course Objectives:

This course makes to study and understand storage area networks, fundamentals of data creation, storage, architecture, components, data protection, storage methods, information availability, and monitoring and management of data centers. Further, policies, backup recovery techniques, storage virtualization, security management are discussed in detail using case studies and concern applications.

Module I: Introduction to Information Storage and Management [9 Periods]

Introduction: Review data creation, Amount of data being created and understand the value of data to a business, Challenges in data storage and data management.

Data Centre Infrastructure: Solutions available for data storage, Core elements of a data center infrastructure, Role of each element in supporting business activities.

Module II: Storage Systems Architecture [10 Periods]

Physical Components: Hardware and Software Components of Host Environment, Key protocols and concepts used by each component, Physical and Logical components of connectivity environment, Physical components of a Disk Drive and function, Logical Constructs of a Physical Disk, Access characteristics, and Performance Implications.

Data Protection: Different RAID levels and their suitability for different application environments: RAID 0, 1, 3, 4, 5, RAID 0+1, 1+0, 6, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system.

Module III: Introduction to Networked Storage [9 Periods]

A: Evolution of networked storage

Architecture, Components, Topologies of FC-SAN, NAS, and IPSAN, Benefits of different networked storage options.

B: Storage Methods

Need for long-term archiving solutions, CAS fulfills the need, Different networked storage options for different application environments.

Module IV :Information Availability, Monitoring & Managing Datacenter [10 Periods]

Business Continuity and Disaster Recovery: Planned/unplanned outages and impact of downtime, Impact of downtime, Business Continuity Vs Disaster Recovery, RTO and RPO, Identify single points of failure in storage infrastructure, Solutions to mitigate failures.

Backup/Recovery Topologies: Replication technologies, Business Continuity, Remote Replication technologies, Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor different components in a storage infrastructure, Key management tasks in a data center.

Module V: Storage Virtualization and Case Studies [10 Periods]

Securing Storage and Storage Virtualization: Information security, Critical security attributes for information systems, Storage security domains, List and analyzes common threats in each domain, Virtualization technologies, Block-level and File level virtualization technologies and processes.

Case Studies: Technologies described in course are reinforced with EMC examples of actual solutions. Realistic case studies enable participant to design most appropriate solution for given sets of criteria.

TEXT BOOKS

1. G. Somasundaram, Alok Shrivastava, "**Information Storage and Managemen**t", Wiley, 2010.
2. Meeta Gupta, "**Storage Area Network Fundamentals**", Pearson Education Limited, 2002.

REFERENCES

1. Robert Spalding, "**Storage Networks: The Complete References**", Tata McGraw Hill, 2003.
2. Marc Farley, "**Building Storage Networks**", Tata McGraw Hill, 2001.

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2. https://books.google.co.in/books?isbn=158705065X
3. https://books.google.co.in/books?isbn=158705065X
4. http://ndl.iitkgp.ac.in/document/uT7ohQ3kN8pP8OwteoNZ9LnctkAcqauU6wfPkbQYZW6tW3GrMe8ltD4hlD7okN1Oxl_e6yKh2APw_XypNAE6qg
5. http://ieeexplore.ieee.org/document/5386862/?reload=true
6. http://www.lazysystemadmin.com/2010/04/storage-area-network-san-video-tutorial.html

Course Outcomes:

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

1. **Identify** and describe the functions to build data center networking for switch network.
2. **Describe** different components of a storage infrastructure, types of RAID implementations and data protection.
3. **Evolution of** Network storage and storage methods for application environments.
4. **Demonstrate** Information Availability, Monitoring & Managing Datacenter and list solutions for failures and recovery
5. **Apply** the Secure storage virtualization and case studies and applications.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1			
CO2	1		1		1	
CO3	1				1	
CO4	1	1	1	1	2	2
CO5	2	2	1	1	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			M.Tech II Sem
Code: 85108	WEB SERVICES LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: Java Programming

Software Requirements: JDK

Course Objectives:

This objective of the course is to provide the students to implement WSDL Services, web based applications with request and response operations and applications using database connectivity.

List of Programs:

1. Write a program to implement WSDL Service (Hello Service, WSDL File)
2. Write a program the service provider can implement a single getprice(), static bind() and getproduct operation.
3. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and, pwd4 respectively. Write a servlet for doing the following.
   a. Create a Cookie and add these four user id's and passwords to this Cookie.
   b. Read the user id and passwords entered in the Login form and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display " You are not an authenticated user ".
4. Write a program to implement the operation can receive request and will return a response in One-Way operation.
5. Write a program to implement the operation can receive request and will return a response in Request – Response operations
6. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius (using HTTP Post Protocol).
7. Write a program to implement business UDDI Registry entry.
8. Write a program to implement a Web based service consumer.
9. Write a program to implement a Windows application based web service consumer.
10. Install a database (Mysql or Oracle) and explore the basic commands.
11. Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form). Practice 'JDBC' connectivity. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
12. Beans Assignment – Automobile the Traffic Light.

REFERENCES

1. Michael P. Papazoglou, "**Web Services & SOA Principles and Technology**", Second Edition

Course Outcomes:

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

1. Design and implement web services for single and multiuser applications.
2. Develop the responsive services using HTTP.
3. Implement the web based services for customer operations.
4. Deploy the web services with the database connectivity.
5. Apply the web based concepts in real time applications.

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COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1			1		1	
CO2			1		2	1
CO3	1		1	2	1	2
CO4		1			1	
CO5			1			3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			M.Tech II Sem
Code: 85109	SOFT COMPUTING LAB	L	T	P
Credits: 2		-	-	4

Prerequisites: Basics of Neural Networks

Software Requirements: Java / Python

Course Objectives:

This objective of the course is to provide the students to study and analyze the fuzzy logic concepts, back propagation algorithms, with the analysis of CPN,GA and crisp logics. Further, explore the implementation of Hebb's rule, delta rule and classification.

List of Programs:

1. Write a program for implementing Linear Saturating Function.
2. Study and analysis of Art Model.
3. To perform Union, Intersection and Complement operations.
4. Write a program for Back Propagation Algorithm.
5. Write a program for Error Back Propagation Algorithm (EBPA) Learning.
6. Study and analysis of CPN.
7. Study and analysis of Genetic Algorithm Life Cycle.
8. Study and analysis of Fuzzy Vs Crisp Logic.
9. Write a program of perceptron Training Algorithm.
10. Write a program to implement Hebb's Rule.
11. Write a program to implement of Delta Rule.
12. Write a program for implementing any one classifier.

Reference Books:

1. S.N. Shivnandam, "Principle of soft computing", Wiley.
2. S. Rajshekaran and G.A.V. Pai, "Neural Network, Fuzzy logic And Genetic Algorithm", PHI.
3. Jack M. Zurada, "Introduction to Artificial Neural Network System" Jaico Publication.
4. Simon Haykins, "Neural Network- A Comprehensive Foundation".

Course Outcomes:

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

1. **Understand** the in-depth concepts of various network models.
2. **Explore** and analyze evolutionary algorithms.
3. **Implement** applications using neural networks.
4. **Apply** the Hebb's rule and Delta rule.
5. **Implement** and **explore** classification algorithms.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1		1	1
CO2	1	1	2		2	2
CO3	1	1	1	2	2	3
CO4		1				3
CO5	1		1			3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech II Sem		
Code: 80A05	VALUE EDUCATION	L	T	P
Credits: Nil		2	-	-

Prerequisites: Nil

Course Objectives: The course deals about value of education and self- development, Imbibe good values in students and know about the importance of character.

Module I **[6 Periods]**

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

Module II **[7 Periods]**

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 **[6 Periods]**

A:Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking. Integrity and discipline, Punctuality,

B: Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour.

Module IV **[7 Periods]**

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

Module V **[6 Periods]**

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

References:

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

Course Outcomes:

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

1. **Understand** self-development and moral values
2. **Explore** the importance of character and cultivation of values
3. **Apply** the personality development methods
4. **Analyze** the association and cooperation principles
5. **Elaborate** the principles of religions and good health science.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1					2	2
CO2					2	2
CO3					2	3
CO4					2	2
CO5					2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85125	PARALLEL AND DISTRIBUTED ALGORITHMS	L	T	P
Credits: 3	(Professional Elective-V)	3	-	-

Prerequisites: Computer Architecture

Course Objectives:

This course provides the students to learn and understand the basic of parallel and distributed algorithms, message passing, Partitioning, Divide and Conquer strategies. The use of Pipelined Computations Synchronization and Programming with shared memory. Apply these algorithms in Distributed shared memory systems and programming to solve problems in distributed, internet, and various other applications.

Module I: Parallel Computers [10 Periods]

Basic Techniques: Parallel Computers for increase Computation speed, Types of Parallel Computers.

Cluster Computing: Interconnected Computers as a computing platform, Cluster Configurations, Setting up a dedicated Beowulf style cluster.

Module II: Message-Passing Computing [9 Periods]

Message Passing: Basics, Evaluating Parallel programs, Debugging and evaluating parallel programs empirically.

Partitioning and Divide and Conquer strategies: Introduction to Partitioning Strategies, Partitioning and Divide and Conquer with Examples.

Module III: Pipelined Computations [10 Periods]

A: Pipelining

Pipeline Techniques, Computing platform for pipelined applications.

B: Pipeline Programs

Examples, Adding numbers, Sorting numbers, Prime number generation, Solving a system of linear equations.

Module IV: Synchronization and Programming with shared memory [9 Periods]

Synchronization: Synchronous Computations, load balancing, distributed termination examples.

Programming with Shared memory: Shared memory multiprocessor constructs for specifying parallel list sharing data parallel programming languages and constructs, open MP.

Module V: Distributed shared memory systems and Programming [10 Periods]

Distributed shared memory systems: Distributed shared memory, achieving constant memory distributed shared memory programming primitives.

Algorithms: Sorting algorithms, Compare and Exchange sorting algorithms, Sorting on specific networks, Other sorting algorithms, Numerical algorithms, Matrix multiplication, Solving a system of linear equations.

TEXT BOOKS

1. Barry Wilkinson, Michael Allen, "**Parallel Programming**", Pearson Education, 2nd Edition.
2. B. Chapman, G. Jost, and Ruud van der Pas, "**Using OpenMP**", MIT Press, 2008.

REFERENCES

1. Peter S. Pacheco, "**An introduction to parallel programming**", Morgan Kaufmann, 2011.
2. Quinn, "**Parallel programming in C with MPI and OpenMP**", Tata McGraw Hill, 2003.

E-RESOURCES

1. https://goo.gl/JvM3fU
2. http://hermes.survey.ntua.gr/web/FreeBooks/Parallel_and_Distributed_Computing.pdf
3. https://www.dagstuhl.de/Reports/99/99291.pdf
4. http://reports-archive.adm.cs.cmu.edu/anon/ml2011/CMU-ML-12-111.pdf
5. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY724XlqQGV2Msy4QUygyrM_d5Yo_yAP0nDWoQalPSovkEPXdPMMJMRXx5-x16kZcErg
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-YWREHSqJNXZ5-IVmA63e1fa_-0_8cKDQQ5jyqonM7KTHNTudziB4dzdyILzljXhs6BWw

Course Outcomes:

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

1. **Understand** the basic concepts related to parallel and distributed computing, use of parallel computers for enhance performance with cluster computing.
2. **Illustrate** message passing parallel algorithms of Portioning and Divide and Conquer strategies.
3. **Design** and develop applications with use of pipelined computations and pipeline programs
4. **Use of** Synchronization and Programming with shared memory in parallel programming languages like Open MP.
5. **Explore** various parallel algorithms and programming concepts for solving the problems to achieve constant distributed shared memory.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1			
CO2	1		1			
CO3	1		1		1	
CO4	1		1		1	1
CO5	1		1	2	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85126	WIRELESS SENSOR NETWORKS	L	T	P
Credits: 3	(Professional Elective-V)	3	-	-

Prerequisites: Computer Networks

Course objectives:

This course makes to understand and gain a broad coverage of challenges and latest concepts results related to the design and management of wireless sensor networks, design models, network architectures, node discovery and localization, analyze deployment strategies, node coverage, routing protocols , the systems with power management, protocols with medium access arbitration, fault-tolerance, network security and applications

Module I: Applications and Design Model [10 Periods]

Applications: Introduction: Examples of Sensor nodes, Sample Sensor Networks Applications.

Design Issues: Design Challenges and Models, Contemporary network architectures, Operational and computational models Performance metrics, Software and hardware setups.

Module II: Network Bootstrapping [10 Periods]

Deployment: Sensor deployment mechanisms, Issues of coverage, Node discovery protocols

Localization: Localization and control: Localization schemes, Network clustering.

Module III: Data Dissemination and Routing [9 Periods]

A: Data-centric and Content-based Networking

Query models, In-network data aggregation.

B: Routing Protocols

Robust route setup, coping with energy constraints.

Module IV: Physical and Link layers [9 Periods]

Energy and Power: Radio energy consumption model, Power management.

Protocols: MAC protocols: Medium access arbitration, Optimization mechanisms.

Module V: Dependability Issues [10 Periods]

Security Issues: Security and synchronization-Security challenges, Threat and attack models, Quality of service provisioning.

Synchronization: Clock synchronization, fault tolerance- Supporting fault tolerant operation.

TEXT BOOKS

1. Holger Karl, Andreeas Willig "**Protocols and Architectures for Wireless Sensor Networks**", Wiley, ISBN: 0-470-09510-5, June 2005.
2. Cauligi S. Raghavendra, Krishna Sivalingam, and Taieb M. Znati "**Wireless Sensor Networks**", Springer, 2005

REFERENCES

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks: Theory and Practice", John Wiley & Sons 2010.
2. Abbas Jamalipour Jun Zheng, "**Wireless Sensor Networks: A Networking Perspective",** Wiley 1st Edition, 2014.

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1. http://profsite.um.ac.ir/~hyaghmae/ACN/WSNbook.pdf
2. https://ia800207.us.archive.org/5/items/springer_10.1007-b117506/10.1007-b117506.pdf
3. ceng.usc.edu/~bkrishna/teaching/SensorNetBib.html
4. nesl.ee.ucla.edu/
5. www.intel.com/content/www/us/en/research/intel-research.html
6. www.libelium.com/
7. https://www.youtube.com/watch?v=e7jmXVxqS8s&t=1414s
8. https://www.youtube.com/watch?v=ipnrZUMHfpM

Course Outcomes:

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

1. **Understand** the wireless sensor networks for various applications and design models.
2. **Explore** coverage of Networking, planning, node deployment and localization control.
3. **Devise** appropriate data dissemination protocols and model links cost.
4. **Determine** suitable medium access protocols and radio energy consumption models.
5. **Implement** quality of service, fault-tolerance, security and other dependability requirements in wireless sensor networks.

COs	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1					
CO2	1	1	1			
CO3	1	1	1		1	1
CO4	1		1		1	
CO5	1	1	1	2	2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85127	INFORMATION RETRIEVAL TECHNIQUES	L	T	P
Credits: 3	(Professional Elective-V)	3	-	-

Prerequisites: Data Base Management Systems

Course Objectives:

This course enables the students to gain knowledge in different Information Retrieval (IR), fundamental concepts, Retrieval and Information Search techniques in various application areas, apply IR and Classification methods, Machine Learning techniques, SVM, Clustering and Classification methods. These principles are used to locate relevant information large collections of data, to analyze performance of retrieval systems when dealing with unmanaged data sources, and implement retrieval systems for web search tasks.

Module I: Information System Capabilities & Retrieval Techniques [9 Periods]

Retrieval Techniques-I: Boolean Retrieval, Term Vocabulary, Postings Lists, Indexing Techniques

Retrieval Techniques-II: Dictionaries and tolerant retrieval, Index Construction and Compression.

Module II: Information Search Techniques [10 Periods]

Score Computation: Scoring, Term Weighting and Vector Space Model, Computing scores in Complete search system, Information System Evolution.

Evaluation: Evaluation in information retrieval, Relevance feedback and query expansion.

Module III: Retrieval and classification techniques [10 Periods]

A: Retrieval Techniques

XML retrieval, Probabilistic information retrieval, Language models for information retrieval.

B: Classification Techniques

Text classification, Vector space classification.

Module IV: Machine Learning Retrievals [9 Periods]

Support Vector Machines and machine learning on documents: Support Vector Machines, Extensions to SVM model-Issues in classification of Text documents-Machine Learning methods in Adhoc Information Retrieval.

Clustering Techniques: Flat clustering, Hierarchical clustering, Matrix decompositions and latent semantic indexing.

Module V: Web Search Linking **[10 Periods]**

Web Search Basics: Web characteristics- Advertising as the Economic Model- Search user experience-Index size and estimation-Near-duplicates and Shingling.

Web crawling and indexes: Overview, Crawling, Distributing Indexes, Connectivity Servers, Link analysis, Web as a graph, Page Rank, Hubs and authorities.

TEXT BOOKS

1. Kowalski, Gerald J. Maybury, Mark T, "**Information Storage and Retrieval systems Theory and Implementation**", Second Edition, 2000.
2. Christopher D. Manning and Prabhakar, Raghavan and Hinrich Schütze, "**Introduction to Information Retrieva**l", Cambridge University Press, 2008.
3. Ricardo Baeza Yate, "**Modern Information Retrieval**", Pearson Education, 2007.

REFERENCES

1. David A Grossman and Ophir Frider, "**Information Retrieval: Algorithms and Heuristics**", 2nd Edition, Springer.
2. Robert Korfhage, "**Information Storage & Retrieval**", John Wiley & Sons.

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1. www.unistmo.edu.mx/~daniel.garcia/.../Librorecuperacioninformacion.pdf
2. https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf
3. www.sciencedirect.com/science/article/pii/S1877050916000739
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY71DYMut02wjKcXilXOeS46dDWYndV38tDO50i_mnMwZjXcF6XgqkVglL9ordVB7VBQ

Course Outcomes:

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

1. **Understand the** Information retrieval techniques.
2. **Explore and Analyze** Information search techniques like Vector Space Model, and Probabilistic Model, system evaluation methods.
3. **Identify and Apply** Classification Methods and classification techniques used various applications
4. **Describe and apply** Machine learning retrieval methods like SVM and clustering techniques.
5. **Illustrate** web search technique in Information Retrieval system used in web search, crawling and indexes.

COs	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	1	1			
CO2	2	1	1	1	2	2
CO3	2	1	1	1	2	2
CO4	3	1	1	1	2	3
CO5	3	1	1	1	2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85128	BUSINESS ANALYTICS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

This course provides the students to learn and understand the role of business analytics within an organization, Analyze data using statistical and data mining techniques Also to gain an understanding of how managers use business analytics to formulate and solve, business problems.

Module I: **Business analytics and Statistical Tools** **[9 Periods]**

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business, Analytics Process and organization, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.

Module II: **Trendiness and Regression Analysis** **[9 Periods]**

Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Module III: **Organization Structures and Analytics** **[10 Periods]**

A: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

B: Descriptive Analytics, predictive analytics, predicative Modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modeling, nonlinear Optimization.

Module IV: **Forecasting Techniques** **[10 Periods]**

Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Module V: **Decision Analysis** **[10 Periods]**

Formulating Decision Problems, Decision Strategies with the without outcome Probabilities, Decision Trees, Value of Information, Utility and Decision Making. Recent

Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "**Business analytics Principles, Concepts, and Applications**"**,** Pearson FT Press.
2. James Evans, "**Business Analytics**"**,** Persons Education.

REFERENCES

1. James Cadle, Donald Yeates, James Cadle, Malcolm Eva, Keith Hindle, Debra Paul, Craig Rollason, Paul Turner, Donald Yeates Debra Paul, "**Business Analysis**"**,** BCS, The Chartered Institute for IT; Revised edition, 2014.
2. Erik Larson and, Clifford Gray**, "Project Management: The Managerial Process**", McGraw Hill Education; Sixth Edition, 2017.

Course Outcomes:

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

1. **Understand** the knowledge and need for data analytics.
2. **Demonstrate** the ability of think critically in making decisions based on data and deep analytics.
3. **Explore** the technical skills in predicative and prescriptive modeling to support business decision-making.
4. **Acquire** the ability to translate data into clear, actionable insights.
5. **Analyze** the problems and use various decision strategies.

COs	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1	1	1			
CO2	2			1	2	2
CO3	2	1	1			2
CO4	1	1	1	1	1	3
CO5	1	1	1		2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech. III Semester		
Code: 80B20	ADVANCED OPTIMIZATION TECHNIQUES (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-requisite: Nil

Course Objectives:

To understand extremely important topics under the broad umbrella of optimization, this is synonymous with efficiency which is the underlying prime rationale for all scientific and technological advances and progress.

Module I: Linear Programming **[10 Periods]**

Introduction and formulation of models; convexity; graphical &simplex method; Big-M Method, Two phase method; degeneracy, non-existent and unbounded solutions; duality in L.P. Dual simplex method, sensitivity analysis for cost and requirement vector; Revised simplex method; Transportation and Assignment problems.

Module II: Integer Linear Programming **[10 Periods]**

Gomory's cutting plane method; branch and bound algorithm; traveling salesman problem; knapsack problem; linear C-1 problem.

Module III: Dynamic Programming , CPM & PERT **[9 Periods]**

A: Belman's Principle of optimality; recursive relations; Solution of L.P. Problem; simple examples.

B: CPM & PERT

Module IV: Non-Linear Programming **[9 Periods]**

Classical optimization methods; equality and inequality constraints; Lagrange multipliers; Kuhn-tucker conditions; quadratic forms; quadratic programming and Beale's methods.

Module V: Search Methods **[10 Period]**

One dimensional optimization; Fibonacci search; multi dimensional search methods; uni-variate search; gradient methods; steepest descent/ascent methods; conjugate gradient method; Fletcher- reeves method; penalty function approach.

TEXT BOOKS

1. J.K. Sharma, "**Operations Resarach Theory & Applications**", 4th Edition, Mc.Millan Publications
2. S.S.Rao, "**Engineering Optimization theory and Practice**", 4th Edition, J Wiley & Sons, Newjersey

REFERENCES

1. K.V.Mital , **"Optimization methods in operations research and system analysis**", 3rd Edition, Newage International (P) Ltd., publishers.
2. H.A Taha "**Operations Research: An Introduction**" Prentice Hall Edition, 2016

reprint
3. Raul Poler et.al "Operations Research Problems Statement and solutions" Springer, 2014.

E Resources:

1. http://www.mhhe.com/engcs/industrial/hillier/etext/PDF/chap03.pdf (LPP)
2. http://ocw.nctu.edu.tw/upload/classbfs121001503719748.pdf (Transportation Problems)
3. http://shodhganga.inflibnet.ac.in/bitstream/10603/19544/12/7_chapter%201.pdf (Replacement Models)
4. https://www.math.ucla.edu/~tom/GameTheory/mat.pdf (Game Theory)
5. http://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf (Inventory Models)

Course Outcomes

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

1. Find feasible solution to LPP by various methods.
2. Minimize the cost and time by using Travelling salesmen Problem.
3. Understand various methods Dynamic programming.
4. Understand the various concepts on Non-Linear programming.
5. Understand the various concepts of Search methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	**Programme Outcomes(POs)**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1			3		
CO2		1		2		
CO3	2			3		
CO4	3		1			
CO5			1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85129	INTRODUCTION TO BLOCKCHAIN TECHNOLOGY (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

The blockchain technology course allows the students to explore the driving force behind the cryptocurrency Bitcoin. Along with the Decentralization, Cryptography, Bitcoins with its alternative coins, Smart contracts and outside of currencies.

Module I: Introduction to Blockchain [9 Periods]

Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.

Module II: Decentralization and Cryptography [10 Periods]

Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations.

Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys

Module III: Bitcoin and Alternative Coins [10 Periods]

A: Bitcoin

Transactions, Blockchain, Bitcoin payments

B: Alternative Coins

Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

MODULE IV: Smart Contracts [10 Periods]

Definition, Ricardian contracts: Smart contract templates, Deploying smart contracts on a blockchain.

MODULE V: Blockchain-Outside of Currencies [9 Periods]

Internet of Things, Government, Health, Finance, Media

TEXT BOOKS

1. Imran Bashir, "**Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained**", Packt Publishing Ltd., Second Edition, ISBN 978-1-78712-544-5, 2017.

REFERENCES

1. Daniel Drescher, "**Blockchain Basics: A Non-Technical Introduction in 25 Steps**", Apress, First Edition, 2017.

2. Andreas M. Antonopoulos, "**Mastering Bitcoin: Unlocking Digital Cryptocurrencies**", O'Reilly Media, First Edition, 2014.

E-RESOURCES

1. http://nptel.ac.in/courses/106106168/27
2. https://www.edx.org/learn/blockchain-cryptography
3. https://www.class-central.com/tag/blockchain
4. https://cognitiveclass.ai/courses/blockchain-course/
5. https://www.skillshare.com/browse/blockchain

Course Outcomes:

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

1. **Understand** the types, benefits and limitation of blockchain.
2. **Explore** the blockchain decentralization and cryptography concepts.
3. **Enumerate** the Bitcoin features and its alternative options.
4. **Describe** and deploy the smart contracts
5. **Summarize** the blockchain features outside of currencies.

COS	**CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		1			
CO2	1	1	1	1	2	1
CO3	1	1	1	1	2	2
CO4	2	1	1	1	2	3
CO5	2		1	1	2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85110	SEMINAR	L	T	P
Credits: 2		-	-	4

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech III Sem		
Code: 85111	PROJECT / DISSERTATION PHASE - I	L	T	P
Credits: 8		-	-	16

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	M.Tech IV Sem		
Code: 85112	PROJECT / DISSERTATION PHASE - II	L	T	P
Credits: 16		-	-	32

OPEN ELECTIVES

1) Business Analytics
2) Advanced Optimization Techniques
3) Introduction to Blockchain Technology