ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2021-22 onwards

Course Structure and Syllabus for
B.Tech. Computer Science and Engineering (CSE) Programme.
(MR21 Regulations – Effective from Academic Year 2021-22 onwards)

B.TECH. - FOUR YEAR DEGREE PROGRAMME

MALLA REDDY ENGINEERING COLLEGE(AUTONOMOUS)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH, Hyderabad)

Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited 3rd time by NAAC with 'A++' Grade, NIRF Rank Band 201-250, ARIIA Band Performer, NBA Tier-I Accredited (B.Tech.- CE, EEE, ME, ECE &CSE, M.Tech. - SE, EPS, TE) Maisammaguda (H), Dhulapally (Post Via Kompally),Medchal - Malkajgiri District, Secunderabad– 500100. Telangana State. e-mail: principal@mrec.ac.in, Website:www.mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
MR21 – ACADEMIC REGULATIONS (CBCS)
for B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year *2021-22* onwards

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

VISION

To be a premier center of professional education and research, offering quality programs in a socio-economic and ethical ambience.

MISSION

- To impart knowledge of advanced technologies using state-of-the-art infrastructural facilities.

- To inculcate innovation and best practices in education, training and research.

- To meet changing socio-economic needs in an ethical ambience.

DEPARTMENT VISION

To attain global standards in Computer Science and Engineering education, training and research to meet the growing needs of the industry with socio-economic and ethical considerations.

DEPARTMENT MISSION

- To impart quality education and research to undergraduate and postgraduate students in Computer Science and Engineering.

- To encourage innovation and best practices in Computer Science and Engineering utilizing state-of-the-art facilities.

- To develop entrepreneurial spirit and knowledge of emerging technologies based on ethical values and social relevance.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To impart with a sound knowledge in scientific and engineering technologies necessary to formulate, analyze, design and implement solutions to computer technology related problems.

PEO 2: To carry out research in frontier areas of computer science and engineering with the capacity to learn independently throughout life to develop new technologies.

PEO 3: To train to exhibit technical, communication and project management skills in their profession and follow ethical practices.

PEO 4: To possess leadership and team working skills to become a visionary and an inspirational leader and entrepreneur.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1: Apply the knowledge gained during the course of the program from mathematics, basics Computing, Basic Sciences and all computer science courses in particular to identify, formulate and solve real life complex engineering problems faced in industries and /or during research work with due consideration for the public health and safety, in the context of cultural, societal, and environmental situations.

PSO 2: provide socially acceptable technical solutions to complex computer science engineering problem with the application of modern and appropriate techniques for sustainable development relevant to professional engineering practice.

PSO 3: Comprehend and write effective project in multi disciplinary environment in the context of changing technologies.

PROGRAMME OUTCOMES (POs)

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1. **Malla Reddy Engineering College (Autonomous) (MREC-A)** offers **Four** Year (**Eight** Semesters) **Bachelor of Technology** (**B.Tech**.) with Choice Based Credit System (CBCS) in the following Branches of Engineering.

S. No.	Branch Code	Branch	Intake
1	01	Civil Engineering (CE)	120
2	02	Electrical and Electronics Engineering (EEE)	60
3	03	Mechanical Engineering (ME)	120
4	04	Electronics and Communication Engineering (ECE)	180
5	05	Computer Science and Engineering (CSE)	240
6	12	Information Technology (IT)	60
7	62	Computer Science and Engineering (Cyber Security)	60
8	66	Computer Science and Engineering (AI &ML)	60
9	67	Computer Science and Engineering (Data Science)	60
10	69	Computer Science and Engineering (IOT)	60
11	25	Mining Engineering (Min.E)	60

2. Eligibility for Admission

2.1 Admission to the B.Tech. programme shall be made either on the basis of the merit rank obtained by the qualifying candidate in entrance test conducted by the Telangana State Government (TSEAMCET) or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instructions for the entire B.Tech. programme will be ENGLISH.

3. B.Tech. Programme Structure & Duration of Study

3.1 A student after securing admission shall pursue the B.Tech. programme in a minimum period of **four** academic years (8 semesters) and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester. Further 2 years of extension is allowed for appearing examinations, failing which student shall forfeit seat in B.Tech. Course. The total credits for the entire B.Tech. programme is 160 as prescribed by AICTE. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the B.Tech. programme and award of the B.Tech. degree*.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

Each B.Tech. programme is of 4 academic years (8 Semesters), with the academic year being divided into two semesters of 22 weeks (≥90 instructional days) each, having **'Continuous Internal Evaluation (CIE)'** and **'Semester End Examination (SEE)'** under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC. The Curriculum/ Course Structure is defined based on the model curriculum defined by AICTE.

3.2.2 Credit Courses:

All Subjects/ Courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each Subject/ Course in a 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 of Lecture (L) / Tutorials (T).
- One Credit - for two hours/ Week/ Semester of Practical's (P).

Courses like Environmental Sciences, Induction Programme, Gender Sensitization and students activities like Internship, Sports/Yoga/NSS and courses relevant to emerging technologies are identified as Mandatory/Audit courses. These courses will not carry any credits.

3.2.3 Subject/ Course Classification:
All subjects/ courses offered for the B.Tech. Programmes are broadly classified as follows.
(a) Foundation Courses (FC)
(b) Core Courses (CC)
(c) Elective Courses (EC)
(d) Mandatory Courses (MC)
(e) Audit Courses (AC)

- **Foundation Courses (FC)** are further categorized as:
(i) Humanities and Social Sciences including Management courses (HSMC)
(ii) Basic Science Courses (BSC)
(iii) Engineering Science Courses (ESC).
- **Core Courses (CC) and Elective Courses (EC)** are categorized as
    (i) Professional Core Courses (PCC)
    (ii) Professional Elective Courses (PEC)
    (iii) Open Elective Courses (OEC)
    (iv) Project (PROJ)
- **Mandatory Courses** (**MC** - Non-credit with evaluation).
- **Audit Courses** (**AC** – Non- credit without evaluation).
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3.2.4 Course Nomenclature:
The curriculum nomenclature or course structure grouping for each of the B.Tech. Programmes, is as listed below (along with AICTE specified range of total credits).

Sl. No.	assification		urse Work – Subject Area	Distribution of credits	AICTE Suggested Breakup of Credits tal 160)
	AICTE	GC			
1	HSMC		Humanities and Social sciences including Management courses.		
2	BSC	Foundation urses	Basic Sciences (BSC) including Mathematics, Physics, Chemistry and Biology.		

3	ESC		Engineering Science Courses (ESC) including Engineering Workshop, Engineering Graphics, Basics of Electrical and Electronics / Mechanical / Computer Engineering.		
4	C	Core Courses	Professional core Courses are relevant to the chosen specialization/branch; [May be split into Hard (no choice) and Soft (with choice)], if required.		
5	C	Professional Electives	Professional electives are relevant to the chosen specialization/ branch.		
6	EC	en Electives	Open electives are the courses from other technical and/or emerging subject areas.		
7	PROJ	bject	Mini Project, Project and Seminar		
8	C	Mandatory Courses	These courses are non-credit courses with evaluation.		
9	C	Audit Courses	These courses are non-credit courses without evaluation.		
tal credits for B.Tech. Programme					**0**

4.0 Course Registration

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

4.2 The students have to submit registration form (Online/Offline) to the Academic section of the college within 15 days from the commencement of class work for the first semester. The registration forms for the *subsequent semester* shall be completed before the commencement of SEEs (Semester End Examinations) of the *current semester*.

4.3 A Student has to submit the registration form through the Head of Department (a copy of it being retained with Head of Department).

4.4 A Student may be permitted to register for the Subjects/ Course of CHOICE with a typical deviation of ±3 credits of the semester, based on his PROGRESS and SGPA/CGPA and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the department course structure and syllabus contents. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department, 'within a period of 15 days' from the beginning of the current semester.

4.5 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.

4.6 Subject/ Course options exercised through registration forms will be treated as 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 the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that semester. Such changes are to be intimated to Chief Controller of Examinations/Principal immediately.

4.7 Open Electives: A student has to complete 3 Open Electives during the period of B.Tech. Programme. However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

4.8 Professional Electives: A student has to complete 6 Professional Electives during the period of B.Tech. Programme. Students have to choose professional electives from III year I semester onwards from the list of professional electives offered by their departments.

4.9 For Audit Courses, a '**Satisfactory Participation Certificate**' from the authorities concerned for the relevant semester is essential. No Marks or Credits shall be awarded for these activities.

4.10 For Mandatory Courses, a '**Satisfactory / Not Satisfactory' grade** is awarded based on the performance in both CIE and SEE.

5.0 Subjects/ Courses to be offered

5.1 A typical Section (or Class) strength for each semester shall be 60.

5.2 A Subject/ Course may be offered to the students, only if a minimum of **40 students** opt for the same. The maximum strength of a section is limited to 72.

5.3 More than one teacher may offer the same subject (Lab / Practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection choice for students will be based on 'First Come First Serve' basis and 'CGPA Criterion'(i.e., the first focus shall be on early On-Line Entry from the student for registration in that semester and the second focus, if needed, will be on CGPA of the student).

5.4 If more entries for registration of a subject come into picture, then the concerned Head of the Department shall take necessary actions, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT.

6.0 Attendance Requirements:

6.1 A student shall be eligible to appear for the Semester End Examinations, if he / she acquire a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (including Non-Credit Courses) for that semester.

6.2 Condoning of shortage of attendance in aggregate up to 10%(>= 65% and < 75%) in each semester may be granted by the College Academic Committee (CAC) on genuine and **valid grounds** based on the student's representation with supporting evidence.

6.3 A stipulated fee prescribed by the CAC, shall be payable towards condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in NO case be condoned.

6.5 Students whose attendance is < 65% are not eligible to register for Semester End Examinations, they get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those Subjects registered in that Semester in which he got detained, by seeking re-admission for that semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be **re-registered** if offered, however, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 If any student fulfills the attendance requirement in the present semester shall not be eligible for readmission into the same semester.

7.0 Academic Requirements: The following Academic Requirements have to be satisfied, in addition to the attendance requirements mentioned in item No.**6.**

7.1 A student shall be deemed to have satisfied the Academic requirements and earned the credits allotted to each Subject/ Course, if he / she secures not less than 35% marks in the Semester End Examination and with a minimum of 40% of the total marks allocated for the course; in terms of Letter Grades, this implies securing 'P' Grade or above in that Subject/ Course. 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.

7.2 A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to Mini Project/Seminar/ Project, if he/ she secure not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he/ she (i) does not submit a report on his/ her Mini Project / Seminar / Project or does not make a presentation of the same before the Evaluation Committee as per schedule or (ii) secures less than 40% of marks in Mini Project/ Seminar/ Project evaluations.

He/ She may reappear once for each of the above evaluations, when they are scheduled again; if he/ she fails in such **'one-reappearance'** evaluation also, he/ she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules: Every student has to fulfil the Attendance and Academic requirements by securing the required credits against registered credits as shown below:

S. No.	Promotion	Conditions to be fulfilled
1.	First year first semester (I Semester) to first year second semester (II Semester)	• Regular course of study of first year first semester. (I Semester)
2.	First year second semester (II Semester) to second year first semester (III Semester)	• Regular course of study of first year second semester (II Semester). • Must have secured at least 50% credits up to first year second semester (II Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester (III Semester) to second year second semester (IV Semester)	• Regular course of study of second year first semester (III Semester)
4.	Second year second semester (IV Semester) to third year first semester (V Semester)	• Regular course of study of second year second semester (IV Semester). • Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5.	Third year first semester (V Semester) to third year second semester (VI Semester)	• Regular course of study of third year first semester (V Semester).
6.	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	• Regular course of study of third year second semester (VI Semester). • Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7.	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	• Regular course of study of fourth year first semester (VII Semester).

7.4 A Student shall register for all subjects covering 160 credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, fulfils all the Attendance and Academic requirements for 160 credits securing a minimum of 'P' Grade (Pass Grade) or above in each subject and earn 160 credits securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the B.Tech. Programme.

7.5 After securing the necessary 160 credits as specified for the successful completion of the B.Tech. Programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective/open electives subjects for optional drop out from these 160 credits earned; resulting in 154 credits for B.Tech. Programmeperformance evaluation, i.e., the performance of the student in these 154 credits shall alone be taken into account for the calculation of the final CGPA (at the end of B.Tech. Programme, which takes the SGPA of the IV year II semester into account) and shall be indicated in the grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

7.6 If a student registers for some more **'Extra Subjects'** (in the parent Department or other Departments/ Branches of Engineering) other than those listed subjects totaling to 160 credits as specified in the Course Structure of his/ her department, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subjects registered, Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in items No.6 and 7.1 to7.5.

7.7 When a student is detained due to shortage of attendance in any semester, he/ she may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements. The academic regulations under which student has been readmitted shall be applicable. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire semester in which he/ she got detained.

7.8 When a student is detained due to lack of credits in any year, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which student has been readmitted shall be applicable to him.

7.9 A student eligible to appear in the Semester End Examination in any Subject/ Course, but absent from it or failed (thereby failing to secure 'P' Grade or above) may reappear for that Subject/ Course at the supplementary examination as and when conducted. In such cases, his / her Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over and added to the marks to be obtained in the SEE supplementary examination, for evaluating his/ her performance in that subject.

8.0 Evaluation, Distribution and Weightage of Marks

8.1.1 The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned) for 100 marks for Theory, Practical's, Seminar, Drawing / Design, Mini Project, 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 of 30 Marks for CIE and 70 Marks for SEE decided in the Academic Council.

8.2 Theory Courses:

8.2.1 Continuous Internal Evaluation (CIE):

CIE shall be carried out for all courses of B.Tech. Programme twice in a semester (2 Midterm examinations) with the help of objective evaluation, subjective evaluation and regular assignments. Each mid-term examination shall consist of objective test with a duration of 20 minutes, subjective paper shall be conducted with a duration of 90 minutes and one assignment. The composition of objective test, subjective test and assignment shall be evaluated for 40%, 50% and 10% of the allocated internal marks.

Mid - Term Examination – UG				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Multiple – Choice Questions	20	1	20
Part - B	Internal choice questions (Module-wise)	5	5	25
Mid Term Exam Total				45
Assignment				5
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 average of both mid-term examination. The student shall appear for both midterm examinations, in case of any specific reason the student appears only one midterm examination, 50% weightage of that examination shall be considered.

8.2.2 Semester End Examination (SEE):

Semester End Examination (SEE) shall be conducted for all courses of B.Tech. 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 Examinations/Principal, from the panel of examiners submitted by the head of the respective department.

Semester End Examination - UG			
Type of Questions	No. of Questions	Marks per Question	Total
Internal choice questions (Module-wise)	5	14	70

8.3 Practical Courses:

8.3.1 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 (average of the two exams) and 20% for viva-voce. The CIE will be conducted for 50 marks and scaled to 30 marks.

8.3.2 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 3hours), 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 the outside college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

8.4 Engineering Graphics:

CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below

CIE for Engineering Graphics				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Day – to – Day Work			20
Mid – Term Examination				
Part - B	Internal choice questions (Module-wise)	5	6	30
Total				50

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

The distribution of marks for SEE is given below

SEE for Engineering Graphics			
Type of Questions	No. of Questions	Marks per Question	Total
Internal choice questions (Module-wise)	5	14	70

8.5 Machine Drawing:

CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below

CIE for Machine Drawing			
Type of Questions	No. of Questions	Marks per Question	Total
Day to Day Work			20
I Mid Term Examination			
Part Drawing (4 out of 6)	4	7.5	30
II Mid Term Examination			
Assembly Drawing (1 out of 2)	1	30	30
Total			50

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

The distribution of marks for SEE is given below

SEE for Machine Drawing			
Type of Questions	No. of Questions	Marks per Question	Total
Part A - Part Drawing (2 out of 4)	2	15	30
Part B - Assembly Drawing (Compulsory Question)	1	40	40
Total			70

8.6 Projects:

8.6.1 Internship-III/Mini Project:

There shall be an Internship-III/Mini Project, for which the students will register after the completion of III year II semester (VI Semester) end examinations and pursue it during summer vacation. The evaluation of Mini project will be done at the end of IV Year I semester (VII semester). It shall be evaluated internally for 100 marks. The committee consisting Project Coordinator, Supervisor of the project and one senior faculty of the department will evaluate the Internship-III/Mini Projectand award appropriate Grade, based on the report submitted to the department and presentation provided by the student in front of the committee.

8.6.2 Project:

Major Project has to be carried out during the VIII semester, as per the instructions of the project supervisor assigned by the Head of the Department for 200 marks. Out of total 200 marks allotted for the major project, 60 marks shall be for CIE (Continuous Internal Evaluation) and 140 marks for the SEE (Semester End Viva-voce Examination). CIE marks shall be awarded by a Departmental Committee consisting of Project coordinator, Supervisor of Major Project and a senior Faculty member, from two reviews (average). Review - I will be conducted within a month from the commencement of class work (problem definition, objective, literature survey and brief description - each 10 marks) and

Review - II will be conducted before second mid examination (progress of work, results, discussion and presentation - each 10 marks). The Major Project Viva-voce (SEE) shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. In SEE of 140 marks, 70 marks for working model / simulation / data collection, 35 marks for report preparation and 35 marks for presentation and viva - voce. The external examiner should be selected by Chief Controller of Examinations from outside the college among the autonomous / reputed institutions from a panel of three examiners submitted by the concerned Head of the Department / Board of Studies (BOS) Chairman.

The topics for mini project and seminar shall be different from one another.

The student is deemed to be failed, if he/ she (i) does not submit a report on Project, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.6.3 Seminar:

For Seminar presentation, the student shall collect the information on a specialized topic, prepare a report and submit to the department at the time of seminar presentation. The seminar presentation (along with the report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty members with appropriate grade. The seminar report shall be evaluated internally for 100 marks. There shall be no semester end examination for the seminar.

8.7 Non-Credit Courses:

8.7.1 Mandatory Courses:

For Mandatory Courses offered in any semester, a 'Satisfactory/ Not Satisfactory' shall be awarded to the student based on the performance in both CIE and SEE.

8.7.2 Audit Courses:

For Audit Courses offered in any Semester, the student must submit a '**Participation Certificate**' from the concerned authorities.Internship program is also conducted under the category of Audit Courses. The student needs to submit a detailed report to the department after internship program. No marks or Letter Grade shall be allotted for these activities.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of each student in each theory subject, or Lab/ Practical or Seminar or Project or Mini-Project or Minor Course etc., based on the % of marks obtained in CIE + SEE both taken together as specified in Item No. 8 and a corresponding Letter Grade shall be given.

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

% of Marks	Grade Points	Letter Grade
≥90	10	(Out Standing)
≥80 to < 90	9	A$^+$ (Excellent)
≥70 to < 80	8	A (Very Good)
≥60 to < 70	7	B$^+$ (Good)
≥50 to <60	6	B (Average)
≥40 to < 50	5	C(Pass)
< 40	0	F (Fail)
Absent	0	Ab

9.3 A student obtaining 'F' Grade 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. In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier.

9.4 A Letter Grade does not imply any specific % of marks.

9.5 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'. However, he / she has to repeat all the Subjects/ Courses pertaining to that semester, when he / she is detained (as listed in Items Nos.7.7 &7.8).

9.6 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with credits for that particular Subject/ Course.

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

9.7 The Student passes the Subject/ Course only when he / she gets GP $\geq$ 5('C' Grade or above).

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from all Subjects/ Courses registered in a semester by the Total Number of Credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$SGPA = \left\{ \sum_{i=1}^{N} C_i G_i \right\} / \left\{ \sum_{i=1}^{N} C_i \right\} \dots \text{ for each semester}$$

where 'i' is the subject indicator index (takes into account all subjects in a   semester), 'N' is the number of subjects registered for the semester (as specifically required and listed under the Course Structure of the parent department) is the number of credits allotted to the ith subject and represents the Grade Points (GP)corresponding to the Letter Grade awarded for that i^{th} subject.

9.9 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.

$CGPA = \{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\}$... for all 'S' semesters registered

(i.e., up to and inclusive of 'S' semesters, $S \geq 2$)

where 'M' is the total number of subjects (as specifically required and listed under the course structure of the parent department) the student has registered from the 1st semester onwards up to and inclusive of the semester 'S' (obviously $M > N$), 'j' is the subject indicator index (takes in to account all subjects from '1' to 'S' semesters) is the number of credits allotted to the jth subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth subject. After registration and completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

ILLUSTRATION OF CALCULATION OF SGPA

Course/ Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	3	A	8	3 x 8 = 24
Course 2	3	O	10	3 x 10 = 30
Course 3	3	C	5	3 x 5 = 15
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	1.5	B	6	1.5 x 6 = 09
Course 7	1.5	A	8	1.5 x 8 = 12
Course 8	2	A	8	2 x 8 = 16
	Total = 20			Total Credit Points = 151

SGPA = 151/20 = 7.55

ILLUSTRATION OF CALCULATION OF CGPA:

Semester	Credits	SGPA	Credits X SGPA
Semester I	21	7	21 X 7 = 147
Semester II	19	6	19 X 6 = 114
Semester III	22	6.5	22 X 6.5 = 143
Semester IV	20	6	20 X6 = 120
Semester V	22	5.75	22 X 5.75 = 126.5
Semester VI	18	7.25	18 X 7.25 = 130.5
Semester VII	18	8	18 X 8 = 144
Semester VIII	20	8.5	20 X 8.5 = 170
	160		1095

CGPA = 1095/160 = 6.84

9.10 For merit ranking or comparison purposes or any other listing, only the rounded off values of the CGPAs will be used.

9.11 For calculations listed in Item Nos.9.6 to 9.10, 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. However, Mandatory Courses will not be taken into consideration.

9.12 Passing Standards:

9.12.2 A student shall be declared successful or 'passed' in a semester, only when he / she gets a SGPA $\geq$ 5.00 (at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire B.Tech Programme, only when he / she gets a CGPA $\geq$ 5.00; subject to the condition that he / she secures a GP $\geq$ 5 ('C' Grade or above) in every registered Subject/ Course in each semester (during the entire B.Tech Programme) for the award of degree, as required.

9.12.3 In spite of securing 'P' Grade or above in some (or all)Subjects/ Courses in any semester, if a student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a semester, then he / she 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) (i) to go into the next subsequent semester (subject to fulfilling all other attendance and academic requirements as listed under Item Nos. 7&8);(ii) to 'improve his / her SGPA of such a semester (and hence CGPA) to 5.00 or above', by reappearing for one or more (as per student's choice) of the same course(s) in which he / she has secured 'P' Grade(s) in that semester, at the Supplementary Examinations to be held in the next subsequent semester(s). In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

9.12.4 A student shall be declared successful in any Non-Credit Course, if he / she secures a 'Participation Certificate' for that Audit Course and "Satisfactory Grade' for Mandatory Course.

9.13 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the Letter Grades and credits earned. It will show the details of the courses registered (Course Code, Title, No. of Credits and Grade Earned etc.), Credits earned, SGPA and CGPA.

10 Declaration of Results

10.1 Computation of SGPA and CGPA are done using the procedure listed in items 9.6 to 9.10.

10.2 For final % of marks equivalent to the computed final CGPA, the following formula may be used …

% of Marks = (final CGPA – 0.5) x 10

11 Award of Degree

11.1 A student who register for all the specified courses as listed in the Course Structure, satisfies all the course requirements, passes all the examinations prescribed in the entire B.Tech. Programme within the specified period (refer 4.1) and secures the required 160 Credits (with CGPA $\geq$ 5.0) shall be declared to have '**Qualified'** for the award of the B.Tech. Degree in the chosen branch of engineering as selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in Item 11.1, shall be placed in one of the following classes:

Class Awarded	CGPA
First Class with Distinction	≥ 8.00
First Class	≥ 6.50 and < 8.00
Second Class	≥ 5.50 and < 6.50
Pass Class	≥ 5.00 and < 5.50

11.3 A student with final CGPA (at the end of the B.Tech. Programme) <5.00 will not be eligible for the award of the degree.

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

11.5 A student will be eligible to get under graduate with honours or additional minor engineering if he/she completes an additional 20 credits through MOOCs.

12   Withholding of Results

If the student has not paid fees to college at any stage or has pending dues against his / her name due to any reason whatsoever or if any case of indiscipline is pending against him, the result of the student may be with-held and he / she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13   Transitory Regulations

A. **For students detained due to shortage of attendance**:

1. A student who has been detained in I year of MR15 (2016 admitted)/ MR17/MR18 regulations due to lack of attendance, shall be permitted to join I year I Semester of MR20 regulations and he / she is required to complete the study of B.Tech Programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of MR15/MR17/MR18 regulations for want of attendance shall be permitted to join the corresponding semester of MR20 regulations and is required to complete the study of B.Tech., within the stipulated period of eight academic years from the date of first admission in I Year. The MR20 academic regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further transitory regulations.

B. **For students detained due to shortage of credits**:

1   A student of MR15/MR 17/MR18 regulations, who has been detained due to lack of credits, shall be promoted to the next semester of MR20 regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the B.Tech. Programme within the stipulated period of

eight academic years from the year of first admission. The MR20 academic regulations are applicable to a student from the year of readmission onwards. See rule (C) for further Transitory Regulations.

C. **For readmitted students in MR20 regulations**:

1 A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

2 The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including MR20 regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 160, (see item 7.5).

3 If a student readmitted to MR20 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR20 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).

Note: If a student readmitted to MR20 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR20 regulations, the departments concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

14   Student Transfers

14.1 There shall be no branch transfers after the completion of admission process.

14.2 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) inspite of the fact that those subjects are repeated.

14.3 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.

15   Scope

(i) Where the words "he", "him", "his", occur in the write – up of regulations, they include "she", "her", "hers".

(ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

(iii) The academic regulations should be read as a whole, for the purpose of any interpretation.

(iv) 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 will be considered as final.

Academic Regulations for B.Tech.(Lateral Entry Scheme) w.e.f. the A Y 2021-22

1. **Eligibility for award of B. Tech. Degree (LES)**

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA $\geq$ 5 from II year to IV year B.Tech. Programme (LES) for the award of B.Tech. degree. **Out of the 120 credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects resulting in 114 credits for B.Tech. Programme performance evaluation**.**

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech. Programme.

4. The attendance requirements of B. Tech. (Regular) shall   be applicable to B.Tech.(LES).

5. **Promotion Rule:**

Sl. No.	Promotion	Conditions to be fulfilled
1	Second year first semester (III Semester) to second year second semester (IV Semester)	Regular course of study of second year first semester (III Semester).
2	Second year second semester (IV Semester) to third year first semester (V Semester).	**(i)** Regular course of study of second year second semester (IV Semester) **(ii)** Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those
3	Third year first semester (V Semester) to third year second semester (VI Semester)	Regular course of study of third year first semester (V Semester).
4	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	**(i)** Regular course of study of third year second semester (VI Semester) **(ii)** Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	Regular course of study of fourth year first semester (VII Semester)

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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 student 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 course of the examination)	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 student 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 students 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 student 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 examination.	The student who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in

		all the courses of the examination (including practical's 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 student 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 (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has

	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-incharge, 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	(have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The students 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 script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student 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 student 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 student 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 student 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 student 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)
COURSE STRUCTURE – B.Tech. CSE (Artificial Intelligence and Machine Learning)
(MR21 Regulations - Effective from Academic Year 2021 – 22 onwards)

			SEMESTER – I				
S. No	Category	Course Code	Name of the Subject	Contact hours/week			Credits
				L	T	P	
1	BSC	B0B01	Linear Algebra and Numerical Methods	3	1	-	4
2	BSC	B0B17	Engineering Chemistry	3	1	-	4
3	ESC	B0501	Programming for Problem Solving	3	-	-	3
4	ESC	B0305	Engineering Drawing	1	-	4	3
5	BSC	B0B09	Semiconductor Physics	3	1	-	4
6	ESC	B0502	Programming for Problem Solving Lab	-	-	2	1
7	BSC	B0B11	Applied Physics Lab	-	-		1
8	BSC	B0B18	Engineering Chemistry Lab	-	-	-	1
			Total	12	2	10	21
			Total Contact Hours	24			

			SEMESTER – II				
S. No	Category	Course Code	Name of the Subject	Contact hours/week			Credits
				L	T	P	
1	HSMC	B0H01	English	3	-	-	3
2	BSC	B0201	Basic Electrical and Electronics Engineering	3	-	-	3
3	BSC	B0B02	Probability and Statistics	3	1	-	3
4	ESC	B0504	Python Programming	3	1	-	4
5	ESC	B0506	Python Programming Lab	1	-	4	2
6	HSMC	B0H02	English Language and Communications Skills Lab	-	-	2	1
7	BSC	B0202	Basic Electrical and Electronics Engineering Lab			2	1
8	ESC	B1201	Engineering and IT workshop	-	1	2	2
			Total	14	3	11	19
			Total Contact Hours	28			

			III SEMESTER				
S. No	Category	Course Code	Course Title	L	T	P	Credits
1	PCC	B0507	Discrete Mathematics	3	-	-	3

2	PCC	B0508	Computer Organization and Architecture	3	-	-	3
3	PCC	B0509	Data Structures	3	-	-	3
4	PCC	B6601	Fundamentals of Artificial Intelligence	3	-	-	3
5	PCC	B0510	Object Oriented Programming	3	-	-	3
6	PCC	B0512	Data Structures Lab	-	-	3	1.5
7	PCC	B6602	Applications of Artificial Intelligence Lab	-	1	2	2
8	PCC	B0513	Object Oriented Programming Lab	-	-	3	1.5
9	MC	B00M1	Gender Sensitization	-	-	2	-
10	AC	B00A2	INTERNSHIP – I	-	-	-	-
11	AC	B00A4	NPTEL-I	-	-	2	-
			Total	**15**	**1**	**12**	**20**
			Total Contact Hours		**28**		

IV SEMESTER

S. No	Category	Course Code	Course Title	L	T	P	Credits
1	BSC	B0B07	Applied Statistics and Optimization Techniques	3	-	-	3
2	PCC	B0516	Design and Analysis of Algorithms	3	-	-	3
3	PCC	B6603	Machine Learning Foundations	3	-	-	3
4	PCC	B0511	Operating Systems	3	-	-	3
			Professional Elective –I				
5	PEC-I	B6604	Image Processing	3	-	-	3
		B0522	**Computer Graphics**				
		B0517	Mobile Application Development				
6	PCC	B0521	Design and Analysis of Algorithms Lab	-	0	3	1.5
7	PCC	B6605	Machine Learning Foundations Lab	-	-	3	1.5
8	PCC	B0514	Operating Systems Lab	-	1	2	2
9	MC	B00M2	Environmental Science	2	-	-	-
10	AC	B00A5	NPTEL-II	-	-	2	-
11	AC	B00A6	Co-curricular Activity - I	-	-	1	-
			Total	17	1	11	**20**
			Total Contact Hours		29		

MR21-V SEMESTER

S.No	Category	Course Code	Course Title	L	T	P	Credits
1	HSMC	B0H09	Management Fundamentals	3	-	-	3
2	PCC	B6607	Introduction to Data Visualization	3	-	-	3
3	PCC	B6608	Advanced Machine Learning	3	-	-	3
4	PCC	B0515	Database Management Systems	3	-	-	3

5	PEC-II	B6614	IoT with Machine Learning	3	-	-	3
		B0542	Streaming data Analytics				
		B0528	Semantic Web				
		B0527	**Cloud computing**				
		B6612	Rapid development for AI				

<table>
<tr><td colspan="4" align="center">Professional Elective –II</td><td></td><td></td><td></td><td></td></tr>
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S.No	Category	Course Code	Course Title	L	T	P	Credits
			Professional Elective –II				
5	PEC-II	B6614	IoT with Machine Learning	3	-	-	3
		B0542	Streaming data Analytics				
		B0528	Semantic Web				
		B0527	**Cloud computing**				
		B6612	Rapid development for AI				
			Professional Elective –III				
6	PEC-III	**B0533**	**Distributed Systems**	3	-	-	3
		B0531	Animation Techniques				
		B0547	Internet of Things				
		B6613	Data Analytics				
		B0546	Block chain Technologies				
7	PCC	B0520	Database Management Systems Lab	-	1	2	2
8	PCC	B6609	Introduction to Data Visualization Lab	-	-	3	1.5
9	MC	B00M3	Quantitative Aptitude and Verbal Reasoning - I	2	-	-	-
			Total	20	-	6	21.5
			Total Contact Hours :26				

MR21-VI SEMESTER

S.No	Category	Course Code	Course Title	L	T	P	Credits
1	HSMC	B0H08	Engineering Economics and Accountancy	3	-	-	3
2	PCC	B6201	Computer Networks	3	-	-	3
3	PCC	B6610	Computer Vision	3	-	-	3
			Professional Elective -IV				
5	PEC-IV	B1212	Information Retrieval Systems	3	-	-	3
		B6612	Information Security				
		B0529	Scripting Languages				
		B6613	Pattern Recognition				
		B0537	**NLP (MOOC's/ NPTEL)**				
6	**OEC**	B0159	**Green Buildings**	3	-	**-**	3
7	HSMC	B0H03	English Communication and Presentation Skills Lab	-	-	2	1
7	PCC	B6202	Computer Networks Lab	-	-	3	1.5
8	PCC	B6611	Computer Vision Lab	-	-	2	1
9	MC	B00M4	Quantitative Aptitude and Verbal Reasoning – II	1	1	-	-
			Total	16	2	8	18.5
			Total Contact Hours		26		

VII SEMESTER

S.No	Category	Course Code	Course Title	L	T	P	Credits
1	HSMC	B0536	Data mining	3	-	-	3
2	PCC	B0550	Big Data Analytics	3	-	-	3
3	PCC	B6621	Introduction to Deep Learning	3	-	-	4
4			**Professional Elective -V**				

		B6641	**Business Analytics and Generative AI**				
	PEC-V	B6203	Cryptography and Network Security	3	-	-	3
		B0524	Theory of Automata				
		B6616	Neural networks and fuzzy logics				
		B6617	Statistical Machine Learning				
5	OEC-I		**Open Elective-II**	3	-	-	3
7	PCC	B0544	Data Mining Lab	-		4	1.5
8	PCC	B0559	Big Data Analytics lab	-		4	1.5
9	MC	B00P1	Internship / Mini project		-	4	2
			Total	15		12	21
			Total Contact Hours		27		

VIII SEMESTER							
S.No	Category	Course Code	Course Title	L	T	P	Credits
1			**Professional Elective -VI**				
	PEC -VI	B0556	Software Process & Project Management	3	-	-	3
		B1202	Web Technologies				
		B6618	Applied Machine Learning				
		B6619	Digital Forensics				
		B6620	AI based Cyber Security				
2	OEC-III		**Open Elective-III**	3	-	-	3
3	PRJ	B00P3	Seminar	-	-	2	1
4	PRJ	B00P2	MAJOR PROJECT	-	-	24	12
			Total	6	-	26	19
			Total Contact Hours		32		

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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: B0B01	**Linear Algebra and Numerical Methods** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	L	T	P
Credits: 4		3	1	-

Prerequisites: Matrices, Differentiation and Integration.

Course Objectives:

1. To learn types of matrices, Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
2. To learn concept of Eigen values and Eigen vectors of a matrix, diagonalization of a matrix, Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. To learn various methods to find roots of an equation.
4. To learn Concept of finite differences and to estimate the value for the given data using interpolation.
5. To learn Solving ordinary differential equations and evaluation of integrals using numerical techniques.

MODULE I: Matrix Algebra [12 Periods]

Vector Space, basis, linear dependence and independence (Only Definitions)
Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew- Hermitian; orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; solving system of Homogeneous and Non-Homogeneous linear equations, LU – Decomposition Method.

MODULE II: Eigen Values and Eigen Vectors [12 Periods]

Eigen values, Eigen vectors and their properties; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem; Singular Value Decomposition.

Quadratic forms: Nature, rank, index and signature of the Quadratic Form, Linear Transformation and Orthogonal Transformation, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method.

MODULE III: Algebraic &Transcendental equations [12 Periods]

(A) Solution of Algebraic and Transcendental Equations: Introduction-Errors, types of errors. Bisection Method, Method of False Position, Newton-Raphson Method.

(B) The Iteration Method, Ramanujan's method to find smallest root of Equation. Jacobi's Iteration method. Gauss seidel Iteration method.

MODULE IV: Interpolation [12 Periods]

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences -Central differences - Symbolic relations and separation of symbols. Differences of a polynomial-Newton's formulae for interpolation; Central difference interpolation Formulae – Gauss Central Difference Formulae; Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

MODULE V: Numerical solution of Ordinary Differential Equations and Numerical Integration **[12 Periods]**
Numerical solution of Ordinary Differential Equations: Introduction-Solution of Ordinary Differential Equation by Taylor's series method - Picard's Method of successive Approximations - Euler's Method-Modified Euler's Method – Runge-Kutta Methods.
Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd Rule, Simpson's 3/8 Rule.

TEXT BOOKS
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. M . K Jain, S R K Iyengar, R.K Jain, Numerical Methods for Scientific and Engineering Computation, New age International publishers.
5. S.S. Sastry, Introductory Methods of Numerical Analysis,5th Edition, PHI Learning Private Limited

REFERENCES
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,
Reprint, 2008.
3. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

E – RESOURCES
1. https://www.youtube.com/watch?v=sSjB7ccnM_I (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=h5urBuE4Xhg (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=9y_HcckJ96o (Quadratic forms)
4. https://www.youtube.com/watch?v=3j0c_FhOt5U (Bisection Method)
5. https://www.youtube.com/watch?v=6vs-pymcsqk (Regula Falsi Method and Newton Raphson Method)
6. https://www.youtube.com/watch?v=1pJYZX-tgi0 (Interpolation)
7. https://www.youtube.com/watch?v=Atv3IsQsak8&pbjreload=101   (Numerical Solution of ODE)
8. https://www.youtube.com/watch?v=iviiGB5vxLA (Numerical Integration)

NPTEL
1. https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2B_T&index=5 (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=wrSJ5re0TAw (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=yuE86XeGhEA (Quadratic forms)
4. https://www.youtube.com/watch?v=WbmLBRbp0zA (Bisection Method)
5. https://www.youtube.com/watch?v=0K6olBTdcSs (Regula Falsi and Newton Raphson Method)
6. https://www.youtube.com/watch?v=KSFnfUYcxoI (Interpolation)
7. https://www.youtube.com/watch?v=QugqSa3Gl-w&t=2254s (Numerical Solution of ODE)
8. https://www.youtube.com/watch?v=NihKCpjx2_0&list=PLbMVogVj5nJRILpJJO7KrZa8Ttj4_ZAgl

(Numerical Solution of ODE)
9. https://www.youtube.com/watch?v=hizXlwJO1Ck (Numerical Integration)

Course Outcomes:
1. The student will be able to find rank of a matrix and analyze solutions of system of linear equations.
2. The student will be able to find Eigen values and Eigen vectors of a matrix, diagonalization a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. The student will be able to find the root of a given equation by various methods.
4. The student will be able to estimate the value for the given data using interpolation.
5. The student will be able to find the numerical solutions for a given ODE's and evaluations of integrals using numerical techniques.

CO- PO Mapping

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	2	3	3				2			1
CO2	2	2	2	3	2				2			1
CO3	2	2	2	3	2				2			1
CO4	3	2	2	3	3				2			2
CO5	2	2	2	3	3				2			2

Course objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction path way mechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

Module I: Water and its treatment   **[10 Periods]**

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA method. Boiler troubles - Scale & Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - Lime Soda process (cold & hot) and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonization. Desalination by Reverse osmosis and its significance.

Module II: Molecular structure and Theories of Bonding: **[10 Periods]**

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of diatomic molecules -, N_2 ,O_2 and F_2. Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral ($[CoF_6]^{3-}$ and $[Co(CN)_6]^{3-}$) and tetrahedral ($[NiCl_4]^{2-}$ and $[Ni (CO)_4]$) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion

A. Electrochemistry: **[7 Periods]**

Introduction to Electrochemistry-Conductance (Specific and Equivalent) and units. Types of cells-electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential- cell potential (EMF).Electrochemical series and its applications, Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode and Glass electrode-determination of pH using glass electrode. Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

B. Corrosion: [7 Periods]

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

Module IV: Stereochemistry, Reaction mechanism & synthesis of drug molecules and NMR spectroscopy: [12 Periods]

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN^1 & SN^2) and (E_1&E_2) reactions with suitable example. Ring opening (Beckmann rearrangement), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Aspirin and their applications.
Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift and spin-spin splitting.

UNIT-V   Fuels and Combustion [08 Periods]

Fuels: Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG. **Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.

Text Books:

1. P.C.Jain and Monica Jain, "**A Text Book of Engineering Chemistry**", DhanpatRai Publications, New Delhi, 16th Edition 2014.
2. S.S. Dara and S.S. Umare, "**A Text Book of Engineering Chemistry**", S Chand Publications, New Delhi, 12th Edition 2010.
3. A.Jaya Shree, "Text book of Engineering Chemistry", Wiley, New Delhi, 2018.

Reference Books:

1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, **"Text Book of Engineering chemistry"**, Cengage Learning India Pvt.Ltd,2016.
2. M.G. Fontana and N. D. Greene, "**Corrosion Engineering**", McGraw Hill Publications, New York, 3rd Edition, 1996.
3. K. P. C. Volhardt and N. E. Schore, **"Organic Chemistry: Structure and Function"**, 5th Edition, 2006.

e-Resources:

a) Concerned Website links:

1) https://books.google.co.in/books?isbn=0070669325 (Engineering chemistry by Sivasankar).
2) https://www.youtube.com/watch?v=yQUD2vzfgh8 (Hot dipping Galvanization).
3)https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic
   _Chemistry_Structure_Function_6th_djvu.txt.

b) Concerned Journals/Magazines links:

1) http://americanhistory.si.edu/fuelcells/sources.htm (Fuel Cell Information Sources)
2) https://www.abctlc.com/downloads/courses/WaterChemistry.pdf (Water Chemistry)

c) NPTEL Videos:

1) nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)
2) https://www.youtube.com/watch?v=V7-8EOfZKeE (Stereochemistry)

Course Outcomes:

After completion of the course students will be able to:

1. Understand water treatment, specifically hardness of water and purification of water by various methods.
2. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity.
3. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.
4. Acquire basic knowledge on the concepts of stereochemistry, reaction mechanisms and interpretation of NMR in organic molecules.
5. Acquire the knowledge of various fuels and identify a better fuel source of less pollution.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. I Semester	
Code: B0501	**Programming for Problem Solving** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisites: NIL

Course Objectives:
1. Understand the basic terminology, write, compile and debug programs in computer programming
2. Implement different control statements for solving problems.
3. Understand the concept of structured program and arrays.
4. Implement the idea of strings and pointers.
5. Analyse the usage of structures and different file operations.

MODULE I: Fundamentals and Introduction to 'C' Language   [10 Periods]
Introduction Fundamentals– Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

Introduction to 'C' Language: – Background, C-tokens- Keywords, Identifiers, Basic data types, Variables, Constants, Preprocessor directives-include, define, Managing   Input / Output functions - formatted input / output functions, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Simple C Programming examples.

MODULE II: Conditional Statements and Repetition Statements   [09 Periods]
Conditional Statements: Simple if statement, if-else statement, if-elseif- ladder, nested if-else, Dangling else problem, switch statements.

Repetition statements – while, for, do-while statements, nested looping, other statements related to looping – break, continue, goto, Simple C Programming examples.

MODULE III: Designing Structured Programs and Arrays   [10 Periods]
Designing Structured Programs-Introduction to function, Advantages, user defined functions, inter function communication-call by value, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion – recursive functions-Towers of Hanoi problem.

Arrays: Basic Concepts, Types of arrays, applications- Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods, arrays and functions.

MODULE IV: Strings and Pointers   [09 Periods]
Strings: Concepts, String Input / Output functions, arrays of strings, string manipulation functions, string conversion, C program examples.

Pointers – Basic Concepts, Pointers for inter function communication-call by reference, pointers to pointers, Pointer arithmetic, array of pointers, pointers to array, applications, pointers to void, pointers to functions, Dynamic memory allocation functions.

MODULE V: Structures and File Handling   **[10 Periods]**
Structures – Declaration, definition and initialization of structures, accessing structure elements, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, difference between structures and union, typedef, bit fields, enumerated types, C programming examples.

Files – Basic Concept of a file, file input / output operations, text files and binary files, file status functions (error handling), Random file access functions, command –line arguments.
C program examples.

TEXTBOOKS
1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES
1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
2. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

E–RESOURCES
1. http://oxford university press.ac.in/eBooks/ Programming in C.
2. https://www.journals.elsevier.com/science-of-computer-programming
3. http://www.ejournalofsciences.org
4. http://onlinecourses.nptel.ac.in/iiitk_cs-101
5. http://onlinevideolecture.com/ebooks/?subject=C-Programming

Outcomes:
At the end of the course, students will be able to
1. Translate the algorithms/flowcharts to programs (in C language).
2. Decompose a problem into functions and to develop modular reusable code.
3. Apply different types of control structures and arrays in a computer programming.
4. Develop programs that make use of concepts such as strings, pointers and structures.

Cos	Programme Outcomes (POs)													PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3	3	2	2	2				2	1	1	3	3	2	2	
CO2	3	3	2	2	2				2	1	1	3	3	2	1	
CO3	3	3	3	2	2				1			3	3	2	1	
CO4	3	2	3	2	2				1		1	2	3	2	1	
CO5	3	3	3	2	2				1	1	1	2	3	2	1	

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

5. Analyse file operations and command line arguments.

Prerequisites: NIL

Course Objectives:
To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

MODULE I: DC Circuits   **[09 Periods]**
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

MODULE II: AC Circuits   **[09 Periods]**
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

MODULE III: Introduction to Electrical Machines   **[10 Periods]**
A: DC Machines: Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation – Brake Test - Characteristics.

B: AC Machines: Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors - Brake test on 3-Phase Induction Motor – Applications.

MODULE IV: P-N Junction Diode   **[10 Periods]**
P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.

Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

Filters: Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

MODULE V: BJT and Junction Field Effect Transistor (JFET)   **[10 Periods]**
Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations

Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

TEXT BOOKS
1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, "Basic Electrical and Electronics Engineering", S.Chand and Company Limited, New Delhi, 1st Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, "Electronic Devices & Circuit Theory", Pearson Education, 2007.

REFERENCES
1. V.K. Mehtha and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Co., 2009.
2. Jacob Milliman, Christos C. Halkias, Satyabrata Jit (2011), "Electronic Devices and Circuits", 3rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - RESOURCES
1. https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/
2. https://www.eeweb.com/passives
3. http://nptel.ac.in/courses/108108076/
4. http://nptel.ac.in/downloads/108105053/

Course Outcomes:
At the end of the course, students will be able to:
1. Apply basic laws in electrical circuit.
2. Analyze the single phase circuits
3. Comprehend the construction and Operation of DC and AC machines
4. Know the practical importance of Diode and its characteristics
5. Recognize the construction and operation of BJT and JFET

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak. Programme Outcomes (POs). PSOs.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. I Semester	
Code: B0B18	**Engineering Chemistry Lab** (Common for CE, EEE, ME, ECE, CSE, CSE(AIML), CSE(DS), CSE (CS), CSE(IOT), IT and Min.E))	**L**	**T**	**P**
Credits: 1		-	-	2

Course Objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

List of Experiments:

1. Calibration of Volumetric apparatus.

2. Estimation of Total Hardness of water by EDTA Method.

3. Estimation of an acid by P^H metry.

4. Estimation of alkalinity of water.

5. Estimation of strength of an acid by Conductometry.

6. Estimation of strength of an acid by Potentiometry.

7. Estimation of Mn^{+2} ion in $KMnO_4$ by Colorimetry.

8. Determination of viscosity of given liquids by Ostwald's viscometer.

9. Determination of surface tension of given sample using stalagmometer.

10. Estimation of iron (II) by dichrometry.

11. Determination of rate constant of hydrolysis of methyl acetate.

12. Preparation of Aspirin.

Course outcomes:

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

1. Estimate the hardness of given water samples.

2. Select lubricants for various purposes.

3. Prepare advanced polymers & drug materials.

4. Know the strength of an acid present in batteries.

5. Calculate the amount of Mn^{+2} present in unknown substances/ores using instrumental methods.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: B0202	**Basic Electrical and Electronics Engineering Lab** (Common for ALL)	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Course Objectives:

To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyse the performance of DC Motors, AC Motors and Transformers.

List of Experiments:

1. Verification of Kirchhoff's Laws.

2. Verification of Maximum Power Transfer Theorem.

3. Determination of Phase Angle for RC series circuit.

4. Brake Test on DC-Shunt Motor. Determination of Performance curves

5. Load Tests on Single Phase Transformer

6. Brake Test on Three Phase Induction Motors. Determination of Performance curves

7. V-I Characteristics of PN junction Diode

8. V-I Characteristics of Zener Diode

9. Half Wave Rectifier and Full Wave rectifier.

10. Input and Output characteristics of BJT with CE configuration

11. Input and Output characteristics of BJT with CB configuration

12. Input and Output Characteristics of JFET.

Course Outcomes:

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

1. Analyze electrical circuits by applying basic laws

2. Analyze the performance of DC Motor, three phase Induction motor and transformer

3. Understand V-I Characteristics of various diodes

4. Design Different Rectifier Circuits

5. Differentiate the Transistors and their Operations

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. I Semester	
Code: B0502	**Programming for Problem Solving Lab** (Common for ALL)	L	T	P
Credits: 1.5		-	-	3

Prerequisites: NIL

Objectives:
1. Understand the various steps in Program development
2. Identify syntax and semantics of C Programming Language
3. Illustrate the usage of structured programming approach in solving problems.
4. Develop programs that make use of arrays, strings, pointers and structures in C language
5. Analyse different file operations

Software Requirements: C
List of Programs:
1. a. Practice various Internal and External DOS Commands.
   b. Write sample examples of C programs to implement basic operations.
2. a. Write a C program to find smallest and largest of given three numbers.
   b. Write a C program to find the roots of a quadratic equation.
   c. Write a C program to check whether given character is alphabet, digit or special symbol
3. a. Write a C program to find the sum of individual digits of a positive integer.
   b. Write a C program to generate the first 'n' terms of the sequence.
      [A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.]
4. a. Write a C program to find whether the given number is palindrome, perfect, Armstrong or strong.
   b. Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.
5. Write C programs that use both recursive and non-recursive functions
   a. To find the factorial of a given integer.
   b. To find the GCD (greatest common divisor) of two given integers.
6. a. Write a C program to find both the largest and smallest number in a list of integers.
   b. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search.
   c. Write a C program that uses recursive and non -function to search for a Key value in a given sorted list of integers using Binary search.

7.
  a. Write a C program that implements the Bubble sort method to sort a given array of integers in ascending order.
  b. Write a C program that implements the Selection sort method to sort a given list of names in ascending order.

8. Write a C program to perform the following:
  a. Addition of Two Matrices
  b. Multiplication of Two Matrices.

9. Write a C program that uses functions to perform the following operations:
  a. To insert a sub-string into given main string from a given position.
  b. To delete n characters from a given position in a given string.
  c. To find substring in a given string

10.
  a. Write a C program to determine if the given string is a palindrome or not
  b. Write a C program to count the lines, words and characters in a given text.

11.
  a. Write a C program to swap two numbers, which implement call by value and call by reference.
  b. Write a C program to display the below student details using structures

Roll Number	Name	Gender	Branch	Attendance percentage
501	John	male	CSE	77.3
502	Alice	male	ECE	80.5
503	Sam	female	IT	90.7

  c. Write a C program to find grade of a student using structures.

12.
  a. Write a C program which copies one file to another
  b. Write a C program to find sum of two numbers using command line arguments

13.
  a. Develop a mini project which implement the Library Management System
  b. Develop a mini project which implement the Student Record System

TEXT BOOKS:
a. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press
b. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
c. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:
a. C Programming & Data Structures, B.A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
b. C for Engineers and Scientists, H. Cheng, Mc. Graw-Hill International Edition
c. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

Outcomes:
At the end of the course, students will be able to
1. Analyze concepts in problem solving and write diversified solutions for a given problem.
2. Identify situations where computational methods and computers would be useful.

Cos	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3										2	2	
CO2	3	3	3										2	2	
CO3	2	2	2										2	2	

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

3. Understand the programming tasks using techniques learned and write pseudo-code.
4. Compare the program on a computer, edit, compile, debug, correct, recompile and execute it.
5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task

Pre requisites: NIL

Course Objectives:
- To understand the usage of hand tools, acquire the skills in model / pattern making and familiarize with various work materials and tools.
- The IT Workshop is a training lab course to get training on PC Hardware, Internet & World Wide Web, and Productivity tools for documentation, Spreadsheet computations, and Presentation.
- To introduce to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers, hardware and software level troubleshooting process.
- To introduce connecting the PC on to the internet from home and workplace and effectively usage of the internet, Usage of web browsers, email, newsgroups and discussion forums. To get knowledge in awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
- To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools and LaTeX.

Engineering Workshop:
Problem 1: Trades for Exercises
At least two exercises from each trade
1. House-wiring
2. Soldering

Problem 2: Trades for Demonstration & Exposure
1. Carpentry
2. Wood working lathe

PC Hardware:
The students should work on working PC to disassemble and assemble to working condition and install operating system like Linux or any other on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.

Problem 3:
Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Problem 4:
Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

Problem 5:
Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Problem 6:
Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. Internet & World Wide Web.

Productivity tools: LaTeX and Word Word Orientation: An overview of LaTeX and Microsoft (MS) office / equivalent (FOSS) tool word should be learned: Importance of LaTeX and MS office / equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that should be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Problem 7:
Using LaTeX and Word to create project certificate. Features to be covered: -Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Problem 8:
Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Problem 9:
Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

Problem 10:
Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: -Gridlines, Format Cells, Summation, auto fill, Formatting Text

Problem 11:
Calculating GPA -. Features to be covered: -Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

Problem 12:
Creating Power Point: Student should work on basic power point utilities and tools in Latex and MS Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts

REFERENCE BOOKS:
1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion –Leslie Lamport, PHI/Pearson.
3. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
4. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme.–CISCO Press, Pearson Education.
5. PC Hardware and A+ Handbook –Kate J. Chase PHI (Microso

Course Outcomes:
1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments along with the understanding of house wiring components.
2. Apply knowledge for computer assembling and software installation and ability how to solve the trouble shooting problems.
3. Apply the tools for preparation of PPT, Documentation and budget sheet etc.

<table>
<tr><td colspan="17" align="center">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12" align="center">Programme Outcomes (POs)</td><td colspan="3" align="center">PSOs</td></tr>
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</table>

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: B0H01	**ENGLISH**	**L**	**T**	**P**
Credits: 3	(Common for CE, EEE, ME, ECE, CSE, CSE (AIML), CSE (DS), CSE (CS), CSE(IOT), IT and Min.E)	**3**	**-**	**-**

Course Objectives:

The objective of this course is to improve the English Language and Literary competence of the students. The course provides requisite insights into grammar, vocabulary, prose, and short stories. Further, it also helps in developing the skills of Reading and Writing. The course also equips students to study their academic subjects more effectively using the theoretical and practical components of the English language and literature.

MODULE – I
Speech   : "Go Kiss the World" by Subroto Bagchi
Poem   : **"**Leisure" by W. H. Davies
Vocabulary : Formation of Words, Prefixes, Suffixes, and Root Words
Grammar   : Articles and Prepositions
Reading   : Skimming and Scanning
Writing   : Introduction to Writing Skills, Characteristics of Effective Writing

MODULE – II
Short story : "Gift of Magi" by O' Henry
Poem   : **"**No Man is an Island" by John Donne
Vocabulary : One Word Substitutions; Synonyms and Antonyms
Grammar   : Degrees of Comparison, Voice – Exercises
Reading   : Intensive Reading and Extensive Reading
Writing   : Paragraph Writing- Cohesive devices; Jumbled Sentences; Punctuation

Module – III
Essay   : "Lucidity, Simplicity, Euphony" by W. Somerset Maugham
Poem   : **"**The Mask" by Maya Angelou
Grammar   : Tense and Aspect
Vocabulary : Homonyms, Homophones, Homographs
Reading   : Reading for Topic and Theme
Writing   : Letter Writing

MODULE – IV
Short story : "The Night Train at Deoli" by Ruskin Bond
Poem   : **"**Gift of India" by Sarojini Naidu
Grammar   : Question Tags; Concord
Vocabulary : Idiomatic Expressions; Phrasal Verbs
Reading   : Reading for Interpretation
Writing   : Essay Writing, Describing, Defining and Classifying

MODULE – V
Essay : "Toasted English" by R. K. Narayan
Poem : "If" by Rudyard Kipling
Grammar : Direct and Indirect Speech, Misplaced Modifiers
Vocabulary : Redundancies and Clichés
Reading : Reading for Specific Purposes, Reading Comprehension practice
Writing : Paraphrasing & Summarizing,
* Exercises from the texts not prescribed shall also be used for classroom tasks.

Prescribed Textbook:

Reference Books:
1. Azar, Betty and <u>Stacy A, Hagen</u>. *Understanding and Using English Grammar*. 4th edition, Foundation Books, 2009.
2. Chaudhuri, Santanu S. *Learn English: A Fun Book of Functional Language, Grammar and Vocabulary.* Tata McGraw Hill Education, New Delhi, 2013.
3. Eastwod, John. <u>*Oxford Guide to English Grammar.* 4th edition,</u> <u>Oxford University Press, 1994.</u>
4. Field, Marion. *Improve Your Written English*. 5th Edition. How to Books, UK, 2009.
5. Leech, Geoffrey and Svartvik, J. *A Communicative Grammar of English*. 3rd edition, Routledge, 2013.

Related Websites:
1. http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes
2. http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd.
3. <u>http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf</u>.

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

1. use written and spoken English considerably well for academic purposes.

2. communicate in Enrich accurately and fluently.

3. employ extensive and intensive reading skills.

4. gain confidence in writing for academic and real life situations.

5. use standard grammar, punctuation, and spelling in technical documents.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester	
Code:B0B02	**Probability and Statistics** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: Basic Probability
Course Objectives:
1. Define event, outcome, trial, simple event, sample space and calculate the probability that an event will occur.
2. To learn the random variables and its distributions.
3. Statistical analyses are very often concerned with the difference between means.
4. Investigate the variability in sample statistics from sample to sample
5. Identify the direction and strength of a linear correlation between two factors.

MODULE I: Probability: [12 Periods]
Introduction to Probability**:** Events, sample space, mutually exclusive events. Exhaustive events. Addition theorem for 2& n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem. Boole's inequality, Baye's Theorem.

MODULE II: Random variables: [12 Periods]
Discrete Probability distributions. Bernoulli, Binomial, Poission, Geometric distributions of their mean and variance, moment generating function–related problems. Continuous probability distributions: Normal distribution, Uniform distribution of their mean and variance, moment generating function, Central Limit theorem.

MODULE III: Sampling Distributions: [14 Periods]
(A) Definitions of population-sampling-statistic, parameter. Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, point estimation and interval estimation
(B) Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, two-sided test.
Large sample tests:
(i)Test of significance for single mean
(ii) Test of significance for difference of means
(iii) Test of significance for single proportion
(iv) Test of significance for difference of proportions

MODULE IV: Small sample tests: [12 Periods]
Student t-distribution, its properties and its assumptions, Test of significance difference between sample mean and population mean; difference between means of two small samples, Snedecor's, F- distribution and its properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit, Independence of attributes.

MODULE V: Correlation, Regression: [10 Periods]

Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The lines of regression: simple regression. Multiple regression for three variables.

TEXT BOOKS
1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Mayer Introductory Probability and Statistical Applications, John Wiley Publications.
3. Monte Geometry, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

REFERENCES
1. P. G. Hole, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

E – RESOURCES

a) Concerned Website links:

1. http://www.csie.ntu.edu.tw/~sdlin/download/Probability%20&%20Statistics.pdf(Probability& Statistics for Engineers & Scientists text book)
2. http://www.stat.pitt.edu/stoffer/tsa4/intro_prob.pdf   (Random variables and its distributions)
3. http://users.wfu.edu/Cottrell/ecn215/sampling.pdf (Notes on Sampling and hypothesis testing)

b) Concerned Journals/ Magazines links:
1. http://www.pnas.org/content/93/9/3772.full.pdf (Hypothesis testing and earthquake prediction)
2. http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=2373&context=tqr(Sampling Theory)
3. https://sci-hub.cc/10.1111/j.1540-6261.1996.tb05219.x (probability Distributions)

c) NPTEL Videos:
1. http://nptel.ac.in/courses/117105085/ (Introduction to theory of probability)
2. http://nptel.ac.in/courses/117105085/9 (Mean and variance of random variables)
3. http://nptel.ac.in/courses/111105041/33 (Testing of hypothesis)

Course Outcomes:
1. The students will understand and appreciate the role of P&S in data analytics and big data analysis.
2. Students would be able to find the Probability in certain realistic situation
3. Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables Involved in the probability models. It is quite useful for all branches of engineering.
4. The student would be able to calculate mean and proportions (large and small sample) and to make Important decisions from few samples which are taken out of unmanageably huge populations.

5. Students will understand how to forecast the future observations.

CO- PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3		3		2	2			1
CO2	3	3	3		2			2	1	1	1
CO3	3	2	3		2	1	1	1			1
CO4	3	2	2	2	2	2		3	1	1	3
CO5	3	3	2	1	3	1	2	2	1	1	3

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: B0B09	**Semiconductor Physics**	L	T	P
Credits: 4	(Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	3	1	-

Prerequisites: Fundamentals of Physics

Course Objectives:
The main objective of this course is to provide an adequate exposure and develop insight about the basic principles of quantum mechanics and semiconductor physics along with their possible applications in various branches of engineering.

Module – I: Quantum Mechanics [8 Periods]
Introduction, Discussion on Black body radiation spectrum; Louis de Broglie's concept of matter waves; Davisson and Germer experiment; G P Thomson Experiment; Schrodinger's time independent wave equation; Physical significance and properties of wave function; Heisenberg's uncertainty principle - Why an electron cannot exist inside the nucleus?; Particle in one dimensional infinite potential well.

Module – II: Band Theory of Solids [8 Periods]
Qualitative discussion of Classical free electron theory; Qualitative treatment of Fermi - Dirac distribution function; Qualitative discussion of Quantum free electron theory; Density of energy states; Bloch theorem; Qualitative treatment of Kronig - Penney model; E Vs k relationship; Origin of energy band gap; Classification of materials into Conductors, Semi conductors and insulators; Concept of Effective mass.

Module –III: Semiconductor Physics [13 Periods]
A: Elemental and compound semiconductors; Intrinsic and Extrinsic Semiconductors; Expression for carrier concentration in intrinsic and extrinsic semiconductors; Qualitative treatment of Fermi energy level in Intrinsic and extrinsic semiconductors.
B. Direct and indirect band gap semiconductors; Carrier generation and Recombination; Drift and Diffusion; Equation of Continuity; P-N Junction diode - Formation & V-I Characteristics; LED - Construction and Working Principle; Solar Cell - Construction & I-V Characteristics.

Module – IV [12 Periods]
LASER: Introduction, Characteristics of LASER; Absorption, Spontaneous and Stimulated emission; Einstein's coefficients derivation; Population inversion; Pumping mechanisms; Basic components of a LASER system; three and four level LASER systems; Ruby LASER, He-Ne LASER, Semiconductor diode LASER (Homo junction and hetero junction); Applications of LASER - Computers, Medical, Military.

Optical Fibers: Introduction to Optical fibers; Total Internal Reflection; Acceptance angle and acceptance cone, Numerical aperture; types of optical fibers; Losses in optical fibers - absorption losses, scattering losses and bending losses; Applications of optical fibers - Communications, Level Sensor, LASER angioplasty.

Module – V: Introduction to Digital Electronics   [9 Periods]

Different types of number systems, Binary logic; Boolean algebra - Basic theorems and properties of Boolean algebra; Boolean functions; logic gates – construction and working of AND, OR, NOT, NAND, NOR and XOR using discrete components.

Integrated circuits: Levels of integration - SSI, MSI, LSI and VLSI; basic IC logic gates - AND, OR, NOT, NAND, NOR and XOR.

Course Outcomes:

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

1. Explain the dual nature of the matter and evaluate the energy of a particle trapped in 1D infinite potential well.
2. Classify the materials into conductors, semiconductors and insulators based on the outcomes of Kronig - Penney model.
3. Analyze the working of semiconductor devices like PN junction diode, LED and Solar cell.
4. Explain the working of three LASERs.
5. Explain the applications of LASER and optical fibers.
6. Describe the Boolean algebra and examine various logic gates.

Text Books:

1. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics'' Volume I & II, S. Chand, 1st Edition, 2017.
2. Jasprit Singh, "Semiconductor Optoelectronics: Physics and Technology", McGraw-Hill, 1995.
3. Morris Mano, "Digital Design", Prentice - Hall, 1995.

Reference Books:

1. P K Palanisamy, **"Engineering Physics"**, SciTech Publication, 4th Edition, 2014.
2. B K Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India Revised Edition, 2014.
3. P Horowitz and W. Hill, "The Art of Electronics" Cambridge University Press, 3rd edition, 2015.
4. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.
5. P Bhattacharya, "**Semiconductor Optoelectronic Devices**", Prenticehall of India,1997

e-RESOURCES

1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering _Physics
2. https://www.researchgate.net/publication/292607115_Applied_Physics
3. https://www.livescience.com/33816-quantum-mechanics-explanation.html

Journals :

1. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational +physics/journal/40094
2. http://www.springer.com/physics/journal/340

NPTEL VIDEOS:

1. http://nptel.ac.in/courses/113104012/
2. https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUF ChSiCj7jBidO0&index=29
3. https://www.youtube.com/watch?v=4a0FbQdH3dY

Course Objectives: This course will enable students to

1. Learn syntax and semantics along with the basic data structures of Python
2. Handle modules, files and exceptions in Python.
3. Understand regular expressions and multithreaded programming in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build GUI programming and web programming in Python.

MODULE - I [10 Periods]

Python Basics, Getting started, Python Objects, Numbers, Sequences: Strings, Lists, Tuples, Set and Dictionary. Conditionals and Loop Structures

MODULE - II [9 Periods]

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Why Exceptions, Why Exceptions at All? Exceptions and the sys Module.

MODULE - III [10 Periods]

Regular Expression (RE): Introduction, Special Symbols and Characters, REs and Python.

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

MODULE – IV [10 Periods]

Classes and Object-Oriented Programming (OOP): OOP, Classes, Class Attributes, Instances, Instance Attributes, Binding and Method Invocation, Composition, Subclassing and Derivation, Inheritance, Built-in Functions for Classes, Instances, and Other Objects, Types vs. Classes/Instances, Customizing Classes with Special Methods, Privacy, Delegation and Wrapping

MODULE - V [9 Periods]

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

Web Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers

TEXT BOOKS

1. Wesley J. Chun, Core Python Programming, Second Edition, Prentice Hall, 2007.
2. Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2011.

REFERENCE BOOKS

1. Allen B. Downey, "Think Python, How to think like a Computer Scientist", First Edition, O'reilly Publishing, 2018.
2. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson India, 2017.
3. Mark Lutz, "Learning Python", Fifth Edition, O'rielly Publishers, 2013.

E–RESOURCES

1. "Learn Python - Free Interactive Python Tutorial", https://www.learnpython.org/
2. "Free Python Tutorial - Python For Beginner," https://www.udemy.com/share/101EfoB UcccV1SQHw
3. "Basics of Python for Data Science", https://olympus.greatlearning.in/courses/11265
4. "Beginners Guide / Programmers - Python Wiki", https://wiki.python.org/moin/Beginn ersGuide/Programmers
5. "Introduction to Python", https://www.datacamp.com/courses/intro-to-python-for-data-science

Course Outcomes

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling modules, strings and file systems.
3. Create, run and manipulate Python Programs using regular expressions and multithreaded programming environments.
4. Interpret the concepts of object-oriented programming in Python.
5. Implement exemplary GUI applications related to Web Programming in Python.

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<tr><td>CO2</td><td></td><td></td><td>2</td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>2</td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td>2</td></tr>
<tr><td>CO4</td><td>1</td><td>2</td><td>3</td><td>2</td><td>3</td><td></td><td>1</td><td></td><td>3</td><td></td><td>1</td><td>2</td><td></td><td></td><td>3</td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td><td></td><td>2</td></tr>
</table>

Code: B0305	ENGINEERING DRAWING (Common for CE, ME and Min.E)	**L**	**T**	**P**
Credits: 3		2	-	2

Prerequisites: Nil

Course Objectives:
To develop in students, graphic skills for communication of concepts and ideas of engineering products.

MODULE I: **Introduction to Engineering Drawing, Scales and Curves**   **12 Periods**
Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance. Lettering and dimensioning. Geometrical Constructions: Regular polygons only.
Scales: Plane Scale, Comparative Scale, Diagonal Scale, Vernier Scale
Curves: Conic Sections, Cycloidal Curves and Involutes.

MODULE II: **Projection of Points, Lines and Planes**   **12 Periods**
Projection of Points: Principles of Orthographic Projections – Conventions – First and Third Angle projections. Projection of points including all four quadrants.
Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line.
Projection of Planes: Projection of Planes - Axis inclined to one reference plane.

MODULE III: **Projection of Solids, Section of Solids and Development**   **12 Periods**
of Surfaces
A. Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined to one reference plane.

B. Section of Solids: Sectioning of single solid with the cutting plane inclined to one plane and perpendicular to the other - true shape of section.
Development of Surfaces: Development of lateral surfaces of simple Solids.

MODULE IV: **Isometric Projections and Transformation of**   **10 Periods**
Projections
Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions – Plane Figures, Simple Solids.
Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice   versa– simple objects.

MODULE V: **Introduction to Computer Aided Drafting**   **10 Period**
CAD workstation, Advantages of CAD, CAD Software, AutoCAD – Opening and Creating Drawings-Exploring the AutoCAD interface-Zooming and Panning, AutoCAD Commands and Toolbars-Basic Drawing and Editing Commands.

TEXT BOOKS
1   K.L.Narayana, S.Bheemanjaneyulu "**Engineering Drawing with Auto CAD-2016**" New Age International Publishers, 1st Edition, 2018.
2   N.D. Bhat, "**Engineering Drawing**", Charotar Publishing House, 53rd Edition, 2014.

REFERENCES

1. K.L.Narayana, P.Kannaiah, "**Engineering Drawing**", SciTech Publishers. 2nd Edition, 2017
2. K.Venugopal,"**Engineering Drawing**",NewAge International Publishers, 3rd Edition, 2014.
3. K. V. Natarajan, "**A text book of Engineering Graphics**", Dhanalakshmi Publishers, 2015.
4. M.S. Kumar, "**Engineering Graphics**", D.D. Publications, 2011.
5. Trymbaka Murthy, "**Computer Aided Engineering Drawing**", I.K. international Publishing House, 3rd Edition, 2011.

E - RESOURCES

1. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
2. https://www.wiziq.com/tutorials/engineering-drawing
3. http://freevideolectures.com/Course/3420/Engineering-Drawing
4. http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711
5. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics
6. http://nptel.ac.in/courses/112103019/

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: B0H02	**English Language and Communications Lab** (Common for CE, EEE, ME, ECE, CSE, CSE(AIML), CSE(DS), CSE (CS), CSE(IOT),IT and Min.E)	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objectives:

The course aims to develop students' intelligibility in their pronunciation of English - speech sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, namely, listening and speaking skills. It also trains students to understand nuances of both verbal and non-verbal communication during all activities. The course enables the learners to develop their confidence levels so as to participate in discussions, debates and public speaking.

Listening Skills:

Objectives:
1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.
   • Listening for general content
   • Listening to fill up information
   • Intensive listening
   • Listening for specific information

Speaking Skills:

Objectives:
1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
• Oral practice
• Describing objects/situations/people
• Just A Minute (JAM) Sessions.

Syllabus: English Language Communication Skills Lab shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab
The following course content is prescribed for the English Language Communication Skills
   Lab

Module - I:
CALL Lab   : Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab   : Ice-Breaking activity and JAM session; Listening: listening for sounds in
                context, for ideas; Speaking: ideation and translation of ideas into
                sentences.

Module - II:
CALL Lab   : Structure of Syllables - Past Tense Marker and Plural Marker – Weak
                Forms and Strong Forms - Consonant Clusters.
ICS Lab   : Situational Dialogues – Role-Play- Expressions in Various Situations –
                Self-introduction and Introducing others – Greetings – Apologies – Requests
                – Social and Professional Etiquette - Telephone Etiquette; Listening:
                listening for specific purposes, for details; Speaking: speaking in the above
                situations with clarity, connectivity, maintaining voice characters.

Module - III:
CALL Lab   : Word accent and Listening Comprehension-reading(aloud) meaningfully.
ICS Lab   : Descriptions- Narrations- Giving Directions and guidelines; Listening:
                listening for intelligible English; Speaking: formal and informal
                conversations, register.

Module - IV:
CALL Lab   : Intonation and Common errors in Pronunciation- reading aloud (evaluating
                through recording).
ICS Lab: Extempore- Public Speaking, Oral Presentation Skills; Listening: note taking and
                listening for speaker's tone/attitude; Speaking: organizing, connecting ideas and
                sentences, short forms in spoken English, errors in spoken English

Module - V:

CALL Lab   : Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab   : Information Transfer, Debate

Minimum Requirement of infra structural facilities for EL Lab:
1. Computer Assisted Language Learning (CALL) Lab:
The Computer aided Language Lab for 40 students with 40 systems, one master console,
LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following
specifications:
a) P – IV Processor   b) Speed – 2.8 GHZ   c) RAM – 512 MB Minimum
d) Hard Disk – 80 GB   e) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab: The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.
Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

Prescribed Lab Manual:
Rani, Sudha. *English Language Communication Skills Laboratory*. 5th edition, Pearson Publication, 2014.

Reference Books:
1. Gairns, Ruth and Redman, Stuart. *Oxford Word Skills: Learn and Practice English Vocabulary.* 2nd edition, Oxford University Press, 2008.
2. Hughes, John and Mallett, Andrew. *Successful Presentations DVD and Student's Book Pack*. Oxford University Press, 2013.
3. Hancock, Mark. *English Pronunciation in Use* (Intermediate). 2nd edition, Cambridge University Press, 2009.
4. Karia, Akash. *Public Speaking Mastery: Speak Like a Winner*. Kindle edition, 2013.
5. Lucas, Stephen. *The Art of Public Speaking.* 11th edition, Tata McGraw Hill, 2011.

Websites:
1. http://www.mindtools.com/CommSkll/ActiveListening.htm
2. http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity
3. http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a2 2/An%20article%20for%20Monika%20(2010).pdf

Course Outcomes:
After completion of the course, students will be able to:
1. Understand the nuances of language through audio- visual experience and group activities.
2. Neutralize the accent for intelligibility
3. realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence; thereby enhance employability skills of the students.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester	
Code: B0B11	**Applied Physics Lab**	**L**	**T**	**P**
Credits: 1	(Common for CSE, CSE (AI & ML), CSE (Cyb. Sec.), CSE (IoT), CSE (Data Science), IT, ECE and EEE)	-	-	2

Course objectives:

The main objective of this course is to provide the necessary exposure to the practical aspects, which is an essential component for learning science.

List of Experiments:

1. **Planck's constant**
   To determine Planck's constant using Photo electric effect.
2. **Energy band –gap of a semiconductor**
   To determine the energy band gap of a semiconductor.
3. **V-I and P-I characteristics of light emitting diode**
   Plot V-I and P-I characteristics of light emitting diode.
4. **Laser diode**
   To study the Characteristics of Laser diode.
5. **Solar Cell**
   To study the V-I Characteristics of solar cell.
6. **LCR Circuit**
   To determination of resonant frequency, bandwidth and quality factor of RLC circuit.
7. **Numerical Aperture of an Optical fiber**
   To determine the Numerical aperture of the given fiber.
8. **Bending Loss of a Fiber**
   To determine the bending loss of the given fiber.
9. **Light Dependent Resistance (LDR)**
   To determine the characteristics of a LDR.
10. **Stewart and Gee's Experiment**
    Determination of Magnetic field along the axis of current carrying circular coil.
11. **B-H Curve**
    To study the magnetization of ferromagnetic material in presence of magnetic field.
12. **Sonometer**
    To verify the frequency of AC Supply.
13. Construction of fundamental logic gates using discrete components and verification of truth tables
14. Verification of truth tables of fundamental logic gates using ICs
15. Construction of universal logic gates using fundamental logic gates.

Course Outcomes:
1. At the end of the course, students will able to
2. Develop skills to impart practical knowledge in real time solution.
3. Understand principle, concept, working, application and comparison of results with theoretical calculations.
4. Design new instruments with practical knowledge.
5. Understand measurement technology.
6. Use new instruments and real time applications in engineering studies.

Prerequisites: NIL
Course Objectives:
This course enables the students to develop various applications using python.

Software Requirements: Python

List of Programs:
1 a) Write a program to purposefully raise Indentation Error and correct it.
   b) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
   c) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
2 a) Write a Program for checking whether the given number is a even number or not.
   b) Using for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10.
   c) Write a program using for loop that loops over a sequence. What is sequence?
   d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3 a) Find the sum of all the primes below two million.
   b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89
   c) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
   d) Write a program to count the numbers of characters in the given string and store them in a dictionary data structure
   e) Write a program to use split and join methods in the given string and trace a birthday with a dictionary data structure.
4 a) Write a program to combine two lists into a dictionary.
   b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
5 a) Write a program to print each line of a file in reverse order.
   b) Write a program to compute the number of characters, words and lines in a file.
6 a) Write a function ball _collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
      Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius. If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
   b) Find mean, median, mode for the given set of numbers in a list.
7 a) Write a function nearly_ equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
   b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

8 a) Write a function cumulative_product to compute cumulative product of a list of numbers.

   b) Write a function reverse to reverse a list. Without using the reverse function.

9 Create a Regular Expression and implement the following

   a) Recognize the following strings: "bat," "bit," "but," "hat," "hit," or "hut."

   b) Match any pair of words separated by a single space, i.e., first and last names.

   c) Match any word and single letter separated by a comma and single space, as in last name, first initial.

10 Write a python program to implement multithreading scenarios.

11 Write a python program to simulate the banking operations using Class.

12 Write a python program to demonstrate the Queue / Stack operations using Class.

TEXT BOOKS

1. Wesley J. Chun, Core Python Programming, Second Edition, Prentice Hall, 2007.

2. Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2011.

REFERENCE BOOKS

1. Allen B. Downey, "Think Python, How to think like a Computer Scientist", First Edition, O'reilly Publishing, 2018.

2. VamsiKurama, "Python Programming: A Modern Approach", Pearson India, 2017.

3. Mark Lutz, "Learning Python", Fifth Edition, O'rielly Publishers, 2013.

Course Outcomes

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

1. Develop simple applications using python.

2. Make use of functions, methods and classes in python scripts.

3. Deploy variety of applications using necessary packages for applications.

COs	ProgrammeOutcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			1	1							1	1	2	
CO2		1	2	3								3		1	1
CO3	1	1	1	1	2	1	1					3	1	2	3

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: B00A1	**NSS/SPORTS/YOGA** (Common for ALL)	L	T	P
Credits: Nil		-	-	3

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B0507	**Discrete Mathematics** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE(DS), CSE(IOT) and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL
Course Objectives:
This course provides the concepts of mathematical logic demonstrate predicate logic and Binary Relations among different variables, discuss different type of functions and concepts of Algebraic system and its properties. It also evaluates techniques of Combinatorics based on counting methods and analyzes the concepts of Generating functions to solve Recurrence equations.

MODULE I: Mathematical Logic   **[10 Periods]**
Basic Logics - Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology.

Implications and Quantifiers - Equivalence implication, Normal forms, Quantifiers, Universal quantifiers.

MODULE II: Predicate Logic and Relations   **[10 Periods]**
Predicate Logic - Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Proof of automatic Theorem.

Relations -   Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram.

MODULE III: Functions and Algebraic Structures   **[10 Periods]**
A: Functions - Inverse Function, Composition of functions, recursive Functions - Lattice and its Properties.

B: Algebraic structures - Algebraic systems Examples and general properties, Semi-groups and monoids, groups, sub-groups, homomorphism, Isomorphism, Lattice as POSET, Boolean algebra.

MODULE IV: Counting Techniques and Theorems   **[09 Periods]**
Counting Techniques - Basis of counting, Combinations and Permutations with repetitions, Constrained repetitions

Counting Theorems - Binomial Coefficients, Binomial and Multinomial theorems, principles of Inclusion – Exclusion. Pigeon hole principle and its applications.

MODULE V: Generating functions and Recurrence Relation   **[09 Periods]**
Generating Functions - Generating Functions, Function of Sequences, Calculating Coefficient of generating function.

Recurrence Relations - Recurrence relations, Solving recurrence relation by substitution and Generating functions. Method of Characteristics roots, solution of Non-homogeneous Recurrence Relations.

TEXTBOOKS:
1. J P Tremblay & R Manohar, "**Discrete Mathematics with applications to Computer Science**", Tata McGraw Hill.
2. J.L. Mott, A. Kandel, T.P.Baker "**Discrete Mathematics for Computer Scientists & Mathematicians**", PHI.

REFERENCES:
1. Kenneth H. Rosen, "**Discrete Mathematics and its Applications**", TMH, Fifth Edition.
2. Thomas Koshy, "**Discrete Mathematics with Applications**", Elsevier.
3. Grass Man & Trembley, "**Logic and Discrete Mathematics**", Pearson Education.
4. C L Liu, D P Nohapatra, "**Elements of Discrete Mathematics** - **A Computer Oriented Approach**", Tata McGraw Hill, Third Edition.

E-RESOURCES:
1. http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book/fullbook.pdf
2. http://www.medellin.unal.edu.co/~curmat/matdiscretas/doc/Epp.pdf
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xPG734QA9tMJN2ncqS12ZbN7pUSSlWCxS gPOZJEokyWJlxQLYsrFyeITA70W9C8Pg
4. http://nptel.ac.in/courses/106106094/

Course Outcomes:
At the end of the course, a student will be able to
1. **Apply** the concepts of connectives and normal forms in real time applications.
2. **Summarize** predicate logic, relations and their operations.
3. **Describe** functions, algebraic systems, groups and Boolean algebra.
4. **Illustrate** practical applications of basic counting principles, permutations, combinations, and the pigeonhole methodology.
5. **Analyze** techniques of generating functions and recurrence relations.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2				3							2	3		
CO2	3											2	3		
CO3		3										2	3		
CO4	3	3	2	3								2		3	
CO5					3							2		3	

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B0508	**Computer Organization and Architecture** (Common for CSE, CSE(DS), CSE (AI and ML), CSE(Cyber Security), CSE(IOT) and IT)	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites: No prerequisites

Objectives
1. The purpose of the course is to introduce principles of Digital fundamentals computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors.

UNIT – I   **[10 Periods]**
Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT – II   **[10 Periods]**
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT – III   **[9 Periods]**
Micro Programmed Control: Control Memory, Address Sequencing, Micro Program Example, Design of Control Unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control.

UNIT – IV   **[10 Periods]**
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations. Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT – V   **[9 Periods]**

Input-Output Organization: Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associate Memory, Cache Memory.

Textbook:

1. Computer System Architecture, M. Moris Mano, 3rd Edition, Pearson/PHI.

References:

1. Computer Organization, Car Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Organization and Architecture, William Stallings 6th Edition, Pearson/PHI.
3. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

E-Resources:

1. https://books.google.co.in/books?isbn=8131700704
2. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7Eh9eBOsT1ELoYpKlg_xngrkluevXOJLs1Tbx S8q2icgUs3hL4_KAi5So5FgXcVg
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSlXl4zudlsolr-e7wQNrNXLxbgGFxbkoyx1iN3YbHuFrzI2jc_70rWMEwQ
4. http://nptel.ac.in/courses/106106092/

Outcomes:

1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory and computer arithmetic operations of binary number system.
4. Design memory organization and control unit operations.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2									2			
CO2		2	3									1			
CO3	2	2	3	2	2							2			
CO4	3														
CO5	3														

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B0509	**Data Structures** (Common for CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT) and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: A course on "Programming for Problem Solving "

Course Objectives:
- Exploring basic data structures such as linked list, stacks and queues.
- Introduces a variety of data structures such as dictionaries and hash tables
- To learn non linear data structures i.e. Binary search trees and height balanced trees.
- To understand the graph traversal algorithms and heap sort.
- Introduces the pattern matching and tries algorithms

MODULE-I: [10 Periods]
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

MODULE-II: [09 Periods]
Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash table representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.
MODULE-III: [10 Periods]
Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Definition and example of Red –Black, Splay Trees.

MODULE-IV: [10 Periods]
Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sortings: Max Heap, Min Heap,Heap Sort. External Sorting: Model for external sorting, Merge sort.

MODULE-V: [09 Periods]
Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS:
1. Jean Paul Tremblay, Paul G Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudo code approach with C ", Thomson (India), 2nd Edition, 2004.

REFERENCES:
1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "Fundamentals of Data Structure in C", University Press (India), 2nd Edition, 2008.
2. A. K. Sharma, "Data structures using C", Pearson, 2nd Edition, June, 2013.
3. R. Thareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014.

E-RESOURCES:
1. http://gvpcse.azurewebsites.net/pdf/data.pdf
2. http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMApVUMmjlExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

Course Outcomes:
At the end of the course, students will be able to
1. **Implement** the linear data structures such as linked list, stacks and queues.
2. **Understand** the Dictionaries and Hash table representation.
3. **Analyze** the various non linear data structures with its operations
4. **Develop** the programs by using Graph Traversal and heap sort
5. **Apply** data structure concepts for the implementation of pattern matching and tries.

<table>
<tr><td colspan="16">CO- PO,PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes (POs)</td><td colspan="3">PSOs</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO2</td><td>2</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td></tr>
<tr><td>CO3</td><td></td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td></tr>
<tr><td>CO4</td><td></td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO5</td><td>2</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
</table>

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester	
Code: B6601	**Fundamentals of Artificial Intelligence** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		3	-	-

PRE-REQUISITES
⬜⬜Basic Programming in Python
⬜⬜Data Structures

OBJECTIVES
Artificial Intelligence is a major step forward in how computer system adapts, evolves and learns. It has widespread application in almost every industry and is considered to be a big technological shift, similar in scale to past events such as the industrial revolution, the computer age, and the smart phone revolution.

This course will give an opportunity to gain expertise in one of the most fascinating and fastest growing areas of Computer Science through classroom program that covers fascinating and compelling topics related to human intelligence and its applications in industry, defence, healthcare, agriculture and many other areas. This course will give the students a rigorous, advanced and professional graduate-level foundation in Artificial Intelligence.

LEARNING OUTCOMES
After undergoing this course, the students will be able to:

⬜⬜Build intelligent agents for search and games.

⬜⬜Solve AI problems through programming with Python.

⬜⬜Learning optimization and inference algorithms for model learning.

⬜⬜Design and develop programs for an agent to learn and act in a structured environment.

DETAIL CONTENTS
1. Introduction   [9 Hours]
Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and

graph structures, State space representation, Search graph and Search tree.

2. Search Algorithms   [10 Hours]
Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first

search, A* algorithm, Game Search.

3. Probabilistic Reasoning   [10 Hours]
Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference,

temporal model, Hidden Markov Model.

4. Markov Decision process   [10 Hours]

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

5. Reinforcement Learning   **[9 Hours]**
Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

LIST OF SUGGESTED BOOKS
1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
4. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
5. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

WEBSITES FOR REFERENCE
https://nptel.ac.in/courses/106105077
https://nptel.ac.in/courses/106106126
https://aima.cs.berkeley.edu
https://ai.berkeley,edu/project_overview.html (for Practicals)

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. III Semester	
Code: B0510	**Object Oriented Programming** (Common for CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisites: Computer Programming

Course Objectives:
This course will make students able to learn and understand the concepts and features of object oriented programming to acquire the knowledge in Java's exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

MODULE-I: OOP concepts & Introduction to C++, Java   [9 Periods]
OOP concepts & Introduction to C+: Introduction to object oriented concepts: Object, class, methods, instance variables; C++ program structure; accessing class data members; Overview of Inheritance, Overloading, Polymorphism, Abstraction, Encapsulation.

Introduction to Java - History of JAVA, Java buzzwords, data types, variables, scope and life time of variable, arrays, operators, expressions, control statements, type conversion and type casting, simple Java program.

Module II: Basics of Java   [11 Periods]
Classes and Objects - Concepts of Classes, Objects, Constructors, Methods, This Key Word, Garbage Collection, Overloading Methods, Constructors, Parameter Passing, Recursion, String Handling: String, String Buffer, String Tokenizer.

Inheritance - Base Class Object, Subclass, Member Access Rules, Super Uses, Using Final with Inheritance, Method Overriding, Abstract Classes

MODULE III: Interfaces and Exception Handling   [10 Periods]
Interfaces - Defining an interface, implementing interface, differences between classes and interfaces, extending interfaces. Packages - Defining, creating and accessing a package, importing packages, access control, exploring package-java.io (file handling).

Exception handling - Concepts of Exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of try, catch, throw, throws and finally, built-in exceptions, creating own exception subclasses

MODULE IV: Multithreading and Collection Classes   [09 Periods]
Multithreading - Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Collection Classes –ArrayList, LinkedList, HashSet, LinkedHashSet, TreeSet, PriorityQueue, ArrayDequeue, EnumSet.

MODULE V: Event Handling, Layout manager and Swings   **[09 Periods]**
Event handling - Events, Event sources, event classes, event listeners, delegation event model, handling mouse and keyboard events, adapter classes. Layout manager - border, grid, flow, card and grid bag.
Swings - Introduction, limitations of AWT, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, TextFields, buttons – the JButton class, Checkboxes, Radio buttons, Combo boxes, Tabbed Panes, ScrollPanes, Trees and Tables.

TEXT BOOKS:
1. Herbert Schildt, "Java The complete reference", TMH, 8th edition
2. T. Budd, "Understanding OOP with Java", updated edition, Pearson Education.
3. Joyce Farrell, Cengage, "Object Oriented Programming C++", 4th Edition, 2013.

REFERENCES:
1. P.J. Deitel and H.M. Deitel, "Java for Programmers", Pearson education.
2. P. Radha Krishna, "Object Orientd Programming through Java", Universities Press.
3. S. Malhotra and S. Choudhary, "Programming in Java", Oxford Univ. Press.
4. Bruce Eckel, "Programming in Java", Pearson Education.
5. Herbert Schildt , "The Complete Reference, C++", TMH, 4th edition.

E-RESOURCES:
1. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-RPf64_TFk2i4LJhgQFPQ WAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi_mMQ
2. https://ndl.iitkgp.ac.in/result?q={"t":"search","k":"object%20oriented%20programming","s":["type=\"video\""],"b":{"filters":[]}}
3. http://www.rehancodes.com/files/oop-using-c++-by-joyce-farrell.pdf
4. http://www.nptel.ac.in/courses/106103115/36

Course Outcomes:
At the end of the course, students will be able to
1. Differentiate structured programming and object-oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object-oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and develop applications for concurrent processing using Thread Concept.
4. Design Applications that take user response through various peripheral devices such as mouse and keyboard by event handling mechanism.
5. Design interactive applications for use on internet.

COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1													
CO2													
CO3													
CO4													
CO5													

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B.Tech. III Semester	
Code: B0512	**Data Structures Lab**	**L**	**T**	**P**	
Credits: 1.5	(Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**-**	**-**	**3**	

Prerequisites: A Course on "Programming for problem solving"

Objectives:
1. To learn linear data structures such as linked list, stack and queues with its operations
2. Ability to learn programs on binary search tree and graph traversal strategies.
3. To understand the pattern matching and hashing techniques.

Software Requirements: C

List of Programs:
1 Write a program that uses functions to perform the following operations on singly linked list.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal
2 Write a program that uses functions to perform the following operations on doubly linked list.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal
3 Write a program that uses functions to perform the following operations on circular linked list.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal
4 Write a program that implement stack (its operations) using
    i) Arrays ii) Pointers
5 Write a program that implement Linear Queue (its operations) using
    i) Arrays ii) Pointers
6 Write a program that implement Deque (its operations) using
    i) Arrays ii) Pointers
7 Write a program to implement all the functions of a dictionary using hashing.
8 Write a program that implement Binary Search Trees to perform the following operations
    i) Creation ii) Insertion iii) Deletion iv) Traversal
9 Write a program to implement the tree traversal methods using recursion.
10 Write a program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Heap sort ii) Merge sort
11 Write a program to implement the graph traversal methods such as BFS and DFS.
12 Write a program to implement the Knuth-Morris- Pratt pattern matching algorithm.

TEXT BOOKS
1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON.

Outcomes:

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

COs	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2										3	2	
CO2	2	2	3										2	3	
CO3		2	3										2	3	1

1. Develop C programs for computing and real life applications using basic data structures like stacks, queues, linked lists, Binary Search Trees.
2. Make use of basic data structures implementing various tree and graph traversal operations and algorithms.
3. Apply the concepts of basic data structures and implement advanced operations AVL Trees, Red –Black Trees, and Splay Trees concepts.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B6602	**Applications of Artificial Intelligence Lab** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 2		**-**	**-**	**3**

LIST OF EXPERIMENTS

Implementation: PYTHON / PROLOG / LISP

1. Write a program to conduct uninformed search.
2. Write a program to conduct informed search.
3. Write a program to conduct game search.
4. Write a program to construct a Bayesian network from given data.
5. Write a program to infer from the Bayesian network.
6. Write a program to illustrate Hidden Markov Model.
7. Write a program to run value and policy iteration in a grid world.
8. Write a program to do reinforcement learning in a grid world.
9. Write a program to implement adaptive dynamic programming.
10. Write a program to implement active dynamic programming.
11. Write a program to implement Q learning.
12. Case Study

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. III Semester	
Code: B0513	**Object Oriented Programming Lab** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 1.5		**-**	**-**	**3**

Prerequisites: NIL

Course Objectives:
This course will make students able to learn and understand the concepts and features of object-oriented programming and the object-oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java's exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

Software Requirements: Java

List of Programs:
1. Write Java Programs that implement the following.
    a) Constructor
    b) Parameterized constructor
    c) Method Overloading
    d) Constructor overloading
2. Write a Java program
    a) checks whether a given string is a palindrome or not.
    b) for sorting a given list of names in ascending order.
    c) that reads a line if integers and then displays each integer and the sum of all integers(use string tokenizer class of java.util).
3. Write Java programs that uses the following keywords…
    a) this
    b) super
    c) static
    d) final
4. Write a Java program to implement
    a) Method Overriding.
    b) dynamic method dispatch.
    c) multiple inheritance.
    d) access specifiers.
5. Write a Java program that
    a) reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
    b) reads a file and displays the file on the screen, with a line number before each line.
    c) displays the number of characters, lines and words in a test file.
6. Write a Java program for handling
    a) Checked exceptions.
    b) unchecked exceptions.

7. Write a Java program
    a) Creates three threads. First threads displays "Good Morning "for every one
    Second, the second thread displays "Hello" for every two seconds, the third thread Displays
    "Welcome" for every three seconds.

b) that correctly implements producer consumer problem using concept of inter thread communication.
8. Write a Java program which demonstrates the use of following collection classes
    a) Array List
    b) Hash Set
    c) Deque
9. Write a Java program that works as a simple calculator. Use a grid layout to   arrange buttons for the digits and for the +,-,*,/ operations. Add a text field to displaythe result.
10. Write a Java program for handling
    a) mouse events.
    b) key events.
11. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields num1 and num2. The division of num1 and num2 is displayed in the result field when the divide button is clicked. If num1 or num2 were not an integer, the program would throw number format exception. If num2 were zero, the program would throw an arithmetic exception and display the exception in the message dialogue box.
12. Write a Java program that
    a) Simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on and only one light can be on at a time. No light is on when the program starts.
    b) Allows the user to draw lines rectangles and ovals.

TEXT BOOKS:
1. Herbert Schildt, "**Java The complete reference**", TMH, 8th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.
REFERENCES:
1. P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.
2. P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.
3. Bruce Eckel," **Programming in Java**", Pearson Education.
4. S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

Course Outcomes:
At the end of the course, students will be able to
    1. **Build** simple java progras using the basic concepts of OOP
    2. **Create** user defined packages to build real time applications
    3. **Develop** applications on files, exceptions, threads and applets.
    4. **Construct** GUI based applications.
    5. **Design** Interactive applications for use on internet.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester

Code: B00M1	GENERAL SENSITIZATION (An Activity-based Course)	L	T	P
	GENDER SENSITIZATION (An Activity-based Course)	L	T	P
Credits: NIL	(Common for CE, EEE, ME, ECE, MiE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	-	-	2

Prerequisites: NIL

COURSE DESCRIPTION
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical
questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:
- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

MODULE I: UNDERSTANDING GENDER   [06 Periods]
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men- Preparing for Womanhood. Growing up Male. First lessons in Caste.

MODULE II: GENDER ROLES AND RELATIONS   [06 Periods]
Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

MODULE III: GENDER AND LABOUR   [07 Periods]
Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Sharethe Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

MODULE IV: GENDER - BASED VIOLENCE   [07 Periods]
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu*".

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

MODULE V: GENDER AND CULTURE   **[06 Periods]**
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

➢ *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*

➢ **ESSENTIAL READING**: The Textbook, *"Towards a World of Equals: A Bilingual Textbook onGender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu**published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:
- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

TEXT BOOKS:
1. Towards a World of Equals: A bilingual Textbook on Gender, A Suneetha -etall

REFERENCES:
1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We Were Making History...' Life Stories of Women in the ToIrmgana People's Struggle. New Delhi: Kali for Women, 1989.
2. TriptiLahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp? FlookCndet,3732
4. Vimata. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health end Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making I listory ....' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

E-RESOURCES:
1. http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm (UNDERSTANDING GENDER)
2. https://www.simplypsychology.org/gender-biology.html(GENDERAND BIOLOGY)

3. http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/ (GENDER AND LABOUR)
4. http://journals.sagepub.com/doi/abs/10.1177/1077801200006007004 (ISSUES OF VIOLENCE)
5. http://www.nordiclabourjournal.org/emner/likestilling (GENDER AND BIOLOGY)

Course Outcomes:
At the end of the course,
- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3		3	3		2	3	1		
CO2						3		3	3		2	3	2		
CO3						3		3	3		2	3	1		

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B00A2	**INTERNSHIP – I**	**L**	**T**	**P**
Credits: NIL	(Common for CE, EEE, ME, ECE, MiE, CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT) and IT)	-	-	-

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B00A4	NPTEL-I (Common for CE, EEE, ME, ECE, MiE, CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT) and IT)	L	T	P
Credits: NIL		-	-	2

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester	
Code: B0B07	**Applied Statistics and Optimization Techniques** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Module – I [12 Periods]
Analysis of Variance & Analysis of Co-variance
Analysis of Variance (ANOVA):one-way & two-wav ANOVA and multiple comparisons. Introduction to Factorial design - 2^2 and 2^n. Factorial design, Analysis of Co-variance (ANCOVA). Conducting ANCOVA

Module – II [12 Periods]
Design of Experiments
Importance and applications of design of experiments. Principles of experimentation, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

Module III [13 Periods]
Transportation and Assignment
Transportation: Optimal Solution by North West Corner Method- VAM- Least Cost Method- MODI Method.
Assignment: Formulation-Unbalanced Assignment Problem-Hungarian Algorithm- Travelling Salesman Problem.

Module IV: Game Theory [13 Periods]
Game Theory, Theory of Games, Competitive games, rules for game theory, Saddle point –minmax (maxmin) method of optimal strategies, mixed strategies –Value of the game- two-person zero sum game, method of dominance, graphical method

Method V: Queuing Theory [10Periods]
Structure of a queuing system, operating Characteristics of queuing system. Transient and Steady states, Terminology of   Queuing systems. Arrival and service Processes, Pure Birth-Death process.

Deterministic queuing Models (M/M/1):(∞: FIFO)Model, (M/M/1):(N: FIFO)Model.

Proposed Text Books:
1. Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.
2. J K Sharma, "Operations research Theory and applications" Macmillan publishers india limited, 4th edition.
3. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.

Proposed Reference Books:
1. Willam Feller: "Introduction to Probability theory and its applications". Volume–I,Wiley
2. Goon AM, Gupta MK, Das Gupta B: "Fundamentals of Statistics", Vol-I, the World Press Pvt. Ltd. ,Kolakota.
3. V.K. Kapoor and S.C. Gupta: "Fundamentals of Mathematical Statistics", Sultan Chand &Sons, New Delhi

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Prerequisites: Data Structures
Course Objectives:
1. To Learn fundamental concepts an algorithm, Pseudo code, performance analysis, time complexity, disjoint sets, spanning trees and connected components.
2. To Learn and Understanding of divide and conquer, applications, binary search, sorting and Strassen's matrix, greedy method, job sequencing, spanning trees and shortest path problem.
3. To Learn and understanding dynamic programming, matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
4. To Learn and understanding backtracking, n-queen problems, subset problem, graph coloring, Hamiltonian cycles and branch bound methods, travelling sales, knapsack problem, branch and bound, FIFO branch.
5. To Learn and understanding of NP Hard and NP complete problems

MODULE I: Basics of Algorithm Design   **[09 Periods]**
Introduction -Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations, Amortized analysis.

Disjoint Sets -Disjoint set operations, union and find algorithms, spanning trees, connected components and bi connected components.

MODULE II: Algorithm Methods   **[10 Periods]**
Divide and Conquer - General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication

Greedy method General method, applications-Job sequencing with deadlines, general knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

MODULE III: Dynamic Programming and Optimization Techniques   **[10 Periods]**
A: Dynamic Programming - General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem   .

B: Optimization Techniques - All pairs shortest path problem, travelling sales person problem, Reliability design.
MODULE IV: Backtracking and Branch and Bound   **[10 Periods]**
Backtracking-General method, n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles

Branch and Bound - General method, applications: Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

MODULE V: NP-Hard and NP-Complete problems   **[09 Periods]**
 NP-Hard and NP-Completeness: Basic concepts, NP - Hard and NP Complete classes, Cook's theorem, Deterministic and Non-Deterministic algorithms, NP-hard graph problems and scheduling problem

TEXTBOOKS:
1. Ellis Horowitz, SatrajSahni and Rajasekharan, **"Fundamentals of Computer Algorithms"** Galgotia publications pvt. Ltd
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, **"Introduction to Algorithms"**, second edition, PHI Pvt. Ltd./ Pearson Education

REFERENCES:
1. M.T.Goodrich and R.Tomassia **"Algorithm Design, Foundations, Analysis and Internet examples**", John wiley and sons.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, **"Introduction to Design and Analysis of Algorithms A strategic approach"**, Mc Graw Hill.
3. Parag Himanshu Dave, Himanshu BalchandraDave,**"Design and Analysis of algorithms"** Pearson

E-RESOURCES:
1. https://comsciers.files.wordpress.com/2015/12/horowitz-and-sahani-fundamentals -of-computer-algorithms-2nd-edition.pdf
2. https://books.google.co.in/books?id=7qKXCzF1XC8C&printsec=frontcover&dq=T.H.Cormen,C.E.Leiserson ,+R.L.Rivest,and+C.Stein,+%22Introduction+to+Algorithms%22,+second+edition,+PHI+Pvt.+Ltd./+Pearson +Education,ebook,pdf&hl=en&sa=X&ved=0ahUKEwjFupORxdXTAhXLQo8KHU7FC5cQ6AEIKjAB#v=o nepage&q&f=false
3. http://en.cnki.com.cn/Article_en/CJFDTOTAL-JFYZ200208019.htm
4. http://nptel.ac.in/courses/106101060/

Course Outcomes:
At the end of the course, students will be able to
1. **Analyze** performance of algorithms using asymptotic notations, performance analysis, disjoint sets, spanning trees and connected components
2. **Describe and analyze** paradigms for designing good algorithms using Divide-and-Conquer and Greedy Techniques, applications, binary search, sorting and Strassen's matrix, greedy method, job sequencing, spanning trees and shortest path problem.
4. **Synthesize** dynamic-programming algorithms and analyze matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
5. **Apply** backtracking and branch and bound techniques to solve some complex problems, n-queen problems, subset problem, graph coloring, Hamiltonian cycles and branch bound methods, travelling sales, knapsack problem, branch and bound, FIFO branch
6. **Apply** algorithm design techniques to solve certain NP-complete problems.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2									3	2	
CO2	3	2	3	2									3	2	
CO3	3	2	3	2									3	2	
CO4	3	2	3	2									3	2	
CO5	3	2	3	2									3	2	

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: B6603	**Machine Learning Foundations** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		3	-	-

Course Objectives:

- To design a learning system and know about the learning tasks.
- To apply decision tree learning in classification tasks.
- To develop neural networks algorithms in machine learning.
- To illustrate Bayesian learning and instance-based learning.
- To examine the concepts of reinforcement learning and advanced techniques.
- To understand deep learning concepts.

Module I: Foundation   [8 Periods]
Introduction-What Is Learning?, when Do We Need Machine Learning?, Types of Learning.
A Formal Model: The Statistical Learning Framework, Empirical Risk Minimization, Empirical Risk Minimization with Inductive Bias
A Formal Learning Model: PAC Learning, A More General Learning Model, learning via Uniform Convergence- Uniform Convergence Is Sufficient for Learnability, Finite Classes Are Agnostic PAC Learnable.
The Bias-Complexity Trade-off: The No-Free-Lunch Theorem, Error Decomposition.

Module II:
Supervised Learning and Introduction to Python   [12 Periods]
Basic methods: Distance-based methods, Nearest-Neighbours, 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.
Ensemble Methods.: Boosting, Bagging, Random forests.

Module III:
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), Evaluating Machine Learning algorithms and Model Selection.

Module IV: Additional Learning Techniques   [9 Periods]
Scalable Machine Learning (Online and Distributed Learning), A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning

Module V: Advanced/Recent Techniques   [8 Periods]
Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning, Recent trends in various learning techniques of machine learning and classification methods for IOT applications, various models for IOT applications.

TEXT BOOKS

1. Understanding machine learning from theory to algorithms, Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press 2014.
2. Machine Learning, Tom M. Mitchell, MGH, 1st Edition, 2013.
3. Machine Learning: An Algorithmic Perspective", Stephen Marsland, , Chapman and Hall / CRC, 2nd Edition, 2014.
4. Core Python Programming, Wesley J. Chun, Second Edition, Pearson., 2nd Edition, 2006

REFERENCE BOOKS
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.
4. Core Python Programming, Wesley J. Chun, Second Edition, Pearson., 3nd Edition, 2012

E-RESOURCES
1. http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
2. https://www.learnpython.org/
3. http://index-of.es/Python/Core.Python.Programming.2nd.Edition.Wesley.Chun.2006.pdf
4. http://index-of.es/Python/Core.Python.Applications.Programming.3rd.Edition.pdf
5. https://www.davekuhlman.org/python_book_01.pdf
6. http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
7. www.fxpal.com/publications/a-genetic-algorithm-for-video-segmentation-and-summarization.pdf
8. http://nptel.ac.in/courses/106106139/
9. http://nptel.ac.in/courses/106105152/

Prerequisites: NIL

Course Objectives:
1. **Explain** operating system structure, services and **Determine** the interfaces between OS and other components of a computer system.
2. **Illustrate** the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling. **Describe** the different approaches for deadlock detection, avoidance, recovery and dead lock handling techniques.
3. **Describe** different approaches of memory management and **Apply** different page replacement algorithms to resolve page faults.
4. **Describe** the structure and organization of file system, **Analyse** the data storage in secondary storage and **understand** the protection issues in computer systems.
5. **Familiar** with the basics of Linux system and Mobile OS like iOS and Android.

MODULE I: OPERATING SYSTEM OVERVIEW   [10 Periods]

Computer System Overview- Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. **Operating system overview-** objectives and functions, Evolution of Operating System- Computer System. Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

MODULE II: PROCESS MANAGEMENT   [9 Periods]

Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues;

Process Synchronization – The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

MODULE III: STORAGE MANAGEMENT   [10 Periods]
Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples;
Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

MODULE IV: FILE SYSTEMS AND I/O SYSTEMS   [10 Periods]
Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection;

File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

MODULE V: CASE STUDY   **[08 Periods]**
Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication;
Mobile OS – iOS and Android – Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TEXT BOOKS:
1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, **"Operating System Principles"** 7th Edition, John Wiley.
2. Stallings, **"Operating Systems Internal and Design Principles",** 5th Edition, 2005, Pearson education/PHI

REFERENCES:
1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
3. D M Dhamdhere, "Operating Systems: A Concept-based Approach", Second Edition, Tata McGraw-Hill Education, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2011.
5. Pramod Chandra P. Bhat**, "An Introduction to Operating Systems, Concepts and Practice"**, PHI, 2003

Course outcomes
1. **Distinguish** between the different types of operating system environments.
2. **Apply** the concepts of process scheduling. **Develop** solutions to process synchronization problems.
3. **Identify** Deadlocks, prevention of deadlocks, avoid deadlocks.
4. **Analyze** various memory management techniques.
5. **Identify** various issues of Operating Systems file systems.

<table>
<tr><th colspan="16">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">Programme Outcomes (POs)</th><th colspan="3">PSOs</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th><th>PSO3</th></tr>
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<tr><td>CO3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td>CO5</td><td>2</td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td></tr>
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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: B6604	**Image Processing** [Professional Elective - I] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites : Nil

Course Objectives
1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
2. The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

Course Outcomes
1. Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Demonstrate the knowledge of filtering techniques.
3. Demonstrate the knowledge of 2D transformation techniques.
4. Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

Module I: **[10 Periods]**
Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

Module II: **[09 Periods]**
Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

Module III: **[10 Periods]**
Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

Module IV: **[10 Periods]**
Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

Module V: **[09 Periods]**
Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:
1. Digital Image Processing: **R.C. Gonzalez & R. E. Woods**, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCES:
1. Fundamentals of Digital Image Processing: **A. K. Jain** , PHI.

2. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L.Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

COs	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak		

COs	\multicolumn{12}{c}{Programme Outcomes (POs)}	\multicolumn{3}{c}{PSOs}
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1									2	1		2
CO2	2	2										2	1		
CO3	2														
CO4	2	2	1										2		
CO5	2	2	1										1		

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester	
Code: B0522	**Computer Graphics** [Professional Elective - I] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

This course is to enable the students to understand the fundamental concepts of display devices and output primitives, to demonstrate 2D transformations, viewing and clipping algorithms, explore different representations of 3D objects and illumination models, to understand 3D transformations and viewing, discuss surface detection and animation methods.

Module I: Introduction of Graphics [10 Periods]

Basics of Graphics - Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors, work stations and input devices.

Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms, Filled area primitives-Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

Module II: Transforming and Viewing [10 Periods]

2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-Dviewing - Viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland–Hodgeman polygon clipping algorithm.

Module III: 3D Objects Representation [10 Periods]

Surfaces and Curve: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves.

Models and Methods: Bezier and B-Spline surfaces, Basic illumination models, polygon rendering methods.

Module IV: 3D Geometric Transformations and Viewing [09 Periods]

3-D Geometric Transformations: Translation, rotation, scaling, reflection and Shear transformations, composite transformations.

3-D Viewing: Viewing pipeline, viewing coordinates, view volumes and general projection transforms, clipping.

Module V: Surface detection Methods and Animation   **[09 Periods]**

Visible Surface Detection Methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

TEXTBOOKS:

1. Donald Hearnand M. Pauline Baker, **"Computer Graphics C Version"**, Pearson Education.
2. Foley,Van Dam, Feinerand Hughes, **"Computer Graphics Principles &practice"**, 2nd edition in C, Pearson Education.

REFERENCES:

1. Donald Hearnand M.PaulineBaker, **"Computer Graphics"** , 2nd Edition, PHI / Pearson Education.
2. Zhigandxiang, Roy Plastock, Schaum's outlines, **"Computer Graphics",** 2nd edition, Tata Mc-Graw hill.
3. Davidb F Rogers, **"Procedural Elements for Computer Graphics"**, Tata McGrawhill, 2nd edition.

E-RESOURCES:

1. http://www.hiteshpatel.co.in/ebook/cg/Computer_Graphics_C_Version.pdf
2. http://ptgmedia.pearsoncmg.com/images/9780321399526/samplepages/0321399528.pdf
3. http://social.cs.uiuc.edu/papers/pdfs/g5kar.pdf
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7y_TqI7sLJ_1X3zVWNHhVwSwBCdfRRvSTr PP45TFWuzrxWT5ea_k_dP1rirZCeNbWw

Course Outcomes:

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

1.   **Develop** simple graphics applications.
2.   **Apply** 2D objects transformations.
3.   **Use** the Concepts of 3D Object representations.
4.   **Design** 3D object transformations and viewing.
5.   **Build** Animation sequences.

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2021-22 Onwards (MR-21)	**MALLA REDDY ENGINEERING COLLEGE** (Autonomous)		**B.Tech.** **IV Semester**			
Code: B0517	**Mobile Application Development** [Professional Elective - I] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**		**P**	
Credits: 3		**3**	**-**		**-**	

Prerequisites
1. Acquaintance with JAVA programming
2. A Course on "Database Management Systems"

Objectives
1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

Outcomes
1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Student will be able to develop, deploy and maintain the Android Applications.

UNIT – I [9 Periods]

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT – II [10 Periods]
Android User Interface: Measurements – Device and pixel density independent measuring UNIT – s.

Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non editableTextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT – III [10 Periods]

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT – IV   **[10 Periods]**
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory

Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT – V   **[09 Periods]**
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting, retrieving and editing data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

Textbooks:
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013

Reference:
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3		2	2	2						2	2	2
CO2		3		3	2	2	1				2		3	2	2
CO3	2	3	3	2	2	2	2				1		3	3	2
CO4		3		2	2	2	2							3	
CO5		3		2	2	2	2							3	

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COURSE OBJECTIVES:

This course will make students

1. To analyze asymptotic performance of algorithms, understand different methods postfix, infix expressions, spanning tree algorithms, Strassen's matrix multiplication.
2. To develop solutions to Job sequencing problems, Knapsack algorithm, shortest path algorithms.
3. To implement solutions traveling sales person.
4. To apply dynamic programming method N-Queen's Problem.
5. To learn and apply synthesizing branch and bound, NP problems.

Software Requirements: Turbo C

LIST OF PROGRAMS:

1. Write a program to evaluate a postfix expression E. Assume E is presented data String.
2. Write a program to obtain the postfix form of an infix expression E. Again assume E has only the binary operators+,-,*,/,^.
3. Implement the minimum cost spanning tree algorithm (Kruskal's algorithm).
4. Implement the minimum cost spanning tree algorithm (Prim's algorithm).
5. Implement Strassen's matrix multiplication.
6. Implement Job sequencing problem with deadlines.
7. Implement the Knapsack Algorithm.
8. Implement the shortest path Dijkstra's Algorithm.
9. Implement SSSP (Single Source Shortest Path) in DAG (Directed Acyclic Graphs).
10. Implement travelling sales person problem.
11. Implement N-Queen's Problem using Backtracking.
12. Implement sum of subsets problem.

TEXTBOOKS

1. Ellis Horowitz, Satraj Sahni and Rajasekharan,**"Fundamentals of Computer Algorithms"** Galgotia publications pvt. Ltd
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, **"Introduction to Algorithms"**, second edition, PHI Pvt. Ltd./ PearsonEducation
3. Parag Himanshu Dave, Himanshu Balchandra Dave, **"Design and Analysis of algorithms"** Pearson.

REFERENCES

1. M.T.Goodrich and R.Tomassia**"Algorithm Design, Foundations, Analysis and Internet examples**", John wileyandsons.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, **"Introduction to Design and Analysis of Algorithms A strategic approach"**, Mc GrawHill.

COURSE OUTCOMES:

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

1. **Analyze** asymptotic performance of algorithms, understand different methods
2. **Develop** solutions to Job sequencing problems, Knapsack algorithm, shortest path algorithms,
3. **Implement** solutions traveling sales person.
4. **Apply** dynamic programming method N-Queen'sProblem.
5. **Apply** synthesizing branch and bound NP problems.

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2									3	3	
CO2	3	3	3	2									3	2	
CO3	3	3	3	2									3	2	
CO4	3	3	3	2									3	2	
CO5	3	3	3	2									3	2	

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: A6605	**Machine Learning Foundations Lab** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	L	T	P
Credits: 1.5		-	1	2

Prerequisites: Computer Programming, Python

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.

REFERENCE BOOKS
1. Willi Richert, Luis Pedro Coelho, "Building Machine Learning with Python", Packt Publishing, 2013.

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. III Semester	
Code: B0514	**Operating Systems Lab** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	**L**	**T**	**P**
Credits: 2		-	1	2

Prerequisites: NIL

Course Objectives:
This course enable the students to interpret main components of operating system and their working, identify the role of Operating System in process scheduling and synchronization, analyze the way of addressing deadlock, understand memory management techniques and I/O systems, describes the way of handling files and security.

Software Requirements: C++/JDK

List of Programs:
1. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2. Simulate the following CPU scheduling algorithms
   a) Priority b) Round Robin
3. Simulate the Producer Consumer Problem
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate MVT and MFT techniques.
6. Simulate Paging Technique of memory management
7. Simulate page replacement algorithms a) FIFO b) LRU c) Optimal
8. Simulate the following Disk Scheduling Algorithms
(a) First Come-First Serve (FCFS)
 (b)Shortest Seek Time First (SSTF)
9. Simulate the following Disk Scheduling Algorithms
(a)Elevator (SCAN)
(b) LOOK
10. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked
11. Simulate File Organization Techniques
   a) Single level directory b) Two level
12. Simulate File Organization Techniques
   a) Hierarchical b) DAG

TEXT BOOKS:
1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, **"Operating System Principles"** 7th Edition, John Wiley.
2. Stallings **"Operating Systems Internal and Design Principles",** Fifth Edition-2005, Pearson education/PHI

REFERENCES:
1. Crowley," Operating **System A Design Approach",**TMH.
2. Andrew S Tanenbaum," Modern **Operating Systems",** 2nd edition Pearson/PHI.
3. Pramod Chandra P. Bhat**, "An Introduction to Operating Systems**", Concepts and Practice", PHI, 2003
4. DM Dhamdhere**," Operating Systems A concept based approach"** ,2nd Edition, TMH

Course Outcomes:

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

1. **Implement** various CPU scheduling algorithms, Bankers algorithms used for deadlock avoidance and prevention.
2. **Develop** disk scheduling algorithms and apply File organization techniques.
3. **Simulate** file allocation method

COs	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak			
	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1									2	1		
CO2	2	2										2	2		
CO3	1	2										1	1		

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: B00M2	**Environmental Science**	L	T	P
Credits: NIL	(Common for CE, EEE, ME, ECE, MiE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)	2	-	-

Pre-Requisites: NIL

Objectives
1. Creating the awareness about environmental problems among students.
2. Imparting basic knowledge about the environment and its allied problems.
3. Developing an attitude of concern for the environment.
4. Motivating students to participate in environment protection and environment improvement.

Outcomes
At the end of the course, it is expected that students will be able to:
1. Identify and analyze environmental problems as well as the risks associated with these problems
2. Understand what it is to be a steward in the environment
3. Studying how to live their lives in a more sustainable manner

UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:
Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies –Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources –Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams– benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

UNIT – II : ECOSYSTEMS:
Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. – Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT – III: BIODIVERSITY AND ITS CONSERVATION:
Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – IV
Environmental Pollution and control:
Environmental Pollution: Classification of pollution, **Air Pollution**: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.

Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil**.**

Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT – V: SOCIAL ISSUES AND THE ENVIRONMENT:

From Unsustainable to Sustainable development- Urban problems related to energy -Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns. Case Studies -

Environmental ethics:

Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies -Wasteland reclamation. –Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water(Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. –Case Studies.

Textbooks:
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission., Universities Press
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

References:
1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

COS	Programme Outcomes (POs)												PSOs		
CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-												
CO2	-	2	2										1	2	
CO3	2	2	2	3											
CO4	2	2	2	2										2	2
CO5	1	2													

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B0H09	Management Fundamentals	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:
Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE – I: Management and Principles of Management   [09 Periods] Introduction to Management: Concepts of Management and organization-nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management.
Management Theories: Mayo's Hawthorne Experiments, Maslow's Theory of Human
Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Corporate Social responsibility.

MODULE – II: Planning, Organization and types of Structures   [10 Periods] Planning: Need for planning- -Steps in the process of planning-Advantages and limitation of planning. Types of planning - Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Management by Objectives (MBO).
Organization and types of Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of Organizations- Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE – III: Staffing and controlling   [10 Periods]
A. **Staffing:** Basic concepts of HRM, functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development. Performance Appraisal, Job Evaluation and Merit Rating.
B. **Controlling:** process of controlling, types of controlling, managing productivity, Quality Control: chart, R chart, C chart, P chart, (simple Problems), Deming's contribution to quality.

MODULE – IV: Operations and Materials Management   [09 Periods]
Operations Management : Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.
Materials Management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

MODULE – V: Project Management and Contemporary Practices   [10 Periods]
Project Management (PERT/CPM): Network Analysis, Programme Evaluation and
Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

Contemporary Management Practices: Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), six sigma and Capability Maturity Model (CMM) Levels, Bench marking, Balanced Score card.

TEXT BOOKS:
1. Aryasri, **Management Science**, 4th edition TMH, 2004. (UNITS I,II,III,IV,V)
2. Stoner, Freeman, Gilbert, **Management,** Pearson Education, New Delhi, 6th Ed, 2004. (UNITS I,II)

REFERENCES:
1. Kotler Philip & Keller Kevin Lane, **"Marketing Management"**, PHI, 12th edition, 2005
2. Koontz &Weihrich, **"Essentials of Management"**, TMH, 6th edition, 2005.
3. Thomas N.Duening& John M. Ivancevich **"Management - Principles and Guidelines"**, Biztantra, 5th edition 2003.
4. Memoria & S.V. Gauker, **"Personnel Management"**, Himalaya, 25th edition, 2005
5. Samuel C. Certo, **"Modern Management"**, PHI, 9th edition, 2005.

E RESOURCES:
1. http://freevideolectures.com/Course/2689/Management-Science
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=human-resourcemanagement
3. http://www.onlinevideolecture.com/?course=mba-programs&subject=marketingfundamental
4. http://freevideolectures.com/Course/2371/Project-and-Production-Management
5. http://nptel.ac.in/courses/110105034/

Course Outcomes:
At the end of the course, students will be able to
1. Understand the various concepts, principles and theories of management.
2. Understand the basic concepts of planning and various structures of organizations.
3. Understand the process of staffing and controlling
4. Understand the process of operations management. Also learn the concepts of materials management and marketing management at an organization.
5. Understand the various contemporary management practices. Also the project management techniques.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	3	1			2	
CO2		3							2		1				2
CO3		3								2	1		3		
CO4		3		2	1										

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B6607	INTRODUCTION TO DATA VISUALIZATION	L	T	P
Credits: 3		3	-	-

PREREQUISITES: NIL

Course Objectives:
- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- To learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

MODULE I: INTRODUCTION

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

MODULE II: VISUALIZATION SYSTEMS

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

MODULE III: METAPHORICAL VISUALIZATION

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

MODULE IV: VISUALIZATION OF DATA

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

Module V: Data structures in data visualization.

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

TEXT BOOKS:

1. Data base Management Systems, Raghu Rama krishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited l, 6th edition

REFERENCES:

1. WARD, GRINSTEIN, KEIM,.Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. Tufte, The Visual Display of Quantitative Information, Graphics Press.

E-RESOURCES:

1. https://kakeboksen.td.org.uit.no/Database%20System%20Concepts%206th%20edition.pdf
2. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf
3. http://airccse.org/journal/ijdms/ijdms.html
4. http://www.springer.com/computer/database+management+%26+information+retrieval?SGWID=0-153-12-114576-0
5. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093
6. http://www.nptelvideos.in/2012/11/database-management-system.html

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Identify** and define the data models needed to design a database.
2. **Write** queries in SQL for database creation and maintenance.
3. **Analyze** functional dependencies for designing a robust database.
4. **Implement** transactions, concurrency control, recovery and Query optimization techniques.
5. **Compare** various indexing and hashing techniques.

CO- PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			3				2		3	3	3	
CO2	3	3	3			3				3		3	3	3	
CO3	3	3	3			2				3		2	3	3	
CO4	3	2	1			1				1		1			
CO5	3	1	1			1						1			

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester	
Code: B6608	ADVANCED MACHINE LEARNING	L	T	P
Credits: 3		3	-	-

PREREQUISITES: MACHINE LEARNING

Course Objectives:
Enhancing the basic understanding of Application of Mathematics in Computer Science. Imparting design thinking capability to build ML systems. Developing design skills of models for machine learning problems

MODULE I: STATISTICS: [10 PERIODS]

Measures of location- arithmetic, geometric and harmonic means, median, mode, measures of spread – range, variance and standard deviation, mean deviation, concept of skewness – positively and negatively skewed data, kurtosis, covariance.

MODULE II: Random Variables: **[09 Periods]**
Introduction to random variables, Probability mass functions, distribution and density functions, Discrete distributions– Binomial, Poisson, geometric and negative binomial distributions, Continuous distributions – exponential, Gamma, Normal distribution, T, and F distributions, mathematical expectation of random variables, probability generating function, moment generating function, characteristic function.

MODULE III: Open source ML tools: **[10 Periods]**
Computer vision-SimpleCV, Tessaract OCR, Detectron, Natural Language Processing Stanford core NLP, Music and Audio analysis-LibROSA, Other tools-KNIME and Orange

MODULE IV: Graph based learning: **[10 Periods]**
Graph based ML architectures,: Pregal, signal-collect, GraphLab, PowerGraph, GraphChi, GraphX,   Multi rank-walk SSL method, Modified Adsorption SSL method, Label propagation for SSL - Scalable machine learning algorithm

MODULE V: Machine Learning Applications for signal processing: **[09 Periods]**
Machine Learning for Audio Classification - Time Series Analysis, LSTMs and CNNs. Machine Learning for Image Processing - Transfer Learning, Attention models, Attribute-based learning

TEXT BOOKS:

1. Jennifer Campbell paul Gries Jason Montojo Greg Wilson, "Practical Programming" An introduction to Computer Science Using Python
2. Tom M. Mitchell, "**Machine Learning**", MGH, 1st Edition, 2013.
3. Stephen Marsland, "**Machine Learning: An Algorithmic Perspective**", Chapman and Hall / CRC, 2nd Edition, 2014.

REFERENCES:

1. Neural Networks, William WHsieh, "**Machine Learning Methods in the Environmental Sciences**"
2. Richard O. Duda, Peter E. Hart and David G. Stork, "**Pattern Classification**", John Wiley & Sons Inc., 2001
3. Chris Bishop, "**Neural Networks for Pattern Recognition**", Oxford University Press, 1995

E-RESOURCES:

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

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Formulate** machine learning problems corresponding to different applications.
2. **Understand** a range of machine learning algorithms like decision trees, and ANN.
3. **Apply** Machine Learning algorithms, Bayesian and Instance based Learning techniques.
4. **Use** of machine learning algorithms to solve problems using rules, and analytical learning techniques
5. **Illustrate** the Combining Inductive and Analytical Learning and applications of Reinforcement Learning

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1		1		1						1	1		
CO2	1	2	1	1	1	1						1		2	1
CO3	1	1	2	2	1	1						2		2	2
CO4	1	1	1	2	1	1						3		1	2
CO5	1	1	1	1	1	1						2		1	2

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B0515	DATABASE MANAGEMENT SYSTEMS (Common for CSE and IT)	L	T	P
Credits: 3		3	-	-

PREREQUISITES: NIL

Course Objectives:
This course enables the students to learn the basic concepts and the applications of Data Base Systems and conceptualize and depict a Data Base System using ER diagram, master in constructing queries using SQL. Using this course student can understand relational database principles, become familiar with the basic issues of transaction processing and concurrency control and Data Base storage structures and access techniques.

MODULE I: INTRODUCTION: [10 PERIODS]

Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

MODULE II: Relational Algebra and Calculus: [09 Periods]
Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

MODULE III: Schema Refinement and Normal Forms: [10 Periods]
A: Schema Refinement - Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs,
B: Normal Forms- Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

MODULE IV: Transaction Management and Concurrency Control: [10 Periods]
Transaction Management:-Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.
Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp- Based Protocols, Validation-Based Protocols, Multi version Schemes.
Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm,

Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems..

MODULE V: Storage and Indexing: **[09 Periods]**
Storage- Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations. Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghu Rama krishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India)Private Limited l, 6th edition

REFERENCES:

1. Database Systems, 6th edition, R Elmasri, ShamkantB.Navathe, PearsonEducation.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.

E-RESOURCES:

1. https://kakeboksen.td.org.uit.no/Database%20System%20Concepts%206th%20edition.pdf
2. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf
3. http://airccse.org/journal/ijdms/ijdms.html
4. http://www.springer.com/computer/database+management+%26+information+retri eval?SGWID=0-153-12-114576-0
5. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093
6. http://www.nptelvideos.in/2012/11/database-management-system.html

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Identify** and define the data models needed to design a database.
2. **Write** queries in SQL for database creation and maintenance.
3. **Analyze** functional dependencies for designing a robust database.
4. **Implement** transactions, concurrency control, recovery and Query optimization techniques.
5. **Compare** various indexing and hashing techniques.

CO- PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			3				2		3	3	3	
CO2	3	3	3			3				3		3	3	3	
CO3	3	3	3			2				3		2	3	3	
CO4	3	2	1			1				1		1			
CO5	3	1	1			1						1			

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester		
Code: B0539	**IoT with Machine Learning** [Professional Elective - V]		L	T	P
Credits: 3			3	-	-

Module-I
Principles and Foundation of IoT and AI – what is IoT 101?,IoT reference model,IoT platforms,IoT verticals,Big Data and IoT, Infusion of AI – data science in IoT- Cross –industry standard for data minimg,AI platforms and IoT platforms,Data access and Distributed processing for IoT-TXT format, CSV format, XLSX format, Woking with the JSON format, HDF5 format, SQL data,NoSQL data,HDFS

Module-II
Machine Learning for IoT, ML and IoT , Learning paradigms, prediction using linear regression, Logistic regression for classification, classification using support vector machines, Naïve Bayes, Decision trees, Ensemble learning.

Module-III
Deep Learning for IoT-Deep learning ,Multilayered perceptrons for regression and classification, Convolutional neural networks,Recurrent neural networks,autoencoders
Genetic algorithms for IoT Optimization-deterinistic and analytic methods,gradient desent method,newton Raphson method,Natural optimization methods,Introduction to genetic algorithms

Module-IV
Reinforcement learning for IoT-Introduction, RL terminology,Deep reinforcement learning,Simulated Environments,policy gradients.
Generative Models for IoT – introduction, generating images using VAEs,GANs

Module-V
Personal and Home IoT- personal IoT,Super shoes by MIT,Iot and smart Homes-human activity recognition, HAR using wearable sensors, HAR from videos,Smart lighting,AI for the indusrial IoT

Text Book:

1. Hands-On Artificial Intelligence for IoT-Expert Machine Learning and Deep Learning Techniques for

   Developing Smarter IoT Systems

References
1. Machine Learning and IoT: A Biological Perspective Shampa Sen, Leonid Datta, Sayak Mitra · 2018
2. Introduction to IoT with Machine Learning and Image Processing Shrirang Ambaji Kulkarni, Varadraj P. Gurupur, Steven L. Fernandes · 2020
3. Machine Learning Approach for Cloud Data Analytics in IoT Sachi Nandan Mohanty, Jyotir Moy Chatterjee, Monika Mangla · 2021

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			2		2				3					2	
CO2	2	3		1									2		
CO3			2	3	3								2	1	
CO4			2	2	2				3					2	
CO5	2	3			1								2		

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B0542	STREAMING DATA ANALYTICS [Professional Elective – II]	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

COURSE OBJECTIVES:

Data analysts exist at the intersection of information technology, statistics and business. They combine these fields in order to help businesses and organizations succeed. The primary goal of a data analyst is to increase efficiency and improve performance by discovering patterns in data.

Module –I Data Management   **[10 Periods]**

Data Management:

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

Module II: Data Analytics   **[09 Periods]**

Data Analytics:

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

Module III: Regression   **[10 Periods]**

Regression :

Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

Module IV: Object Segmentation   **[10 Periods]**

Object Segmentation:

Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

Module V: Data Visualization   **[09 Periods]**
Data Visualization:
Pixel-Oriented Visualization Techniques, Geometric Projection Visualization
Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization
Techniques, Visualizing Complex Data and Relations.

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

REFERENCES:

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

E-RESOURCES:

- https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/revised.pdf
- http://www.sciencedirect.com/science/article/pii/S1532046401910299
- http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.34.1r036
- http://nptel.ac.in/courses/106101007/
- http://nptel.ac.in/courses/106105158/

COURSE OUTCOMES:

After completion of this course students will be able to

1. Understand the impact of data analytics for business decisions and strategy

2. Carry out data analysis/statistical analysis

3. To carry out standard data visualization and formal inference procedures

<table>
<tr><td colspan="17">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="12">Programme Outcomes(POs)</td><td colspan="3">PSOs</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td></td><td></td><td>2</td><td></td><td>2</td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td>2</td><td></td></tr>
<tr><td>CO2</td><td>2</td><td>3</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td></tr>
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<tr><td>CO5</td><td>2</td><td>3</td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td></tr>
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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous	B.Tech. V Semester		
Code: B0528	SEMANTIC WEB	L	T	P
Credits: 3	[Professional Elective – II]	3	-	-

Prerequisites: Web Technologies

COURSE OBJECTIVES:

This course enables the students to learn and understand the fundamental technologies for enabling the envisioned semantic web, study various knowledge representation techniques, make use of development tools and methods for ontology engineering, construct application and services using semantic web technologies and analyze various collaboration networks.

MODULE I: World Wide Web   [09 Periods]
Web Intelligence - Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence
Web Description - Ontology, Inference Engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

MODULE II: Knowledge Representation for the Semantic Web   [10 Periods]
Ontology - Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web -Resource Description Framework (RDF) / RDF Schema,
Web Languages - Ontology Web Language (OWL), UML, XML, XML Schema.

MODULE III: Ontology Engineering   [10 Periods]
A: Ontology Development - Ontology Engineering, constructing Ontology, Ontology Development Tools, Ontology Methods
B: Ontology Sharing and Merging - Ontology Sharing and Merging, Ontology Libraries and Ontology mapping, Logic, Rule and Inference Engines.

MODULE IV: Semantic Web Applications, Services and Technology
[10 Periods]
Semantic Web Services - Semantic Web applications and services, Semantic Search,e-learning **Semantic**
Web Applications - Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods

MODULE V: Social Network Analysis and Semantic Web   [09 Periods]
Social Network Analysis - What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis - Electronic Discussion networks.
Semantic Web - Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

TEXT BOOKS:

1. Berners Lee, Gödel and Turing, "**Thinking on the web**", Wiley interscience, 2008.
2. Peter Mika, ". **Social Networks and the Semantic Web**", Springer, 2007

REFERENCES:

1. J.Davies, R.Studer, P.Warren, Johri. Wiley & Sons, "**SEMANTIC WEB TECHNOLOGIES, TRENDS AND RESEARCH IN ONTOLOGY BASED SYSTEMS**"

2. Liyang Lu Chapman and Hall, **" Semantic Web and Semantic Web Services**", CRC Publishers,(Taylor & Francis Group)

E-RESOURCES:

1. http://as.wiley.com/WileyCDA/WileyTitle/productCd-0471768669.html
2. http://www.springer.com/in/book/9780387710006
3. https://research.vu.nl/ws/portalfiles/portal/2312133
4. http://nptel.ac.in/courses/106105077/18

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Develop** web applications using semantic techniques.
2. **Relate** knowledge representation methods for semantic web.
3. **Explain** the key aspects of ontology engineering**.**
4. **Design** web services and its applications.
5. **Analyze** and build a social network.

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			2		2				3					2	
CO2	2	3		1									2		
CO3			2	3	3								2	1	
CO4			2	2	2				3					2	
CO5	2	3			1								2		

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisites: Operating Systems

COURSE OBJECTIVES: THIS COURSE PROVIDES THE STUDENTS

- To gain knowledge in the cloud computing environment
- To understand development of cloud services.
- To examine the collaboration of real time cloud services
- To analyze the case studies from various cloud development tools.

Module I: Computing Paradigms [8 Periods]

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

MODULE II: CLOUD COMPUTING FUNDAMENTALS [12 PERIODS]

Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

Module III: Cloud Computing Architecture and Management [8 Periods]

Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

MODULE IV: CLOUD SERVICE MODELS [8 PERIODS]

Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

MODULE V: Cloud Service Providers [12 Periods]

EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, AmazonWeb Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud,

Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

TEXT BOOKS

1. ESSENTIALS OF CLOUD COMPUTING : K.CHANDRASEKHRAN , CRC PRESS, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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

1. Understand the cloud enabling technologies and the Cloud service models.

2. Choose the levels of virtualization and tools for resource provisioning.

3. Compare the cloud platform architectures of virtualized data centers and Inter-cloud Resource Management.

4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.

5. Propose the standards of Parallel and Distributed Programming Paradigms for improving user Access to Cloud Computing.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											
	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				2							
CO2		1		2	2							1
CO3		1			3							2
CO4	1											2
CO5	1			2								1

Module-I

Artificial Intelligence in Process systems engineering-what is process system engineering,what is artificial intelligence?the AI-based application in PSE – physical properties prediction and product design,process modeling,fault detection and diagnosis,process optimization and scheduling.

Module-II

Deep learning in QSPR modeling for the prediction of critical properties-Introduction, methodology-The signature molecular descriptor,Data Preparation: Molecules encoding and canonizing,Data preparation Atom embedding from chemical bonds,Deep neural network,model training and evalution.

Module-III

Predictive deep learning models for environmental properties-Introduction,Methodology-Data acquisition and processing,tree structures in information processing ,signature molecular descriptor and encoding rules,structural features and parameters of DNN,List of molecular features,training process,generalization ability,applicability domain,external competitiveness,Discriminative power in isomers.

Module-IV

Automated extraction of molecular features in machine learning based environmental property prediction-Introduction,methodology-Data collection,feature extraction,Neural network design, model training,feacture vector,training process,model performance ,comparision with reported models

Module-V

Applications of artificial intelligence in modeling,control and fault diagnosis-ANN-Introduction, the architecture of neural networks,applications of neural network in chemical processes.Fuzzy Logic-

Introduction of Fuzzy,Applications of fuzzy controller in process control,A sample nof process control by fuzzy controller,Support Vector machine-Introduction,SVM Classifiers,SVM for nonlinear and nonseparable cases,Nonlinear SVMs.

Text Books

1. Applications of Artificial Intelligence in Process Systems Engineering

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			2		2				3					2	
CO2	2	3		1									2		
CO3			2	3	3								2	1	
CO4			2	2	2				3					2	
CO5	2	3			1								2		

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester	
Code: B0533	DISTRIBUTED SYSTEMS [Professional Elective – III]	L	T	P
Credits: 3		3	-	-

Pr

erequisites: Computer Networks, DBMS and Operating Systems

COURSE OBJECTIVES:

Student will be able to learn fundamental aspects of Distributed systems and analyze basics of Architectural and Fundamental Models. To identify various types of requirements and the process for Distributed objects. To make use of various OS layers to conceptualize and construct a system, to demonstrate different file systems tactics and define Events and time ordering in distributed transactions.

MODULE I: BASIC CONCEPTS   [09 PERIODS]

Characterization of Distributed Systems – Examples – Resource Sharing and the Web – Challenges – System Models – Architectural and Fundamental Models – Networking and Internetworking – Types of Networks – Network Principles – Internet Protocols – Case Studies.

MODULE II: Processes and Distributed Objects   [09   Periods]
Inter–process Communication – The API for the Internet Protocols – External Data Representation and Marshalling – Client –Server Communication – Group Communication – Case Study – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications – Java RMI – Case Study.

MODULE III: OPERATING SYSTEM ISSUES I   [10 PERIODS]

The OS Layer – Protection – Processes and Threads – Communication and Invocation – OS Architecture – Security – Overview – Cryptographic Algorithms – Digital Signatures – Cryptography Pragmatics – Case Studies – Distributed File Systems – File Service Architecture – Sun Network File System – The Andrew File System.

MODULE IV: Operating System Issues II   [10   Periods]
Name Services – Domain Name System – Directory and Discovery Services – Global Name Service – X.500 Directory Service – Clocks – Events and Process States – Synchronizing Physical Clocks – Logical Time And Logical Clocks – Global States – Distributed Debugging – Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

MODULE V: Distributed Transaction Processing   [10   Periods]
Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks – Transaction Recovery – Overview of Replication And Distributed

Multimedia Systems.

TEXT BOOKS:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", 3rd Edition, Pearson Education, 2002.
2. Andrew S. Tanenbaum, Maartenvan Steen, Distibuted Systems, "Principles and Pardigms", Pearson Education, 2002.

REFERENCES:

1. Sape Mullender, "Distributed Systems", 2nd Edition, Addison Wesley, 1993.
2. Albert Fleishman, Distributes Systems, "Software Design and Implementation", springer, Verlag, 1994.
3. M. L. Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004.

E- REFERENCES:

1. http://www.gecg.in/papers/ds5thedn.pdf
2. https://cs.uwaterloo.ca/~bernard/courses/cs454/0.Begin.pdf
3. https://www.cs.helsinki.fi/u/jakangas/Teaching/DistSys/DistSys-08f-1.pdf
4. https://courses.cs.ut.ee/MTAT.08.009/2014_fall/uploads/Main/slides10-2.pdf

COURSE OUTCOMES:

At the end of the course, students will be able to:
1. Structuring distributed applications: using client-server and remote procedure calls.
2. Learns inter process communication and distributed objects.
3. Design Cryptographic Algorithms and security issues for distributed systems.
4. Assess distributed file systems.
5. Ordering of events: using logical and physical clocks.

COs	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3		3								3	1	
CO2	1	3		2									2	1	
CO3			3	2	3				3				2	3	
CO4	2	3											2		
CO5	2	2			2								3		

Prerequisites: Computer Graphics

COURSE OBJECTIVES:

This course will enable the students to learn the fundamental concepts of animation, creating flash animation concepts, learn the 3d animation techniques, apply the motion capture software for animation and analyze various color models.

MODULE I: INTRODUCTION   [09 PERIODS]

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

MODULE II: Creating Animation in Flash   [10 Periods]

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based   Animation   -Working   with   the Time line   and Twin based animation - Understanding Layers – Action script.

MODULE III: 3D Animation Effects   [10 Periods]

A: 3D Animation & its Concepts – Types of 3D Animation – Skeleton & Kinetic3D Animation.
B: Texturing & Lighting of 3D Animation – 3D Camera Tracking –Applications &
     Software of 3D Animation.

MODULE IV: Motion Capture   [09 Periods]

 Motion Caption – Formats – Methods – Usages – Expression – Motion Capture Softwares' – Script Animation Usage – Different Languages of Script Animation among the Software.

MODULE V: Color Model   [10 Periods]

Concept Development –Story Developing –Audio & Video – Color Model –Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TEXT BOOKS:

1. Juke Parent, **"Computer Animation: Algorithms and Techniques"**, 3rd Edition, (Hardcover,RickParent).
2. Williams Richars, "**The Animator's Survival Kit--Revised Edition: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and**

Internet", Faber & Faber, 2012.

REFERENCES:

1. Alex Michael, **"Animating with Flash MX Professional Creative Animation Techniques"**, 1st edition Focal Press, 2003.

E-RESOURCES:

1. http://www.bkstr.com/floridastore/home Autodesk Maya 2016
2. https://itunes.apple.com/us/app/the-animators-survival-kit/id627438690?mt=8
3. http://ieeexplore.ieee.org/document/7239940/
4. nptel.ac.in/courses/106102063/25

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Understand** fundamental concepts of animation.
2. **Implement** animation using flash concepts.
3. **Outline** the scripting concepts in 3D animation methods.
4. **Analyze** the different languages of scripting animation techniques.
5. **Apply** the story developing and color model in 3D animated movies.

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
	Programme Outcomes(POs)												**PSOs**		
CO1	1	2			2							-	1		
CO2			3		3							3		2	
CO3					3							-		2	
CO4				2								-			
CO5			3		3							3		3	3

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B0547	INTERNET OF THINGS [Professional Elective – III]	L	T	P
Credits: 3		3	-	-

Prerequisites: Basic knowledge of computer architecture, programming and communication protocols

COURSE OBJECTIVES:

Understand the basics of Embedded System, IoT and the development model. Understand the architecture, Instruction set and work on ARM microcontroller using practical hands-on. Ability to select appropriate hardware and microcontrollers based on need of application. Understand the Internet of Things Standards, Frameworks and Techniques. Apply the tools, techniques and skills acquired towards development of Projects.

MODULE I - INTRODUCTION TO EMBEDDED SYSTEMS AND INTERNET OF THINGS (IOT) [09 PERIODS]

Architecture of Embedded Systems , Embedded Systems Development process, Architecture of Internet of Things , Applications of Embedded Systems and IoT, Design Methodology for IOT Products

MODULE II - OVERVIEW OF OPEN SOURCE HARDWARE AND ITS RELEVANCE TO IOT [09 PERIODS]

introduction and programming Adriano development board , working with sensor integration, interfacing input / output devices (pot, ldr, lcd, etc), introduction to network connectivity, concepts of ip based communication, client – server model of communication, introduction to wi-fi communication using esp8266, esp8266 in station & access point mode

MODULE III – FUNDAMENTALS OF PYTHON PROGRAMMING & RASPBERRY PI [10 PERIODS]

A: Introduction to python programming, working with functions, classes, REST full Web Services, Client Libraries.
B: Introduction & programming Raspberry Pi3, Integrating Input Output devices with Raspberry Pi3

MODULE IV – IOT PLATFORM: CLOUD COMPUTING PLATFORMS FOR IOT DEVELOPMENT (IBM CLOUD)   [10 PERIODS]

IOT Platform Architecture (IBM Internet of Things & Watson Platforms), API Endpoints for Platform Services , Devices Creation and Data Transmission, Introduction to NODE-RED and Application deployment

MODULE V – IOT USECASES: SMART CITY PROJECT & INDUSTRIAL   USECASES [10 PERIODS]

Introduction to Smart City Project & IOT Use cases , Development of Smart city Applications , Project Work -1 (Smart city Use case) , Project Work-2 (Industrial Use case)

TEXT BOOKS:

1. Internet of Things: A Hands-On Approach by by Arsheep Bahga, Vijay Madisetti
2. The Internet of Things: Key applications and Protocols ǀ Wiley Publications 2nd Edition

REFERENCES:

1. Embedded Systems: Real-Time Interfacing to Arm(r) Cortex -M Microcontrollers: Volume-1 & 2 by Jonathan W Valvano
2. Designing the Internet of Thingsǀ by Adrian McEwen, Hakim Cassimally, Wiley Publications, 2012
3. Embedded Real Time Systems: Concepts, Design and Programmingǀ by Dr.K.V.K.K.Prasad, DreamTech Publication, 2003.

E-RESOURCES:

1. http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx
2. http://electronicdesign.com/embedded/understanding-protocolsbehind-internet- things
3. http://eclipse.org/community/eclipse_newsletter/2014/february/articl e2.php
4. http://iot.eclipse.org/protocols.html
5. http://www.slideshare.net/paolopat/internet-ofthingsprotocolswar
6. http://www.slideshare.net/RealTimeInnovations/io-34485340
7. http://www.networkworld.com/article/2456421/internet-of-things/aguide-to-the- confusing-internet-of-things-standards-world.html

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Describe** the fundamental concepts of IoT and its applications
2. **Illustrate** M2M concepts with protocols.
3. **Develop** applications using Python Scripting Language.
4. **Build** real world applications by applying Raspberry PI.
5. **Examine** web based services.

COs	\multicolumn{12}{c}{**Programme Outcomes(POs)**}	\multicolumn{3}{c}{**PSOs**}
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3	3	3						3	3	3
CO2	3	2	3	2	3							2	3	3	3
CO3	3	3	3	3	3							3	3	3	3
CO4	3	3	3	3	3	3						3	3	3	3
CO5	3	3	3	3	3							3	3	3	3

Table title: **CO- PO, PSO Mapping** (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B6613	**Data Analytics** [Professional Elective – III]	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites:

1. A strong mathematical background in Probability and Statistics
2. Proficiency with algorithms
3. Programming skills in C, Python, R, etc.
4. Critical thinking and problem solving skills

Course Objective

Fundamental algorithms and techniques used in Data Analytics. The statistical foundations will be covered first, followed by various machine learning and data mining algorithms. Technological aspects like data management (Hadoop), scalable computation (MapReduce) and visualization will also be covered. In summary, this course will provide exposure to theory as well as practical systems and software used in data analytics.

Module - I

Data Definitions and Analysis Techniques - Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning and R-Programming

Module - II

Descriptive Statistics-Measures of central tendency, Measures of location of dispersions, Practice and analysis with R

Module - III

Basic analysis techniques - Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R

Module - IV

Data analysis techniques - Regression analysis, Classification techniques, Clustering, Association rules analysis, Practice and analysis with R

Module - V

Case studies and projects - Understanding business scenarios, Feature engineering and visualization, Scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis

Text Books

1. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013

Reference

1. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer
2. Mining Massive Data Sets, A. Rajaraman and J. Ullman, Cambridge University Press, 2012
3. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
4. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
5. Hadoop: The Definitive Guide (2nd Edn.) by Tom White, O'Reilly, 2014
6. MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014
7. Beginning R: The Statistical Programming Language, Mark Gardener, Wiley, 2013

Course Outcome:

1. Find a meaningful pattern in data
2. Graphically interpret data
3. Implement the analytic algorithms
4. Handle large scale analytics projects from various domains
5. Develop intelligent decision support systems

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3		3								3	1	
CO2	1	3		2									2	1	
CO3			3	2	3				3				2	3	
CO4	2	3											2		
CO5	2	2			2								3		

Table title: **CO- PO, PSO Mapping** (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B0546	**Block chain Technologies** [Professional Elective – III]	**L**	**T**	**P**
Credits: 3		3	-	-

Course objective:

To give students the understanding of emerging abstract models for Blockchain Technology and to familiarise with the functional/operational aspects of cryptocurrency eco-system.

Module - I
Introduction:

Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Nakamoto's concept with Blockchain based cryptocurrency, Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.

Module - II
Basic Distributed Computing & Crypto primitives:

Atomic Broadcast, Consensus, Byzantine Models of fault tolerance, Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems

Module - III
Bitcoin basics: Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use

Module - IV
Ethereum basics: Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, Writing smart contracts using Solidity & JavaScript

Module - V
Privacy, Security issues in Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks

List of References:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction", Princeton University Press.

2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

3. Imran Bashir, "Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing.

4. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols", Packt Publishing.

5. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design And Use Cases"[MOOC],

NPTEL: https://nptel.ac.in/courses/106/105/106105184/ Course Outcomes (COs): At the end of this course students will be able to…

1. Describe the basic concepts and technology used for blockchain.

2. Describe the primitives of the distributed computing and cryptography related to blockchain.

3. Illustrate the concepts of Bitcoin and their usage.

4. Implement Ethereum block chain contract.

5. Apply security features in blockchain technologies.

6. Use smart contract in real world applications.

COS	\multicolumn{12}{c}{Programme Outcomes(POs)}	\multicolumn{3}{c}{PSOs}
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3		3								3	1	
CO2	1	3		2									2	1	
CO3			3	2	3				3				2	3	
CO4	2	3											2		
CO5	2	2			2								3		

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester		
Code: B0520	**Database Management Systems Lab** (Common for CSE, IT, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and AI & ML)		**L**	**T**	**P**
Credits: 2			**-**	**1**	**2**

(Left margin: **Co-**)

requisites
1. Co-requisite of course "Database Management Systems"

Course Objectives:
This course enables the students to practice the concepts learnt in the subject DBMS by developing a database for an example project.
1. The student is expected to practice the designing a database system using ER diagram, developing and querying a relational database using normalization techniques in the context of example database.
2. Students are expected to Learn SQL basics for data definition and data manipulation using "MySQL" database.
3. Students are expected to apply the learn developing database applications using procedures, cursors and triggers.

Software Requirements: MYSQL

List of experiments:

1	Railway Reservation System -(Redesigning IRCTC database) **Train** (train Number, name, source, destination, start_time, reach_time, traveltime, distance, class, days, type) **Ticket** (PNRNo, Transactionid, from_station, To_station, date_of_journey, class date_of_booking, total_ticket_fare, train number) **Passenger** (PNR No, Serial no, Name, Age, Reservation_status) **Train_Route**(Train_No, route_no, station_code, name, arrival_time, depart_time, distance, day) **Train_Ticket_fare**(Train_No, class, base_fare, reservation_charge, superfast_charge, other_charge, tatkal_charge, service_tax)
	Create all the tables specified above. Make underlined columns as primary key.(use number, number(m,n), varchar(n), date, time, timestamp data types appropriately)
	Insert atleast 5 rows to each table. (Check www.irctc.co.in website for actual data)
	1. Use Interactive insertion for inserting rows to the table.
	2. Use ADT (varray) for class and days column in Train table.
2	Write simple DDL/DML Queries to 1. Remove all the rows from Passenger table permanently. 2. Change the name of the Passenger table to Passenger_Details. 3. List all train details. 4. List all passenger details. 5. Give a list of trains in ascending order of number. 6. List the senior citizen passengers details. 7. List the station names where code starts with 'M'. 8. List the trains details within a range of numbers. 9. Change the super fast charge value in train fare as zero, if it is null. 10. List the passenger names whose tickets are not confirmed. 11. List the base_fare of all AC coaches available in each train. Find the ticket details where transaction id is not known. 1) Use Interactive updation for updating the seat no for particular PNR NO. 2) Find the train names that are from Secunderabad to Mumbai, but do not have the source or

	destination in its name.
	3) Find the train details that are on Thursday (Use the ADT column created).
3	Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table.
	1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999.
	2) Add a suitable constraint for the column of station name, so that does not take duplicates.
	3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values.
	4) Add a suitable constraint for the class column that it should take values only as 1A, 2A, 3A, SL, C.
	5) Add a not null constraint for the column distance in train_route.
4	Use SQL PLUS functions to.
	1. Find the passengers whose date of journey is one month from today.
	2. Print the train names in upper case.
	3. Print the passenger names with left padding character.
	4. Print the station codes replacing K with M.
	5. Translate all the LC in class column (Train_fare) to POT and display.
	6. Display the fare details of all trains, if any value is ZERO, print as NULL value.
	7. Display the pnrno and transaction id, if transaction id is null, print 'not generated'.
	8. Print the date_of_jounrney in the format '27th November 2010'.
	9. Find the maximum fare (total fare).
	10. Find the average age of passengers in one ticket.
	11. Find the maximum length of station name available in the database.
	12. Print the fare amount of the passengers as rounded value.
	13. Add the column halt time to train route.
	14. Update values to it from arrival time and depart time.
	High Level:
	15. Update values to arrival time and depart time using conversion functions.
	16. Display the arrival time, depart time in the format HH:MI (24 hours and minutes).
5	Write Queries to.
	Use SET Operators
	1. Find the train numbers for which reservation have not yet been made.
	2. Find the train names that donot have a first AC class coach.
	3. Print all the PNR nos available in the database.
	4. Find passenger names who have booked to 'Pune'.
	Use Nested Query(in Operators)
	1. Find the train names that stop in 'Warangal'.
	2. Find the train names that are superfast and the service tax is zero.
	3. Find the Passenger name who have booked for the train that starts from 'Secunderabad'.
	4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case.
6	Use Join Query
	1. Find the train names that stop in 'Warangal'.
	2. Find the train names that are superfast and the service tax is zero.
	3. Find the Passenger name (and train name) who have booked for the train that starts from 'Secunderabad'.
	4. Display the trains names, each type of class and the total fare for each type of class.
	5. Display all the train details and the ticket details (if booked any).

	6. Create a sequence to provide values for the PNR no. 7. Write a query for full outer join using any of the tables above. Write Queries to. Use Coorelated (and nested) Query 1. Find the train names for which ten tickets have been reserved. 2. Find the trains that have more than ten substations. 3. Find the passengers who do not pass through 'Kachiguda'. 4. Find passengers who have booked for super fast trains.
7	Complex queries (use groupby/groupby having/join/nested) 1. Take the start station code and end station code and display the train details. 2. List the train names and the number of sub stations it has. 3. List the stations where all types of trains stop. 4. List the trains names that has atleast four bookings. 5. Create a table cancellation history (Insert values from ticket and passenger table). 6. Create a table for all the train numbers and class available in train_ticket_fare with total seats. 1. Find the station name that has highest number of trains stopping at.
8	Write a simple PL/SQL block to. 1. Print the fibonacci series. 2. Print the factorial of a given number. 3. Print 'NOT confirmed' based on the reservation status, of a particular passenger. 4. Print the total seats available for a particular train and for a particular class.
9	Write a cursor for the following. 1. Retrieve the passenger details for —X train number and given journey date. 2. Display the train name (once) and the substation names. 3. Display the fare details of a particular train(use basic exceptions) 4. Write a cursor to update the reservation status of the passengers (generate seat number, if seats have reached maximum, put waiting list number (30% of total seats), if waiting list number reaches maximum, put PQWL (10% of total seats), RAC-20%)

10	1. Write a PL/SQL procedure to.
	  a. List the details of passengers who has reserved next to —Mr. X.
	  b. PNR No. of a passengers for a given source and a destination.
	 2. Write a PL/SQL function to.
	  a. Get the PNRNo and return the total ticket fare.
	  b. Get the Passenger name, train no and return the total journey time in hours andminutes.

11	Write a Trigger for the following: 1) When a passenger cancels a ticket, do the necessary process and update the cancellation history table. 2) When train number is changed, update it in referencing tables. 3) When a passenger record is inserted reservation status should be automatically updated.
12	1) Use TCL commands for your transactions. (commit,rollback,savepoint) 2) Create a role named 'clerk', and give permission for him to select only the trains starting from 'Warangal' along with fare details. 3) Create a nested table containing trainno,name,source,destination and passengers who have booked for it (PNR no,sno, name,age). Find the passengers whose name start with 'S' and train starts from 'Warangal'

Textbooks:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition

2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

References:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Edition.
2. SQL The Complete Reference, James R. Groff, Paul N. Weinberg, 3rd Edition,
3. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
4. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.

Outcomes:
1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers.

<table>
<tr><th colspan="15">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">Programme Outcomes (POs)</th><th colspan="3">PSOs</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th><th>PSO3</th></tr>
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<tr><td>CO3</td><td>2</td><td>2</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td></tr>
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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B6609	**Introduction to Data Visualization lab** Common for CSE (AI and ML)	**L**	**T**	**P**
Credits: 1.5		-	-	3

Prerequisites: Computer programming, Python

Software Requirements: tabula or Python

Course Objectives:
Data Visualization is the process of communicating complex information with simple graphics and charts. Data Visualization has the power to tell data-driven stories while allowing people to see patterns and relationships found in data.

List of Experiments:

1. Connect to data Sources
2. Create Univariate Charts
3. Create Bivariate and Multivariate charts
4. Create Maps
5. Calculate user-defined fields
6. Create a workbook data extract
7. Save a workbook on a Tableau server and web
8. Export images, data.

<table>
<tr><th colspan="16">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">Programme Outcomes (POs)</th><th colspan="3">PSOs</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th><th>PSO3</th></tr>
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<tr><td>CO2</td><td>2</td><td>2</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td></tr>
<tr><td>CO3</td><td>2</td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td></tr>
</table>

PREREQUISITES: NIL

Course Objectives: EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

MODULE-1 Business Environment and Managerial Economics [10 Periods] **Business Environment**: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship).

Managerial Economics: Definition, Nature and Scope of Managerial Economics– Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

MODULE – II Theory of Production and Cost Analysis[10 Periods]
Theory of Production: Production Function – ISOquants and ISOcosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break- even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

MODULE – III MARKET STRUCTURES AND PRICING POLICIES [09 PERIODS]

A. **Introduction to Markets & Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

B. **Pricing Policies & Methods:** Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods.

MODULE – IV Capital and Capital Budgeting [09 Periods]
Capital: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Capital Budgeting: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE – V FINANCIAL ACCOUNTING AND RATIOS   **[10 PERIODS]**

Financial Accounting: Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Financial Analysis Through Ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri, "**Managerial Economics and Financial Analysis**", TMH, 2nd edition, 2005.
2. Varshney & Maheswari, "**Managerial Economics**", 5th edition Sultan Chand, 2003

REFERENCES:

1. H. Craig Peterson & W. Cris Lewis, "**Managerial Economics**", PHI,4th Edition.
2. Domnick Salvatore, "**Managerial Economics In a Global Economy**", Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, "**Managerial Economics& Financial Analysis**", 4th Edition Scitech.
4. S.N.Maheswari & S.K. Maheswari, "**Financial Accounting**", 6th Edition Vikas.
5. Dwivedi, "**Managerial Economics**", Vikas, 6th Edition.

E-RESOURCES:

1. http://www.learnerstv.com/Free-Economics-video-lecture-courses.htm
2. http://nptel.ac.in/courses/110105067/
3. http://nptel.ac.in/courses/110107073/
4. http://nptel.ac.in/courses/110101005/
5. http://nptel.ac.in/courses/109104073/

COURSE OUTCOMES:

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

1. Understand the concepts of managerial economics and their application in evaluating the demand.
2. Evaluate the production function and identifies the least cost combination to control the costs of production.
3. Understand the structures of various market types and their pricing policies.
4. Understand the types of business forms and also be able to evaluate the investments using capital budgeting techniques.
5. Understand the basic concepts of financial accounting and evaluation of company performance using ratio analysis.

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
	Programme Outcomes(POs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2							1		3	
CO2	3			2	1							
CO3		1			2						3	
CO4	2	1			3							
CO5		1			2						3	

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: B6201	COMPUTER NETWORKS	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

This course provides students to understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN, build the skills of subnetting and supernetting, explain the concepts of protocols of Transport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

MODULE I: Basics of Networking and Physical layer [10 Periods]

Basics of Networking - Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO /

OSI model, TCP/IP model.

Physical layer - Digital transmission, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

MODULE II: Data link layer [11 Periods]

Functionalities of Data link layer - Introduction, Framing, Error Detection and Correction

– Parity – LRC – CRC- Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. Random access, Controlled access, Channelization, Collision Free Protocols.

LAN - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11

MODULE III: Network Layer [09 Periods]

A: Basics of Network Layer - Logical Addressing, Internetworking, Tunneling, Address mapping,

B: Communication Protocols - ICMP, IGMP, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols.

MODULE IV: Transport Layer [09 Periods] Connection Oriented and Connectionless Protocols - Process to Process Delivery, UDP and TCP protocols, SCTP.

Congestion Control - Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

MODULE V: Application layer [09 Periods]

DNS - Domain name space, DNS in internet, Electronic mail

Protocols and Network Security - FTP, WWW, HTTP, SNMP, Network Security, Cryptography.

TEXTBOOKS:

1. Behrouz A. Forouzan, **"Data Communications and Networking"**, 4thEdition,TMH, 2006.
2. Andrew S Tanenbaum, **"Computer Networks"**, 4th Edition, Pearson Education/PHI.

REFERENCES:

1. P.C .Gupta, **"Data communications and computer Networks"**, PHI.
2. S.Keshav, **"An Engineering Approach to Computer Networks"**, 2nd Edition, Pearson Education.

3. W.A. Shay, **"Understanding communications and Networks"**, 3rd Edition, Cengage Learning.
4. James F.Kurose & Keith W. Ross, **"Computer Networking: A Top-Down Approach Featuring the Internet"**, 3rd Edition, Pearson Education.

E-RESOURCES:
1. https://www.saylor.org/site/wp-content/uploads/2012/02/ComputerNetworking-   Principles-Bonaventure-1-30-31-OTC1.pdf
2. http://ebook-dl.com/downloadbook/230
3. https://doi.org/10.1016/0169-7552(89)90019-6
4. http://nptel.ac.in/courses/106105081/

Course Outcomes:
At the end of the course, students will be able to
   • **Understand** the Layered Architecture of Computer Networks.
   • **Conceptualize** the protocols of Data Link Layer and can build Local area networks.
   • **Apply** Subnet and Supernet concepts in the construction of computer network**.**
   • **Summarize** the protocols used in Transport Layer, QoS and Congestion control mechanisms.
   • **Analyze** different protocols of Application Layer and various security risks.

<table>
<tr><td colspan="16">CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes(POs)</td><td colspan="3">PSOs</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td></tr>
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<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: B6610	**COMPUTER VISION** Common for CSE (AI and ML)	L	T	P
Credits: 3		3	-	-

Course Objectives
To make the students to understand

- The fundamentals of Computer Graphics and Image Processing
- The concepts related edge detection, segmentation, morphology and image compression methods.

Module I: Introduction:Applications of Computer Graphics and Image Processing, Fundamentals on Pixel concepts, effect of Aliasing and Jaggles, Advantages of high resolution systems DDA line algorithms: Bresenhams line and circle derivations and algorithms.

Module II: 2-D Transformations:Translations, Scaling, rotation, reflection and shear transformations, Homogeneous coordinates, Composite Transformations- Reflection about an arbitrary line; Windowing and clipping, viewing transformations, Cohen- Sutherland clipping algorithm.

Module III: Digital Image Properties:Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, Color perceived by humans, Color Spaces, Palette Images, color Constancy.
Color Images:Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Fri-chen, Canny Edge detection.

Module IV: Mathematical Morphology:Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation

ModuleV: SEGMENTATION:Threshold detection methods, Optimal Thresholding, Edge based Segmentation-Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Mergingm Region Splitting, Splitting and Merging, Watershed Segmentation.

Image Data Compression:Image data Properties, Discrete Image Transformations in data compression, Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predicative Compression methods, Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG- MPEG Image Compression methods.

Text Books

- Computer Graphics C Version, Donald Hearn, M Paulli Baker , Pearson (Uniit I and Unit II)
- Image Processing, Analysis and Machine Vision, Millan Sonka, Vaclov Halvoc, Roger Boyle, Cengage Learning, 3ed, (Unit III, Unit IV, Unit V and Unit VI)

References

- Computer & Machine Vision, Theory , Algorithms , Practicles, E R Davies, Elsevier, 4ed
- Digital Image Processing with MATLAB and LABVIEW, Vipul Singh, Elsevier

- Digital Image Processing, R C Gonzalez &R E woods, Addison Pearson, 3ed.

Course Outcomes

- understanding of digital image processing fundamentals: hardware and software, digitization, enhancement and restoration, encoding, segmentation, feature detection
- ability to apply image processing techniques in both the spatial and frequency (Fourier) domains
- Ability To understand (i.e., be able to describe, analyse and reason about) how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation

COS	Programme Outcomes(POs)												PSOs		
---	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3											3	
CO2	3												2		
CO3				2										2	
CO4					3									2	
CO5						2									3

CO- PO,PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisites: Data Structures

COURSE OBJECTIVES:
- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

MODULE- I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

MODULE- II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

MODULE - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

MODULE - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

MODULE - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval,

Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
   Modern Information

E-RESOURCES:

1. http://gvpcse.azurewebsites.net/pdf/data.pdf
2. http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMApVUMmjlExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

COURSE OUTCOMES:

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1		1		1						1	1		
CO2	1	2	1	1	1	1						1		2	1
CO3	1	1	2	2	1	1						2		2	2
CO4	1	1	1	2	1	1						3		1	2
CO5	1	1	1	1	1	1						2		1	2

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: B6612	INFORMATION SECURITY [Professional Elective - IV] Common for CSE (AI and ML)	L	T	P
Credits: 3		3	-	-

Prerequisites: Computer Networks
COURSE OBJECTIVES:

This course enables the students to understand the main concepts of Security services and Attacks, categorize various Conventional Encryption Algorithms, compare various algorithms and fundamental ideas of public-key cryptography, illustrate various E-Mail privacy techniques and infer web security and intrusion detection systems.

MODULE I: Introduction - Security Attacks and Mechanisms   **[10 Periods]**
Security Attacks - Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability)
Security Mechanisms - A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking and man-in-the-middle attacks.

MODULE II: ENCRYPTION   **[09 PERIODS]**

Conventional Encryption Principles - Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices.
Key Distribution - key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

MODULE III: Cryptographic Techniques   **[10 Periods]**
A: Cryptographic Techniques - Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates.
B: Key Management - Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

MODULE IV: Email Privacy   **[09 Periods]**
Email Privacy - Pretty Good Privacy (PGP) Characteristics of PGP, Cryptographic Keys and Key rings, PGP Message Generation.
S/MIME - S/MIME, MIME Types and Subtypes, Cryptographic algorithms in S/MIME.

MODULE V: IP & Web Security   **[10 Periods]**
IP Security - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.
Web Security - Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Basic concepts of SNMP,

SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion DetectionSystems.

TEXT BOOKS:

1. William Stallings "**Network Security Essentials (Applications and Standards)**", 4th Edition,Pearson Education 2011.
2. Behrouz A . Forouzan, **"Cryptography and Network Security"** TMH 2007.

REFERENCES:

1. Eric Maiwald, **"Fundamentals of Network Security"**, Dreamtech press.
2. William Stallings, "**Cryptography and network Security**", 3rd Edition, PHI, Pearson.
3. Atul Kahate,"**Cryptography and Network Security**", 2nd edition, TMH.

E-RESOURCES:

1. http://sbmu.ac.ir/uploads/3._Network-security-essentials-4th-edition-william-stallings.pdf
2. https://docs.google.com/file/d/0B5F6yMKYDUbrYXE4X1ZCUHpLNnc/edit
3. https://www.ijirset.com/upload/2015/march/43_A_COMPARATIVE.pdf
4. http://airccse.org/journal/ijcis/ijcisleaflet.pdf
5. http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-YWRO7kjOasUj1lin1v_dK-KbzKa2DvORf95P_mMwhs8pOqinTDauGH9wz6GFBPImIE6A

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Analyze** various security service mechanisms.
2. **Compare** and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.
3. **Apply** cryptographic techniques in real time applications
4. **Formulate** web security services and mechanisms.
5. **Distinguish** SSL, TLS and its applications.

COs	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3			2				2					2
CO2		3		2				2						2	
CO3	3			3			2			2			3		
CO4													2		
CO5		3		2				2						2	

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Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

COURSE OBJECTIVES:

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

MODULE - I

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

MODULE- II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interperter

MODULE - III

Introduction to PERL and Scripting
Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

MODULE- IV

Advanced perl Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

MODULE-V

TCL

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk

Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

COURSE OUTCOMES:

- Comprehend the differences between typical scripting languages and typical system and application programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
- Acquire programming skills in scripting language.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3		2	2				2		3	2	3	3
CO2			3		2	2				2		3	2	3	3
CO3			3		2	2				2		3	2	3	3
CO4			3		2	2				2		3	2	3	3
CO5			3		2	2				2		3	2	3	3

CO- PO,PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester	
Code: B6613	**PATTERN RECOGNITION** [**Professional Elective - IV**]	L	T	P
Credits: 3		3	-	-

Course Objectives
The course is designed to introduce students to theoretical concepts and practical
issues associated with pattern recognition

UNIT-I: Introduction:Machine perception, pattern recognition example, pattern recognition
systems, the Design cycle, learning and adaptation
Bayesian Decision Theory: Introduction, continuous features – two categories classifications,
minimum error-rate classification-zero–one loss function, classifiers, discriminant functions, and
decision surfaces.

UNIT-II: Normal density:Univariate and multivariate density, discriminant functions for the
normal Density different cases, Bayes decision theory – discrete features, compound Bayesian
decision theory and context

UNIT-III : Maximum likelihood and Bayesian parameter estimation:Introduction, maximum
likelihood Estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case

UNIT-IV : Un-supervised learning and clustering: Introduction, mixture densities and
identifiability, maximum likelihood estimates, application to normal mixtures, K-means
clustering. Date description and clustering – similarity measures, criteria function for clustering

UNIT-V : Pattern recognition using discrete hidden Markov models:Discrete-time Markov
process, Extensions to hidden Markov models, three basic problems of HMMs, types of HMMs.

Continuous hidden Markov models :Continuous observation densities, multiple mixtures per
state, speech recognition applications.

Text Books

- Pattern classifications, Richard O. Duda, Peter E. Hart, David G. Stroke. Wiley student
  edition, Second Edition.
- Pattern Recognition, An Introduction, V Susheela Devi, M Narsimha Murthy, Universiy
  Press

Course Outcomes
Design systems and algorithms for pattern recognition (signal classification), with focus on
sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM),

- Analyse classification problems probabilistically and estimate classifier performance,
- Understand and analyse methods for automatic training of classification systems,
- Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models,
- Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models

CO	Programme Outcomes(POs)												PSOs		
	s PO	PO	PO	PO	PO	PO	PO	PO	PO	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO	1	1	1	1									1	1	1
CO	1	2	2	2	1							1	1		2
CO	1	1	1	2	1							1	1		1
CO	1	1	1	1	1							1	1	1	1
CO	1	2	2	2	2							2	2	1	3

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: B0537	**Natural Language Processing** **[Professional Elective - IV]** **(Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)**	L	T	P
Credits: 3		3	-	-

Course Objectives:

1. Gain a foundational understanding in natural language processing methods and strategies
2. Learn how to evaluate the strengths and weaknesses of various NLP technologies and frameworks as they gain practical experience in the NLP toolkits available.
3. learn how to employ literary-historical NLP-based analytic techniques like stylometry, topic modeling, synsetting also and named entity recognition in their personal research.
4. Enlighten concepts of Predicate – Argument Structure
5. Evaluate various discourse Processing of Cohesion Reference Resolution

Module I: Finding the Structure of Words: [10 Periods]

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

Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

Module II: Syntax Analysis: [09 Periods]

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

Module III: Semantic Parsing: [10 Periods]

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

Module IV: Predicate-Argument Structure [09 Periods]

Predicate-Argument Structure, Meaning Representation Systems, Software.

ModuleV: Discourse Processing: [10 Periods]

Cohension, Reference Resolution, Discourse Cohension and Structure **Language Modeling:**

Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

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

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

E-RESOURCES:
1. https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/revised.pdf
2. https://hpi.de/fileadmin/user_upload/fachgebiete/plattner/teaching/Natural Langua geProcessing/NLP2016/NLP01_IntroNLP.pdf
3. http://www.sciencedirect.com/science/article/pii/S1532046401910299
4. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.34.1r036
5. http://nptel.ac.in/courses/106101007/
6. http://nptel.ac.in/courses/106105158/

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

COs	Programme Outcomes (POs)												PSOs		
CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	2	2	1	-	1	2	2	2
CO2	3	3	2	2	1	-	-	2	2	1	-	2	3	2	2
CO3	3	3	3	1	1	-	-	2	2	1	-	2	3	1	1
CO4	3	3	2	2	1	-	-	3	3	1	-	2	3	2	2
CO5	3	3	2	2	1	-	-	2	2	1	-	2	3	2	2

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: B0H03	English Communication and Presentation Skills Lab (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	L	T	P
Credits: 1		-	-	2

Pre-requisites: NIL

Course Objectives:
The learners need to be aware of the characteristics of technical communication in their workplaces; as a result, they are exposed to different channels of technical communication. Hence the acquired skills make the learners effective communicators using persuasive language. Besides the above said, one of the major objectives is to maintain objectivity in writing documents and to produce professional quality documents using different components of the language.

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

MODULE I: Oral Presentation
Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation. *This particular MODULE is for internal evaluation purpose(s).

MODULE II: E - Correspondence and Email etiquette
Common web mail services, yahoo, gmailetc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock , Highlight, The 'KISS' strategy (Keep It Simple and Short,)Points to remember while signing off, Introduction to Technical Vocabulary.
• This MODULE is purely for internal assessment/evaluation

MODULE III: Group Discussion

Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

MODULE IV: Interview Skills & Office Etiquette

Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards.

MODULE V: Job Hunt Process

SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's -electronic, video and printed resume's
  • Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

REFERENCES:

1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.
3. Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
4. Leslie. T. Giblin: **Skill with people** Publication details not known
5. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
6. Murthy, A.G, Krishna,:**Ten Much** : Tata McGraw-Hill :New Delhi, 2010.

E-RESOURCES:
1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

Course Outcomes:

At the end of the course, students will be able to
1.Give Oral Presentations Confidently.
2. Draft appropriate Resume in accordance with the context.
3. Participate and present their view and ideas logically and confidently.
4. Understand the importance of communication in various settings.
5. Utilize the technology for career advancement.

COs												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1					1					2		2
CO2										1		2
CO3		1		1						2		2
CO4					1	1			1	2		2
CO5				1	1				1	2		2

The first two header rows of the table read:

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Programme Outcomes(POs)

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester	
Code: B6202	COMPUTER NETWORKS LAB (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	L	T	P
Credits: 1.5		-	-	3

Prerequisites: NIL

Course Objectives:

This course provides students to understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN, build the skills of subnetting and supernetting, explain the concepts of protocols of Tranport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

Software Requirements: Turbo C/JDK

LIST OF PROGRAMS:

1. Implement the data link layer farming methods:
    • Character Count
    • Character stuffing and destuffing.
    • Bit stuffing and destuffing
2. Implement on a data set of characters the three CRC polynomials: CRC-12, CRC-16 and CRC-32.
3. Implement Parity Check using the following techniques
    • Single Dimensional Data
    • Multi Dimensional Data
4. Implement the Even and Odd parity.
5. Impelementation of Data Link Protocols
    • Unrestricted Simplex Protocol
    • Stop and wait Protocol
    • Noisy Channel
2. Impelementation of Sliding Window Protocols
    • One bit sliding window protocol
    • Go Back N sliding window protocol
    • Selective Repeat sliding window protocol
3. Write a code simulating ARP /RARP protocols
4. Impelementation of Routing Protocols
    • Dijkstra's algorithm

- Distance Vector routing protocol
- Link State routing protocol
5. Implement the congestion algorithms
   a. Token bucket algorithm
   b. Leaky bucket algorithm 10.Implement RSA algorithm.

TEXTBOOKS:

1. Behrouz A. Forouzan, **"Data Communications and Networking"**, 4thEdition, TMH, 2006.

2. Andrew S Tanenbaum, **"Computer Networks"**, 4th Edition, Pearson Education/PHI.

REFERENCES:
1. P.C .Gupta, **"Data communications and computer Networks"**, PHI.

2. S.Keshav, **"An Engineering Approach to Computer Networks"**, 2nd Edition, Pearson Education.

3. W.A. Shay, **"Understanding communications and Networks"**, 3rd Edition, Cengage Learning.

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Implement** the various protocols.
2. **Analyze** various Congestion control mechanisms.
3. **Implement** encryption mechanisms using Symmetric Key and Asymmetric Key algorithms.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
CO1			3										2		
CO2		3												2	

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2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester		
Code: B6611	COMPUTER VISION LAB CSE (AI and ML		L	T	P
Credits: 2			-	-	3

Prerequisites: Computer programming, Python

Software Requirements: Python

Course Objectives:
This objective of the course is to provide the students to study and understand the execute the experiments related to computer vision, Image processing applications using Python.

List of Programs:
1. Installation of Python
2. Python operations and the image processing toolbox
i) Image enhancement   ii) Image compression
iii) color image processing,   iv) image morphology Python

3. Basic image processing operations and histograms algorithms
i) Resizing (scaling) and rotation   ii) Quantization   iii) Histogram

4. Image filtering in spatial and in frequency domain using Python commands

5. Observe the following
i. shift
ii. Linearity
iii. Scaling
iv. rotation
v. Exchange between magnitude and phase

6. Image Restoration

7. Image compression

8. Video tracking

BOOKS
1. Hands-On Image Processing with Python, SandipanDey, Pact publishing 1st edition2018.
2. Python 3 Image Processing, Ashwinpajankar, BPB publications, 2019
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, IncDigitalImageProcessing Second Edition

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: B00M4	**Quantitative Aptitude and Verbal Reasoning – II**	**L**	**T**	**P**
Credits: -	(Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	2	-	-

2021-22 Onwards (MR-21)	**MALLA REDDY ENGINEERING COLLEGE** (Autonomous)	**B.Tech. VII Semester**		
Code: B0536	**Data Mining**	**L**	**T**	**P**
Credits: 3	[Professional Elective - III] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	**3**	**-**	**-**

Prerequisites: NIL

Course Objectives:
1. Uunderstands stages in building a Data Warehouse
2. Makes Identify the need and importance of preprocessing techniques
3. Implement similarity and dissimilarity techniques
4. Analyze and evaluate performance of algorithms for Association Rules
5. Analyze Classification and Clustering algorithms.

MODULE I: Introduction and Mining Issues & Data [09 Periods]
Introduction – Data, Why Data Mining? What Is Data Mining? What Kinds of Data Can Be mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted?
Mining Issues and Data - Major Issues in Data Mining, Types of Data, Data Quality

MODULE II: Data, Data Preprocessing [9 Periods]
A: Data Pre-processing: Data Warehousing, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Aggregation, Sampling,
B: Techniques: Dimensionality Reduction, Feature Subset Selection, Feature Creation, Data Discretization and Binarization, Variable transformation.

MODULE III: Data Similarity and Dissimilarity Classification [10 Periods]
A:Measuring Data Similarity and Dissimilarity - Similarity and Dissimilarity between simple attributes, Dissimilarities and similarities between data objects, Examples of Proximity measures, Issues in Proximity Calculation, Selection of right proximity measure.
B:Classification - Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree.

MODULE IV: Classifier and Association Analysis [10 Periods]
Classifiers - Alterative Techniques**,** Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks**Association Analysis -** Basic Concepts and Algorithms: Problem Definition, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm.

MODULE V: Cluster Analysis and DBSCAN [10 Periods]
Cluster Analysis - Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses;

Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm
DBSCAN - Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

TEXT BOOKS:
1. Vikram Pudi & P.Radha Krishna, "**Data Mining**",4th Edition, Oxford Higher Education .
2. Jiawei Han, Michel Kamber,"**Data Mining concepts and Techniques**", 3/e, Elsevier.

REFERENCES:
1. Hongbo Du, "**Data Mining Techniques and Applications: An Introduction**", Cengage Learning.
2. Vikram Pudi and P. Radha Krishna, "**Data Mining**", Oxford.
3. Mohammed J. Zaki, Wagner Meira, Jr ,"**Data Mining and Analysis-fundamental Concepts and Algorithms**", Oxford
4. Alex Berson, Stephen Smith ,"**Data Warehousing Data Mining & OLAP**" , TMH.

E-RESOURCES:

1. http://www-users.cs.umn.edu/~kumar/dmbook/index.php
2. 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
3. http://www.ijctee.org/files/Issuethree/IJCTEE_1111_20.pdf
4. https://gunjesh.wordpress.com/

COURSE OUTCOMES:
At the end of the course, students will be able to
1. **Acquire** knowledge in building a Data Warehouse
2. **Understand** the need and importance of preprocessing techniques
3. **Implement** Similarity and dissimilarity techniques
4. **Analyze** and evaluate performance of algorithms for Association Rules.
5. **Deploy** Classification and Clustering algorithms

CO- PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
POs	Programme Outcomes(POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1									1	1	1
CO2	1	2	2	2	1							1	1		2
CO3	1	1	1	2	1							1	1		1
CO4	1	1	1	1	1							1	1	1	1
CO5	1	2	2	2	2							2	2	1	3

Signature of Faculty   **HOD**

2021-22 Onwards (MR21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: B0542	**BIG DATA ANALYTICS** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	**L**	**T**	**P**
Credits: 3		3	1	-

Prerequisites: Databases, programming fundamentals.

Course Objectives:
This course enables the students to learn and understand Big data, data analytics, R language, developing map reduce programs, discuss about concepts of big data, make use of Hadoop concepts for designing applications, develop applications using Hadoop I/O and analyze big data using programming tools such as Pig and Hive.

MODULE I: Big data overview, data analytics, and R Language [09 Periods]
Big Data Overview: Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, Bl Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics. Data Analytics Lifecycle, Model Building and Basic Data Analytic Methods Using R Data Analytics Lifecycle Overview, Key Roles for a Successful Analytics Project, Background and Overview of Data Analytics Lifecycle - Discovery, Data Preparation,   Learning the Business Domain , Model Planning , Model building, Communicate Results, Operationalize and case study example Global Innovation Network and Analysis (GINA)
R Introduction: Introduction to R, Exploratory Data Analysis, Statistical Methods for Evaluation, Hypothesis Testing, Difference of Means, Rank-Sum Test, Errors, Sample Size data

MODULE II: Working with Big Data [09 Periods]
Hadoop - Google File System, Hadoop Distributed File System (HDFS)– Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker).
Configuring of Hadoop Cluster - Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

MODULE III: Hadoop API and Map Reduce Programs [09 Periods]
A: Hadoop API - Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New)
B: MapReduce Programs with classes - Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

MODULE IV: Hadoop I/O and Implementation [09 Periods]
Hadoop I/O - The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections.

Implementation - Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators.

MODULE V: PIG and HIVE HADOOP TOOL   [12 Periods]

PIG - HADOOP TOOL -   Hadoop Programming Made Easier - Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

HIVE – HADOOP TOOL - Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

TEXTBOOKS:
1.   Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, Wiley Publishers, 2015.
2.   Cay Horstmann, Wiley John Wiley & Sons, "**Big Java**", 4th Edition, INC 3.Tom White, "**Hadoop: The Definitive Guide**" 3rd Edition, O'reilly

REFERENCES:
1. Alex Holmes, "**Hadoop in Practice**", MANNING Publ. 2. Srinath Perera, ThilinaGunarathne, "**Hadoop MapReduce**" Cookbook.

E-RESOURCES:
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/mapreduceosdi04.pdf
4.   http://www.comp.nus.edu.sg/~ooibc/mapreduce-survey.pdf
5.   http://freevideolectures.com/Course/3613/Big-Data-and-Hadoop/18
6.   http://freevideolectures.com/Course/3613/Big-Data-and-Hadoop/40

Course Outcomes:
At the end of the course, students will be able to 1.**Develop** simple applications using R language
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	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1		1	3	2	1	3	3	2	3
CO2	3	2	3	3	3						2	1	3	2	2
CO3	3	3	3	3	3							3	3	2	2
CO4	3	3	3	3	3						1	3	3	2	2
CO5	2	3	3	3	3						1	3	3	2	2

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Signature of Faculty   **HOD**

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VII Semester	
Code: B6621	**INTRODUCTION TO DEEP LEARNING** CSE (AI and ML)	**L**	**T**	**P**
Credits: 4		**3**	**-**	**-**

Prerequisites: Machine Learning
COURSE OBJECTIVES:

This course aims to present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data.

MODULE I: INTRODUCTION [09 PERIODS]

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

MODULE II: Convolution Neural Networks [09 Periods] Architectures, convolution / pooling layers, Recurrent Neural Networks LSTM, GRU, Encoder Decoder architectures

MODULE III: Deep Unsupervised Learning [10 Periods] Auto encoders (standard, sparse, denoising, and contractive, etc), Variational Auto encoders, Adversarial Generative Networks, Auto encoder and DBM Attention and memory models, Dynamic memory networks (2 lectures)

MODULE IV: Applications of Deep Learning to Computer Vision [10 Periods] Image segmentation, object detection, automatic image captioning, Image, generation with Generative adversarial networks, video to text with LSTM, models. Attention models for computer vision tasks. Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity.

MODULE V: Analogy reasoning [10 Periods] Named Entity Recognition, Opinion Mining using Recurrent Neural Networks Parsing and Sentiment Analysis using Recursive Neural Networks Sentence Classification using convolutional Neural Networks Dialogue Generation with LSTMs Applications of Dynamic Memory Networks in NLP Recent Research in NLP using Deep Learning.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning.

REFERENCES:

1.   Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classi cation. Wiley- Interscience. 2nd Edition. 2001.
2.   Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
3.   Russell, S. and Norvig, N. Arti cial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
4.   Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
5.   Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.
6.   Koller, D. and Friedman, N. Probabilistic Graphical Models. MIT Press. 2009.

COURSE OUTCOMES:

At the end of the course, students will be able to
1. **Examine** the significant features of neural networks.
2. **Explore** the architecture of various neural networks.
3. **Analyze** the strategy for unsupervised learning.
4. **Elaborate** the various deep learning applications concerned with computer vision.
5. **Investigate** various reasoning methods using deep learning techniques.

| COs | Programme Outcomes(POs) | | | | | | | | | | | | PSOs | | |
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1						1	1	2	1
CO2	1	2	1	2	1							1	1	2	
CO3	1	3	2	2	1	1						2	1	2	1
CO4	1	3	3	3	1	2						3	2	2	1
CO5	1	3	3	3	1	2						3	2	3	1

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Signature of Faculty   **HOD**

2021-22 Onwards (MR-21)	MALLAREDDYENGINEERINGCOLLEGE (Autonomous)	IV B.Tech. VIISemester		
Code:B6641	**BUSINESS ANALYTICS&GEN AI** (Professional Elective Core Course)	L	T	P
Credits:3		3	-	-

COURSEOBJECTIVES:

1. To recall data warehousing and business intelligence fundamentals with examples. State Data Lakehouse and its importance. Compare Data Lakehouse to the traditional SQL data warehouse.
2. To write SQL queries to perform complex operations. Learn advanced SQL concept with examples and differentiate NO SQL with RDBMS (which uses SQL) by their advantages and disadvantages.
3. To get clear understanding of AWS, Azure, GCP fundamentals. Cloud Computing-Benefits of it. Basic knowledge on few products and services provided by AWS, Azure, GCP.
4. Be aware of advanced Python concepts programming with real-life examples.
5. To gain insights of fundamental concepts of Artificial Intelligence (AI), Basics of Machine Learning and howto use concepts, Prompt Engineering

MODULE-I
Data Warehouse Concepts: Need for BI, Data Warehouse, Key terminologies related to DWHarchitecture: OLTP vs OLAP, ETL, Data Mart, Metadata, DWH Architecture,
Data Lakehouse: Data Lake to Data Swamp, SQLRelational Databases, TransactionalProcessing, Relational DatabaseWorkload Types,Architectural Challenges, DatabricksEvolution
ETL: Extract Data Dump from source, Data format consistency, Data Quality rules, Truncate & Load, Load strategies, Load Approach, Transform, Mapping, Enriching, Joins, filter, Remove Duplicates, Aggregation, Load, Dimension, Facts, EDW Tables, Data Marts
Variety of ETL Tools: Apache Airflow, Datastage, Oracle Data Integrator, SSIS, Talend, Hadoop, AWS Glue, Azure Data Factory, Google Cloud Dataflow, Stitch, SAP, Hevo, Qlik, Airbyte
Informatica: Informatica Architecture, Informatica PowerCenter & Repository, Informatica PowerCenter Designer, Informatica PowerCenter workflow manager, Informatica PowerCenter workflow monitor, Run Mappings, Workflow creation & Deletion
SQL Basics: DQL, DDL, DML, Filtering and sorting Data, Grouping and Aggregating Data, Joins and Subqueries, Window Functions, Optimizing SQL queries, Automation.
SQL Advanced: Store Procedure, Trigger, Views, Functions

NoSQL: NoSQL Fundamentals and Comparison with SQL
Power BI: Connecting Data Sources and Databases, Data Modeling, Creating Calculated Fields in Power BI

MODULE –II:
Python (Beginner): Variables, Operators, functions, Libraries, Methods, Refactoring, Enum, Tuples, Dictionaries, sets, Map, filter, reduce, Class & objects, Exceptions, Overloading
Python (Advanced): Iterators, Modules, Packages, Generators, List, Comprehensions, Regular expressions, Serialization, Partial functions, closures, Decorators
AWS: Benefits of AWS, AWS Services - Computer, Storage, Database Service, Networking Service, Security Service, Management tool Service, Developer tool Service
Azure: Cloud Computing, Services in Azure - Compute, Containers, Databases, Identity, Security, Networking, Storage
GCP: Cloud Computing, Benefits of GCP, GCP services, AWS vs Azure vs GCP
Python with Deep Learning: Python Data Science Libraries, Numpy, Scipy, Pandas, Matplotlib, Scikit-Learn, Statsmodels, Pandas, Sorting, Concatenate, Preprocessing - Time Series Data, Visualization
Python with AI: Introduction, Demand of AI, What is AI, Types of AI, Why python for AI, Python Packages for AI.

MODULE –III
Artificial Intelligence: Artificial intelligence and its types, AI Roadmap, Machine learning and its types, Linear regression Analysis, Classifications in Machine Learning.
Machine Learning: AI vs ML, Classification vs regression, Supervised learning, Unsupervised learning, Training Model, Preparing Data, K-Nearest Neighbors, Naive Bayes, Logistic Regression, Support Vector Machine, Neural Networks, Tensorflow, K-Means Clustering, Principal Component Analysis, KMeans and PCA Implementations.

MODULE -IV
Prompt Engineering: Introduction to AI, Linguistics, Language Models, Prompt Engineering Mindset, Zero shot and few shot prompts, AI hallucinations, Vectors/text embeddings.

MODULE –V

Generative AI Fundamentals: Generative AI and its use cases, How do LLMS (Large Language Models) work, LLMs generates output for NLP task, LLM model decision criteria, Proprietary models, Finetuned models, Mixing LLM flavors in workflow, Data privacy, Data security

TEXTBOOKS:

1. **"Business Analytics: Data Analysis and Decision Making"** by S. Christian Albright and

Wayne L. Winston
2. **"Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking"** by Foster Provost and Tom Fawcett
3. **"Competing on Analytics: The New Science of Winning"** by Thomas H. Davenport and Jeanne G. Harris

REFERENCEBOOKS:

1. **"Business Intelligence and Analytics: Systems for Decision Support"** by Ramesh Sharda, Dursun Delen, and Efraim Turban
2. **"Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play"** by David Foster
3. **"Deep Learning with Python"** by François Chollet
4. **"Hands-On Generative Adversarial Networks with Keras"** by Rafael Valle

CO-PO, PSO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3		3				1		1	2	2	1	
CO2			2		3							1	1		
CO3			2		2							2			2
CO4	1	2	3	2	3		1		3		1	2			3
CO5					3						1	2			2

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: B6203	**CRYPTOGRAPHY AND NETWORK SECURITY** [Professional Elective - IV] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: Computer Networks

Course Objectives:
- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec.
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls.

MODULE – I: [10 Periods]
Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

MODULE – II: [9 Periods]
Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm..

MODULE – III: [10 Periods]
Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA- 512),

Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

MODULE – IV: **[9 Periods]**
Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

MODULE – V: **[10 Periods]**
E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange
Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site ScriptingVulnerability.

TEXT BOOKS:
   1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
   2. Cryptography and Network Security: AtulKahate, McGraw Hill, 3rd Edition

REFERENCE BOOKS:
   1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
   2. Cryptography and Network Security: ForouzanMukhopadhyay, McGraw Hill, 3rd Edition
   3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
   4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
   2. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
   3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Course Outcomes:
   • Student will be able to understand basic cryptographic algorithms, message and web authentication and Security issues
   • Ability to identify information system requirements for both of them such as client and server
   • Ability to understand the current legal issues towards information security

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	3	1				2
CO2		3							2		1			2	
CO3		3								2	1		3		
CO4		3		2	1								2		
CO5				2			3				1				

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: B0524	THEORY OF AUTOMATA	L	T	P
Credits: 3	[Professional Elective - IV] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	3	-	-

Course Objectives
1. To understand artificial neuron models & learning methods of ANN.
2. To utilize different algorithms of ANN.
3. To distinguish between classical and fuzzy sets.
4. To understand different modules of fuzzy controller.
5. To understand applications of neural networks and fuzzy logic.

Module - I
Introduction-Artificial Neural Networks (ANN) – Humans and computers – Biological neural networks – ANN Terminology – Models of Artificial neuron – activation functions – typical architectures – biases and thresholds – learning strategy (supervised, unsupervised and reinforced) – Neural networks learning rules. Single layer feed forward neural networks: concept of pattern and its types, perceptron training and classification using Discrete and Continuous perceptron algorithms– linear separability- XOR function.

Module - II
ANN Paradigms-Multi-layer feed forward networks –Generalized delta rule– Back Propagation algorithm – Radial Basis Function (RBF) network. Kohonen's self organizing feature maps (KSOFM), Learning Vector Quantization (LVQ)– Functional Link Networks (FLN) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

Module - III
Classical and Fuzzy Sets-Introduction to classical sets- properties, Operations and relations; Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions.

Module - IV
Fuzzy Logic Modules-Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Module - V
Applications-Neural network applications: Load flow studies, load forecasting, reactive power control. Fuzzy logic applications: Economic load dispatch, speed control of DC motors, single area and two area load frequency control.

Course Outcomes
1. know different models of artificial neuron & Use learning methods of ANN.
2. use different paradigms of ANN.

3. classify between classical and fuzzy sets.
4. use different modules of Fuzzy logic controller.
5. apply Neural Networks and fuzzy logic for real-time applications.

Text Books
1. Introduction to Artificial Neural Systems – Jacek M. Zuarda, Jaico Publishing House, 1997.
2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandPai – PHI Publication.

Reference Books
1. Artificial Neural Network – B.Yegnanarayana, PHI, 2012.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – Mc Graw Hill Inc, 1997.
3. Introduction to Neural Networks using MATLAB 6.0 – S N Sivanandam,SSumathi,S N Deepa
TMGH
4. Introduction to Fuzzy Logic using MATLAB – S N Sivanandam,SSumathi,S N Deepa Springer, 2007.

COS	\multicolumn{12}{c	}{CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak Programme Outcomes(POs)}												\multicolumn{3}{c	}{PSOs}
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3											3	
CO2	3												2		
CO3				2										2	
CO4					3									2	
CO5						2									3

2021-22 Onwards (MR-21)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester		
Code: B6617	**STATISTICAL MACHINE LEARNING** [Professional Elective - V]		**L**	**T**	**P**
Credits: 1			3	-	-

Module 1: Introduction to Probability and Statistics: [09 HOURS]

Basic probability concepts, Descriptive statistics, Inferential statistics, Probability distributions,
Central limit theorem.

Module 2: Fundamentals of Machine Learning: [11 HOURS]

Overview of machine learning paradigms (supervised, unsupervised, and reinforcement learning), Model representation and evaluation, Bias-variance tradeoff, Cross-validation. Feature engineering.

Module 3: Linear Models: [11 HOURS]

Linear regression, Logistic regression, Regularization techniques (L1 and L2 regularization), Model interpretation and diagnostics, Multivariate linear models.

Module 4: Non-linear Models: [09 HOURS]

Decision trees, Random forests, Support Vector Machines (SVM), Neural networks, Ensemble methods.

Module 5: Advanced Statistical Machine Learning: [09 HOURS]

Bayesian methods, Gaussian processes, Dimensionality reduction techniques (e.g., PCA), Clustering algorithms, Advanced optimization techniques.

TEXT BOOKS:
1. **"Pattern Recognition and Machine Learning"** by Christopher M. Bishop**.**
2. **"Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman.**
3.**"Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy**

REFERENCES:

1. **"Introduction to Machine Learning with Python**: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido

2. **"An Introduction to Statistical Learning"** by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani.

3. **"Python Machine Learning"** by Sebastian Raschka and Vahid Mirjalili

COS	**CO- PO,PSO Mapping** **(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**			
	\multicolumn{12}{	c	}{**Programme Outcomes(POs)**}			\multicolumn{3}{	c	}{**PSOs**}
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1			3											3	
CO2	3												2		
CO3				2										2	
CO4					3									2	
CO5						2									3

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2020-21 Onwards (MR20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester	
Code: A0544	**Data Mining Lab** (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)		**P**
Credits: 3			**-**

PERQUISITE: NIL

OBJECTIVE:
1. Makes Identify the need and importance of preprocessing techniques
2. Analyze and evaluate performance of algorithms for Association Rules
3. Analyze Classification and Clustering algorithms.

Software Requirements: WEKA TOOL

List of Programs:
1. Demonstration of preprocessing on dataset student.arff.
2. Implementation of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori Algorithm.
4. Implement Association rule process on datasettest.arff using apriori algorithm.
5. Apply classification rule process on dataset student.arff using j48 algorithm.
6. Perform classification rule process on dataset employee.arff using j48 algorithm.
7. Use classification rule process on dataset employee.arff using id3 algorithm.
8. Deploy classification rule process on dataset employee.arff using naïve bayes Algorithm.
9. Implement clustering rule process on dataset iris.arff using simple k-means.
10. Make use of clustering rule process on dataset student.arff using simple k-means.
11. Design a decision tree by pruning the nodes on your own. Convert the decision trees into "if- then-else rules". The decision tree must consists of 2-3 levels and convert it into a set of rules.
12. Generate Association rules for the following transactional database using Apriori algorithm.

TID	stofItems
T100	I2,I5
T200	I4
T300	I3
T400	I2,I4
T500	I3
T600	I3
T700	I3
T800	I2,I3,I5

TEXTBOOKS:
1. Pang-Ning Tan & Michael Steinbach, "**Introduction to Data Mining**", VipinKumar, Pearson.

2. Jiawei Han, Michel Kamber ,"**Data Mining concepts and Techniques**", 3/e,Elsevier.

REFERENCES:
1. Hongbo Du,"Data Mining Techniques and Applications:An Introduction",Cengage Learning.
2. Vikram Pudi and P.RadhaKrishna,"Data Mining",Oxford.
3. Mohammed J.Zaki,Wagner Meira,Jr,"Data Mining and Analysis-Fundamental Concepts and Algorithms",Oxford
4. Alex Berson,Stephen Smith,"Data Warehousing Data Mining & OLAP",TMH.

Course Outcomes:
At the end of the course, students will be able to
1. Analyze the classification rules on various databases.
2. Deploy association rules for any kind of databases.
3. Develop clustering rules for applications.

CO-PO,PSO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
Os	Program Outcomes(POs)												PSOs		
	O1	O2	O3	O4	O5	6	7	8	9	10	11	12	SO1	SO2	SO3
CO1	1		1										1	1	1
CO2	1	2	2	2	2								2		2
CO3	1	2	3	2	1								1		2

Prerequisites: NIL

Course Objectives:

1. The course should enable the students to:
2. Optimize business decisions and create competitive advantage with Big data analytics
3. Practice java concepts required for developing map reduce programs.
4. Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
5. Practice programming tools PIG and HIVE in Hadoop eco system.
6. Implement best practices for Hadoop development.

Software Requirement: JDK, Hadoop and R Studio

List of Programs

1. INSTALL VMWARE Installation of VMWare to setup the Hadoop environment and its ecosystems.
2. HADOOP MODES a. Perform setting up and Installing Hadoop in its three operating modes. i. Standalone. ii. Pseudo distributed. iii. Fully distributed. b. Use web based tools to monitor your Hadoop setup.
3. USING LINUX OPERATING SYSTEM Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.
4. FILE MANAGEMENT IN HADOOP 6 Implement the following file management tasks in Hadoop: i. Adding files and directories ii. Retrieving files iii. Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
5. MAPREDUCE PROGRAM 1 Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
6. MAPREDUCE PROGRAM 2 Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented
7. MAPREDUCE PROGRAM 3 Implement matrix multiplication with Hadoop Map Reduce.
8. PIG LATIN LANGUAGE – PIG Installation of PIG.
9. PIG COMMANDS Write Pig Latin scripts sort, group, join, project, and filter your data.
10. PIG LATIN MODES, PROGRAMS a. Run the Pig Latin Scripts to find Word Count
a. Run the Pig Latin Scripts to find a max temp for each and every year.
11. HIVE Installation of HIVE.

12.   HIVE OPERATIONS Use Hive to create, alter, and drop databases, tables, views, functions, and indexes. Reference Books: Jay Liebowitz, ―Big Data And Business Analytics Laboratory, CRC Press.

References:
1. Jay Liebowitz, ―Big Data And Business Analytics Laboratory, CRC Press

Course Outcomes:
1. Understand the installation of VMWare
2. Understand and apply the Perform setting up and Installing Hadoop in its three operating modes.
3. Implementing the basic commands of LINUX Operating System
4. Implement the file management tasks in Hadoop.
5. Understand Map Reduce Paradigm.
6. Apply Map Reduce program that mines weather data.
7. Implement matrix multiplication with Hadoop MapReduce
8. Apply Map Reduce program that makes the dataset to be compressed.
9. Understand the installation of PIG.
10. Understand Pig Latin scripts sort, group, join, project, and filter your data.
11. Implement the Pig Latin scripts in two different modes
12. Understand the installation of HIVE
13. Apply Hive to create, alter, and drop databases, tables, views, functions, and indexes.

COs	\multicolumn{12}{c}{Programme Outcomes(POs)}	PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2							3			1		2	
CO2				2	3		2					1			1
CO3			1					3				3	1		

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VII Semester	
Code: B1231	**SOFTWARE PROCESS & PROJECT MANAGEMENT** [Professional Elective - VI] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

PREREQUISITES: NIL

Course Objectives:

Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project. Compareand differentiate organization structures and project structures. Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

MODULE I   [09 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   [09 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   [10 PERIODS]

A: 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   [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   [10 PERIODS]

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

TEXT BOOKS:
   1. Managing the Software Process, Watts S. Humphrey, Pearson Education.
   2. Software Project Management, Walker Royce, Pearson Education.

REFERENCES:
 1.   Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth
            2.   Edition, Wiley India, rp2011.
            3.   An Introduction to the Team Software Process, Watts S.
                 Humphrey, Pearson Education,2000

COURSE OUTCOMES:
                   At the end of the course, students should be able to
 1.   Apply software framework, process, and models in development.
 2.   Implements the Life cycle process and models in production stages and improve software by
      economics and management.
 3.   Planning and scheduling the process with cost estimation and Analyze work flow in
      process at major milestones by periodic assessment
 4.   Use of projects in organizations in line of business with process automations and project
      control with quality metrics.
 5.   Analyze next generation software with case study applications.

	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2				3	2	3	3	3	3	2
CO2	3	3	3	3	2				3	2	2	2	3	3	2
CO3	3	3	3	3	2							2	3	3	2
CO4	3	3	3	3	2							2	3	3	2
CO5	3	3	3	3	2							2	3	3	2

Objectives
1. To introduce PHP language for server side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server side programming with Java Servlets and JSP
4. To introduce Client side scripting with Javascript and AJAX.

MODULE I: [10 Periods]

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

MODULE II: [09 Periods]
HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

MODULE III: [10 Periods]
Introduction to Servlets: Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request &Responses, Using Cookies and Sessions, connecting to a database using JDBC.

MODULE IV: [10 Periods]
Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

MODULE V: [09 Periods]
Client side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, on submit etc.), Document Object Model, Form validation.

TEXT BOOKS:
1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCES:
1. Web Programming, building internet applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Java Server Pages, Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan, 6th Edition, O'Reilly Media.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W.Sebesta, 4th Edition, Pearson.
6. Internet and World Wide Web — How to program, Dietel and Nieto, Pearson.

E-RESOURCES:
1. https://kakeboksen.td.org.uit.no/Database%20System%20Concepts%206th%20edition.pdf
2. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf
3. http://airccse.org/journal/ijdms/ijdms.html
4. http://www.springer.com/computer/database+management+%26+information+retri eval?SGWID=0-153-12-114576-0
5. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093
6. http://www.nptelvideos.in/2012/11/database-management-system.html

Outcomes
1. Gain knowledge of client side scripting, validation of forms and AJAX programming
2. Have understanding of server side scripting with PHP language
3. Have understanding of what is XML and how to parse and use **XML** Data with Java
4. To introduce Server side programming with Java Servlets and JSP

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	O4	O5	PO6	O7	O8	O9	PO10	O11	PO12	PSO1	PSO2	SO3
CO1	3	2	2			3				2		3	3	3	
CO2	3	3	3			3				3		3	3	3	
CO3	3	3	3			2				3		2	3	3	
CO4	3	2	1			1				1		1			
CO5	3	1	1			1						1			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: B6618	**Applied Machine Learning** [Professional Elective - VI] (Common for CSE (AI and ML))	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisite: Machine Learning

MODULE I: [10 Periods]

Introduction, Notation and probability basics, Statistical Learning (Overview), What is Statistical Learning? Assessing model accuracy, R programming basics

MODULE II: [10 Periods]

Linear regression- Simple linear regression, Multiple linear regression, Illustrations, Classification- Classification overview, Logistic regression

MODULE III [09 Periods]

Resampling methods- Cross-validation and bootstrap, Linear model selection and regularization- Subset selection, Penalty-based methods, Dimensional reduction, High-dimensional issues

Tree-based methods and ensembles- Classification and regression trees (CART), bagging, and random forests, Boosting, gradient boosting, and other ensemble methods

MODULE IV: [10 Periods]

Support vector machines- Maximum margin classifier, Support vector classifier, Kernel trick, Support vector machine, Multi-class problems

MODULE V: [10 Periods]

Unsupervised learning- PCA review, K-means and hierarchical clustering, Bayesian methods- Fundamentals of Bayesian statistics, Gibbs sampling

Text Book

1. Gareth James, Daniella Witten, Trevor Hastie, Robert Tibshirani. "An Introduction to Statistical Learning"

   REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman. "Elements of Statistical Learning", Springer Texts in Statistics

Course Outcome

The students will learn how to evaluate model performance/accuracy, quantify uncertainty, and combine methods via ensembles. The students will gain hands-on experience implementing and applying the method.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			2		2				3					2	
CO2	2	3		1									2		
CO3			2	3	3								2	1	
CO4			2	2	2				3					2	
CO5	2	3			1								2		