ACADEMIC REGULATIONS, COURSE STRUCTURE

AND DETAILED SYLLABUS
UNDER

CHOICE BASED CREDIT SYSTEM (CBCS)

Effective from the Academic Year 2015-16

M. Tech. Two Year Degree Course

(MR-15 Regulations)

in

MACHINE DESIGN (MD)

Department of Mechanical Engineering

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

(An Autonomous Institution approved by UGC and affiliated to JNTUH, Approved by AICTE & Accredited by NAAC with 'A' Grade and NBA & Recipient of World Bank Assistance under TEQIP Phase – II, S.C 1.1)

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR 15– ACADEMIC REGULATIONS (CBCS) FOR M. Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of M. Tech. (Regular) programme from the Academic Year ***2015-16*** and onwards

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

INSTITUTION VISION

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

INSTITUTION MISSION

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

DEPARTMENT VISION

To provide world class platform for education, Research and knowledge technical skill in Mechanical Engineering and to create leaders with passion for innovation to ensure environment friendly development needs of the society.

DEPARTMENT MISSION

Create innovative learning atmosphere with superior and environment friendly infrastructure, for better understanding of the technical knowledge in practical situations, so as to make them effective ethical and global leaders.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I : To prepare students for their successful career in industry to meet the needs of Indian and Global companies with sound scientific and Engineering Knowledge for life long learning and introduce them to professional ethics and sustainable development.

PEO-II: To develop the ability among students to synthesize data, interpret them appropriately and be able to apply concepts to thermal system design or to a mechanical subsystem of an interdisciplinary system.

PEO-III: To provide opportunity for the students to work in their individual capacity as well as to function as teams in multidisciplinary projects and to develop attitude towards self employment through entrepreneurship.

ROGRAMME OUTCOMES (POs)

PO1: PG Students can acquire in depth knowledge in their specialized area of Thermal Engineering.

PO2: PG Students can exhibit their ability in analyzing the complex Engineering problems in the field of Thermal Engineering apart from solving the subject problems.

PO3: PG Students can demonstrate their ability to think and work independently in providing various solutions to a problem without supervision, by due considering the importance level of the technical requirement.

PO4: PG Students can have the opportunity of working in research and development environment in both private and government organizations, also able to develop intellectual property, patents.

PO5: PG Students can become familiar with modern Engineering software tools and equipment which enables them industry ready, enhances the career opportunities.

PO6: PG Students can transform their ideas in developing new products by becoming self entrepreneurs and modernize & benefit the society, empower themselves society responsible.

PO7: PG Students are capable of generating technical documents or reports with high standards, which was imparted to them through training on communication skills, particularly verbal and written.

PO8: PG Students can achieve the targets of the organization and improve the business by managing a team and building interpersonal relationship in a team environment with their communication skills.

PO9: PG Students can opt for higher education particularly in research field of their specialization, can update their technical knowledge through continuous learning process, being a member of professional body through research publications and in turn contribute back to the technical community.

PO10: PG Students can demonstrate their professional, ethical values expected from the society.

PO11: PG Students can realize the importance and impact of Thermal Engineering on to the global environmental perspective and exhibit their skills and knowledge for continuous development.

1.0 ELIGIBILITY FOR ADMISSIONS :

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

2.0 AWARD OF M.Tech. DEGREE :

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

2.2 The student shall register for all 88 credits and secure all the 88 credits.

2.3 The minimum instruction days in each semester are 90.

3.0 COURSES OF STUDY :

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

1. Computer Science and Engineering
2. Digital Systems and Computer Electronics
3. Electrical Power Systems
4. Embedded Systems
5. Geotechnical Engineering
6. Machine Design
7. Structural Engineering
8. Thermal Engineering
9. VLSI System Design

and any other programme as approved by the University from time to time.

3.1 Departments offering M. Tech. Programmes with specializations are noted below:

CE	GTE	Geo Technical Engineering
	SE	Structural Engineering
EEE	EPS	Electrical Power Systems
ME	MD	Machine Design
	TE	Thermal Engineering
ECE	DSCE	Digital Systems and Computer Electronics
	ES	Embedded Systems
	VLSI SD	VLSI System Design
CSE	CSE	Computer Science and Engineering

4 COURSE REGISTRATION :

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

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

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

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

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

5 ATTENDANCE :

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

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

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

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

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

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

5.6 A Candidate shall put in a minimum required attendance in atleast three (3) theory subjects in I semester for promoting to II Semester. In order to qualify for the

award of the M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

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

6 EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS: :

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Continuous Internal Evaluation and Semester End Examinations. For all Subjects/ Courses, the distribution shall be 40 marks for CIE, and 60 marks for the SEE

6.1 Theory Courses :

6.1.1 Continuous Internal Evaluation (CIE):

The CIE consists of two Assignments each of 05 marks and two mid-term examinations each of 35 marks. The CIE shall be finalized based on the 70% of the best performed and 30% of the other performance.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 Assignments shall be as specified by the concerned subject teacher.. Each mid-term examination shall be conducted for a total duration of 120 minutes, for 35 marks.

The division of marks for CIE is as given below:

Mid – Term Examination				
Part	**Type of Questions**	**No. of questions**	**Marks per question**	**Total**
Part A	Multiple-choice questions	10	0.5	05
	Fill-in the blanks	10	0.5	05
	Sub-Total			10
Part B	Compulsory questions	5	2	10
Part C	Choice questions (3 out of 5)	3	5	15
			Mid-Term Exam Total	35
			Assignment	05
			Grand Total	40

6.1.2 Semester End Examination (SEE):

The division of marks for SEE is as given below:

Semester End Examination				
Part	**Type of Questions**	**No. of questions to be answered**	**Marks per question**	**Total**
Part A	Compulsory Questions (One from each module)	5	4	20
Part B	Choice Questions (5 out of 8) (Minimum one from each module)	5	8	40
			Grand Total	60

6.2 **Practical Courses:**

6.2.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks, shall be awarded with a distribution of 20 marks for day-to-day performance and timely submission of lab records, 5 marks for viva-voce, 15 marks for internal lab exam (best out of two exams).

6.2.2 Semester End Examination (SEE):

There will be SEE for 60 marks, shall be awarded with a distribution of 20 marks for write-up on the given experiment, 20 marks for proficiency in the exam, 10 marks for results and 10 marks for viva-voce. For conducting SEE, one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations of the College. The external examiner should be selected from outside the College among the autonomous/reputed institutions, from a panel of three examiners submitted by the concerned Head of the Department.

6.3 **Seminar:**

There shall be two seminar presentations during I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 100 marks with a distribution of 30 marks for the report, 50 marks for presentation and 20 marks for the queries. A candidate has to secure a minimum of 50% of marks to be declared successful. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examinations.

6.4 Comprehensive Viva-Voce:

There shall be a Comprehensive Viva-Voce in III Semester. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects studied during the M. Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consists of the Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Chief Controller of Examinations from a panel of three

examiners submitted by the concerned Head of the Department. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examinations.

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

7 EXAMINATIONS AND ASSESSMENT - THE GRADING SYSTEM :

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

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

% of Marks Secured (Class Intervals)	Grade Points	Letter Grade (UGC Guidelines)
≥ 80%	10	O (Outstanding)
≥ 70% to < 80%	9	A+ (Excellent)
≥ 60% to < 70%	8	A (Very Good)
≥ 55% to < 60%	7	B+ (Good)
≥ 50% to < 55%	6	B (Above Average)
< 50%	0	F (Fail)
Absent	Ab	Ab

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

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

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

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

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

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

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

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

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

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

$$\text{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\} \ldots \text{for all S semesters registered}$$
(i.e., upto and inclusive of S semesters, S ≥ 2)

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP)corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11 For Calculations listed in Item 7.6 – 7.10, 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.

8. EVALUATION OF PROJECT/DISSERTATION WORK :

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

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

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

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

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

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

8.6 The work on the project shall be initiated at the beginning of the III Semester and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
Note: *The project supervisor/guide has to ensure that the student has to publish a minimum of one paper related to the thesis in a National/International Conference/Journal.*

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

8.8 Three copies of the Project Thesis certified by the supervisor, HOD and Principal shall be submitted to the Chief Controller of Examinations for project evaluation (viva voce).

8.9 For Project work part-I in III Semester there is an internal marks of 50, the evaluation should be done by the PRC for 30 marks and Supervisor will evaluate for 20 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate

has to secure a minimum of 50% of marks to be declared successful for Project work part-I. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examination.

8.10 For Project work part-II in IV Semester there is an internal marks of 50, the evaluation should be done by the PRC for 30 marks and Supervisor will evaluate for 20 marks. The PRC will examine the overall progress of the Project Work and decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project work part-II. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examination.

8.11 For Project Evaluation (Viva Voce) in IV Semester there is an external marks of 150 and the same evaluated by the External examiner appointed by the Chief Controller of Examinations. For this, the Head of the Department shall submit a panel of 3 examiners, eminent in that field, with the help of the supervisor/guide concerned. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.12 If the student fails to fulfill as specified in 8.11, based the recommendation of the external examiner, the student will reappear for the Viva-Voce examination with the revised thesis only after three months. In the reappeared examination also, fails to fulfill, the student will not be eligible for the award of the degree.

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

9. AWARD OF DEGREE AND CLASS :

9.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **88** Credits (with CGPA $\geq$ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 Award of Class

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

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

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

10. WITHHOLDING OF RESULTS :

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

11. TRANSITORY REGULATIONS :

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

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per MR15 Academic Regulations.

12. GENERAL :

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

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

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

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

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

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the SEE)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including 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	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the

	book or additional sheet, during or after the examination.	candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	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 (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases registered against them.
7	Leaves the exam hall taking away answer 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 candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and

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

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

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

Academic Year 2015-16 (Choice Based Credit System)

COURSE STRUCTURE – M.TECH MACHINE DESIGN (MD)

(MR15 Regulations)

I SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CC I	53301	Advanced Mechanics of Solids	4	--	--	4	40	60	100
2	CC II	53302	Advanced Mechanics of Machinery	4	--	--	4	40	60	100
3	CC III	53303	Industrial Robotics	4	--	--	4	40	60	100
4	PE I	53304	Computer Simulation of Machines	4	--	--	4	40	60	100
		53305	Applied Tribology							
		53306	Vibration Analysis of Mechanical Systems.							
5	PE II	53307	Advanced Mechanics of Composite Materials	4	--	--	4	40	60	100
		53308	Mechanics of Metal Forming							
		53309	Design For Manufacturing & Assembly							
6	OE I	53310	Geometric Modeling	4	--	--	4	40	60	100
		53311	Mechatronics							
		53111	Nano Technology							
7	Laboratory I	53312	Kinematics and Dynamics Lab	--	--	4	2	40	60	100
8	Seminar I	53313	Seminar - I	--	--	4	2	100	--	100
			Total	24	--	8	28	Contact Periods: 32		

II SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CC IV	53123	Advanced Finite Element Analysis	4	--	--	4	40	60	100
2	CC V	53314	Experimental Stress Analysis	4	--	--	4	40	60	100
3	CC VI	53315	Advanced Mechanical Engineering Design	4	--	--	4	40	60	100
4	PE III	53316	Design Optimization	4	--	--	4	40	60	100
		53317	Theory of Plates and Shells							
		53318	Advanced Engineering Design							
5	PE IV	53319	Fracture Mechanics	4	--	--	4	40	60	100
		53320	Vehicle Dynamics							
		53321	Design and Analysis of Experiments							
6	OE II	50B16	Advanced Optimization Techniques and Applications	4	--	--	4	40	60	100
		53116	Computational Fluid Dynamics							
		53124	Energy Management							
7	Laboratory II	53322	Computer Aided testing, Analysis and Modeling Lab	--	--	4	2	40	60	100
8	Seminar II	53323	Seminar - II	--	--	4	2	100	--	100
			Total	24	--	8	28	Contact Periods: 32		

III SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CV	53324	Comprehensive Viva-Voce	--	--	--	4	--	100	100
2	PR I	53325	Project work Part I	--	--	16	8	50	--	50
			Total	--	--	16	12	Contact Periods: 16		

IV SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PR II	53326	Project work Part II	--	--	16	8	50	--	50
2	PR III	53327	Project Viva-Voce	--	--	--	12	--	150	150
			Total	--	--	16	20	Contact Periods: 16		

*** CC – Core Course, PE – Professional Elective, CV – Comprehensive Viva – Voce, PR – Project Work**

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
4	-	-

Course Code: 53301 **Credits: 4**

M.Tech - I Semester

ADVANCED MECHANICS OF SOLIDS

MODULE – I: Shear Centre **[12 Periods]**

Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections.

Unsymmetrical bending:

Bending stresses in Beams subjected to Nonsymmetrical bending; Deflection of straight beams due to nonsymmetrical bending.

MODULE – II: Curved Beam Theory **[10 Periods]**

Winkler Bach formula for circumferential stress – Limitations – Correction factors – Radial stress in curved beams – closed ring subjected to concentrated and uniform lads- stresses in chain links.

MODULE – III: Torsion **[8 Periods]**

Torsion of a cylindrical bar of Circular cross Section; Saint-Venant's semi-inverse methods; Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hallow thin wall torsion members, Multiply connected Cross section, Thin wall torsion members with restrained ends

Axis-Symmetric Problems **[5 Periods]**

Rotating Discs – Flat discs, Discs of uniform thickness, Discs of Uniform Strength, Rotating Cylinders.

MODULE – IV: Theory of Plates **[7 Periods]**

Introduction; Stress resultants in a flat plate; Kinematics: Strain-Displacement relations for plates; Equilibrium equations for small displacement theory of flat plates; Stress – Strain – Temperature relation for Isotropic plates: Strain energy of a plate; Boundary conditions for plate; Solution of rectangular plate problem; Solution of circular plate problem.

Beams on Elastic Foundation: **[6 Periods]**

General theory; Infinite Beam subjected to Concentrated load; boundary conditions; Infinite beam subjected to a distributed load segment; Semi-infinite beam with concentrated load near its end; Short Beams.

MODULE – V: Contact Stresses **[10Periods]**

Introduction, problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Methods of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact. Normal and Tangent to contact area.

TEXT BOOKS:

1. Seely and Smith "**Advanced Mechanics of materials"** John Wiley,2nd Edition,1961.
2. Boresi & Sidebottom "**Advanced Mechanics of materials"** wiely International,4th Edition,1986.

REFERENCE BOOKS:

1. Den Hortog J.P "**Advanced strength of materials"** Torrent,Dover Hill,1987.
2. Sadhu singh "**Strength of materials**" Khanna Publishers ,2004.
3. Beer & Jhonson "**Mechanics of Materials" ,** McGraw Hill,3Edition,2004.
4. Timoshenko " **Theory of Plates & Shells",** McGraw Hill, 2nd Edition,1964.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53302 **Credits: 4**

M.Tech - I Semester

ADVANCED MECHANICS OF MACHINERY

MODULE – I: Advanced Kinematics of Plane Motion- I [10 Periods]

Introduction to plane motion. The Inflection circle, Euler – Savary Equation, Analytical and graphical determination of d_i , Bobillier's construction , collineation axis , Hartmann's Construction ,Inflection circle for the relative motion of two moving planes, Application of the Inflection circle to kinematic analysis.

MODULE – II Advanced Kinematics Of Plane Motion - II [10 Periods]

Polode curvature, Hall's Equation, Polode curvature in the four bar mechanism, coupler motion, relative motion of the output and input links, Determination of the output angular acceleration and its Rate of change, Freudenstein's collineation –axis theorem, Carter –Hall circle, The circling – point curve for the Coupler of a four bar mechanism.

MODULE – III: Introduction To Synthesis-Graphical Methods - I [12 Periods]

The Four bar linkage ,Guiding a body through Two distinct positions, Guiding a body through Three distinct positions, The Roto center triangle , Guiding a body through Four distinct positions, Burmester's curve.

MODULE – IV: Introduction To Synthesis-Graphical Methods - II [12 Periods]

Function generation- General discussion, Function generation: Relative – Roto center method, Overlay's method, Function generation- Velocity – pole method, Path generation: Hrones's and Nelson's motion Atlas, Roberts's theorem.

MODULE – V: Introduction To Synthesis - Analytical Methods [10 Periods]

Function Generation: Freudenstien's equation, Precision point approximation, Precision – derivative approximation, Path Generation: Synthesis of Four-bar Mechanisms for specified instantaneous condition, Method of components, Synthesis of Four-bar Mechanisms for prescribed extreme values of the angular velocity of driven link, Method of components.

TEXT BOOKS:

1. Jeremy Hirschhorn, "**Kinematics and Dynamics of plane mechanisms",** McGraw-Hill, 1962.
2. J.E Shigley and J.J. Uicker Jr. "**Theory of Machines and Mechanisms",** McGraw-Hill,2003.
3. Amitabh Ghosh and Ashok Kumar Mallik "**Theory of Mechanisms and Machines",** E.W.P.Publishers,2 Edition,1998.

REFERENCE BOOKS:

1. Allen S.Hall Jr "**Kinematics and Linkage Design",** PHI,1964.
2. Charles E Wilson "**Kinematics and Dynamics of Machinery",** Pearson, 3rd Edition, 2008.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
4	-	-

Course Code: 53303 **Credits: 4**

M.Tech - I Semester

INDUSTRIAL ROBOTICS

MODULE – I: Introduction **[6 Periods]**

Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement.

Control System and Components: **[6 Periods]**

Basic concept and modais controllers control system analysis, robot activation and feedback components. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics, Positions sensors, velocity sensors, actuators sensors, power transmission system.

MODULE – II: Motion Analysis and Control **[8 Periods]**

Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller.

MODULE – III: End Effectors **[5 Periods]**

Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design.

Machine Vision: **[8 Periods]**

Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, image storage, Image processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.

MODULE – IV: Robot Programming **[8 Periods]**

Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINONAL AND DELAY commands, Branching capabilities and Limitations.

Robot Languages: **[4 Periods]**

Textual robot Languages, Generation, Robot language structures, Elements in function.

MODULE – V: Robot Cell Design and Control **[6Periods]**

Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detect ion, Work wheel controller.

Robot Application: **[6 Periods]**

Material transfer, Machine loading/unloading. Processing operation, Assembly and Inspection, Feature Application.

TEXT BOOKS:

1. Groover M P, "**Industrial Robotics**", Pearson Edu, 2nd Edition, 2012.
2. J J Craig "**Introduction to Robotic Mechanics and Control"** Pearson, 3rd edition, 2008.
3. Fu K S, "**Robotics"** McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Richard D. Klafter, "**Robotic Engineering"** Prentice Hall, 1989.
2. Asada and Slotine, "**Robot Analysis and Intelligence",** Wiley Inter-Science, 1986.
3. Mark W. Spong and M. Vidyasagar, **"Robot Dynamics & Control",** John Wiley & Sons (ASIA) Pte Ltd, 2008.
4. Mittal R K & Nagrath I J, "**Robotics and Control"** TMH, 6th Edition, 2007.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
4	-	-

Course Code: 53304 **Credits: 4**

M.Tech - I Semester

COMPUTER SIMULATIONS OF MACHINES

(PROFESSIONAL ELECTIVE – I)

MODULE- I: Introduction [10 Periods]

Overview, Why Simulate Mechanisms, Kinematics Simulations, Dynamic Simulation of Mechanisms, Summary, Vector Loop and Vector Chain Equations – Introduction, The Planar Vector, Single Loop Equations, Derivatives of Vectors, other Common Mechanisms, Vector Chains.

MODULE – II: Solutions of the Position Problem [12 Periods]

Overview, Numerical Solutions of Nonlinear algebraic Equations, The Position Problem of a Four-Bar Linkage, Mat lab Solution of the position of a Four-Bar Linkage.

MODULE- III: Kinematic Simulations Using Simulation [12 Periods]

What is a Kinematic Simulation, Velocity Solution via Kinematic Simulation, Acceleration Solution via Kinematic Simulation, The Consistency Check, and Kinematic Simulation of a Four-Bar Mechanism.

MODULE – IV: Introducing Dynamics [10 Periods]

Simulating the slider on inclined plane, Adding the Pendulum, Assembling the Matrix Equation, Creating a Dynamic Simulation, Setting Initial conditions and Running Simulation

MODULE – V: Two-Link Planar Robot [12 Periods]

Overview, Vector Equations, Dynamic Equations, The Simultaneous Constraint matrix, Dynamic Simulation, Robot Coordinate Control.

TEXT BOOKS:

1. John F. Gardner, "**Simulation of Machines using Mat Lab and Simulation",** India Edition.
2. Ibrahim zeid, "**CAD/CAM**", TMH, 2nd Edition, 2014.
3. Raj Kumar Bansal, "**Mat Lab",** Pearson Education.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
4	-	-

Course Code: 53305 **Credits: 4**

M.Tech - I Semester

APPLIED TRIBOLOGY

(PROFESSIONAL ELECTIVE – I)

MODULE – I: Historical background [12 Periods]

Viscosity - Viscometry - Effect of temperature on viscosity - Effect of pressure in viscosity - Other physical properties of mineral oils - The generalized Reynolds equation - Flow and shear stress - The energy equation - The equation of state - Mechanism of pressure development.

MODULE – II: Flows [12 Periods]

Circumferential Flow - Oil flow through a bearing having a circumferential oil groove - Heat generation and lubricant temperature - Heat balance and effective temperature - Bearing design: Practical considerations - Design of journal bearings - Parallel surface bearing - Step bearing - Some situations under squeeze film lubrication - The mechanism of hydrodynamic instability - Stiffness and damping coefficients - Stability.

MODULE – III: Elasto hydrodynamic Lubrication [10 Periods]

Theoretical consideration - Grubin type solution - Accurate solution - Point contact - Dimensionless parameters - Film thickness equations - Different regimes in EHL contact - Deep-groove radial bearings - Angular contact bearings - Thrust ball bearings - Geometry - Kinematics - Stress and deformations - Load capacity.

MODULE – IV: Surface Topography [10Periods]

- Surface characterization - Apparent and real area of contact - Derivation of average Reynolds equation for partially lubricated surface - Effect of surface roughness on journal bearings

MODULE – V: Laws of friction [10 Periods]

Friction theories - Surface contaminants - Frictional heating - Effect of sliding speed on friction - Classification of wear - Mechanisms of wear - Quantitative laws of wear - Wear resistance materials.

TEXT BOOKS:

1. Majumdar, B.C, "**Introduction to Tribology of Bearings",** S.Chand, 2nd Edition, 2008.
2. Kenneth C Ludema, "**Friction. Wear, Lubrication: A Text book in Tribology",** CRC Press, 1st Edition, 1996.
3. John Williams, "**Engineering Tribology"**, Cambridge University Press, 2006.

REFERENCE BOOKS:

1. Bharat Bhushan, "**Introduction to Tribology",** Wiley, 2nd Edition, 2013.
2. Prasanta Sahoo, "**Engineering Tribology**", PHI Learning, 2009.
3 Stachowiak & Batchelor., "**Engineering Tribology",** Butterworth – Heinimann, 2nd Edition, 2005.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53306 **Credits: 4**

M.Tech - I Semester

VIBRATION ANALYSIS OF MECHANICAL SYSTEMS

(PROFESSIONAL ELECTIVE – I)

MODULE- I: Single Degree Of Freedom Systems [12 Periods]

Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility- Response to Non Periodic Excitations: MODULE impulse, MODULE step and MODULE Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

MODULE- II: Two Degree Freedom System [10 Periods]

Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers.

MODULE-III: Multi Degree Freedom Systems [12 Periods]

Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

Vibration measuring instruments: Vibrometers, velocity meters & accelerometers.

MODULE- IV: Frequency Domain Vibration Analysis [10 Periods]

Over view, machine-train monitoring parameters-Data base development-vibration data acquisition-trending analysis-failure- node analysis-signature analysis-root cause analysis.

MODULE V: Numerical Methods [10 Periods]

Raleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.

TEXT BOOKS:

1. Groover , **"Mechanical Vibrations",** Nem Chand and Bros, 8th Edition, 2009.
2. Meirovitch, "**Elements of Vibration Analysis",** TMH, 2001.
3. Schaum Series, "**Mechanical Vibrations",** McGraw Hill, 1996.
4. SS Rao, "**Mechanical Vibrations",** Pearson, 2009, 4th Edition, 2015.

REFERENCE BOOKS:

1. Debabrata Nag, "**Mechanical Vibrations",**Wiley
2. S.P. Timoshenko & Young, "**Vibration problems in Engineering",** Oxford city Press publishers, 5th Edition, 2014.
3. A.G.Ambekar, "**Mechanical Vibrations and sound engineering",** PHI
4. JS Rao & K. Gupta, "**Theory and Practice of Mechanical Vibrations",** New Age Intl. Publishers, Revised 2nd Edition, 2014.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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4	-	-

Course Code: 53307 **Credits: 4**

M.Tech - I Semester

ADVANCED MECHANICS OF COMPOSITE MATERIALS

(PROFESSIONAL ELECTIVE – II)

MODULE – I: Basic Concepts and Characteristics [6 Periods]

Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.

Reinforcements: [6 Periods]

Fibres – Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

MODULE – II: Micromechanics [8 Periods]

Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

Manufacturing methods: [4 Periods]

Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

MODULE – III: Coordinate Transformation [7 Periods]

Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. off – axis, stiffness modulus, off – axis compliance.

Elastic behavior of unidirectional composites: [5 Periods]

Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

MODULE – IV: Strength of Unidirectional Lamina [10 Periods]

Micro mechanics of failure, Failure mechanisms, strength of an orthotropic lamina, strength of a lamina under tension and shear maximum stress and strain criteria, application to design. The failure envelope, first ply failure, free-edge effects. Micros mechanical predictions of elastic constants.

MODULE – V: Analysis of Laminated Composite Plates [10 Periods]

Introduction thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

TEXT BOOKS:

1. R. M. Jones, "**Mechanics of Composite Materials",** B S Publications, 2nd Edition,1998.
2. Isaac and M Daniel, "**Engineering Mechanics of Composite Materials",** Oxford University Press, 2nd Edition, 2006.
3. B. D. Agarwal and L. J. Broutman, "**Analysis and performance of fibre Composites",** Wiley-Interscience, New York,3rd Edition,2012.

REFERENCE BOOKS:

1. Autar K. Kaw, "**Mechanics of Composite Materials",** Second Edition (Mechanical Engineering), Publisher: CRC, 2nd Edition, 2006.
2. L. R. Calcote, "**Analysis of Laminated Composite Structures",** Van Nostrand Rainfold, New York, 1969.
3. Vasiliev &Morozov, "**Advanced Mechanics of Composite Materials",** Elsevier, Second Edition, 2007.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53308 **Credits: 4**

M.Tech - I Semester

MECHANICS OF METAL FORMING

(PROFESSIONAL ELECTIVE – II)

MODULE I: Fundamentals of Metal Forming **[6 Periods]**

Classification of forming processes, mechanism of metal forming, temperature of metal working, hot working, cold working, friction and lubricants.

Rolling of metals: **[6 Periods]**

Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations.

MODULE II: Forging **[6 Periods]**

Classification of forging processes, forging of plate, forging of circular discs, open die and Closed-die forging, forging defects, and powder metallurgy forging.

Extrusion: **[6 Periods]**

Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, production of seamless pipes.

MODULE III: Drawing **[6 Periods]**

Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing.

Sheet Metal forming **[6 Periods]**

Forming methods, Bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, defect in formed parts.

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MODULE IV: Advanced Metal Forming Processes **[6 Periods]**

HERF, Electromagnetic forming, residual stresses, in-process heat treatment, computer applications in metal forming.

Press tool design: **[6 Periods]**

Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

MODULE V: Jigs and Fixture Design **[10 Periods]**

Principles of location, six-point location principle, clamping elements and methods.

TEXT BOOKS:

1. G.E. Dieter, "**Mechanical Metallurgy",** Tata McGraw Hill, 1998. 3rd Edition, 2013

2. Surender Kumar**, "Technology Of Metal Forming Processes"**PHI Learning Pvt.Ltd,2008

REFERENCE BOOKS:

1. G.W. Rowe, "**Principles of Metal Working processes",** CBS Publishers & Distributors,2005
2. ASM Metal Forming Hand book.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53309 **Credits: 4**

M.Tech - I Semester

DESIGN FOR MANUFACTURE AND ASSEMBLY

(PROFESSIONAL ELECTIVE – II)

MODULE I: Introduction [10 Periods]

Design philosophy – Steps in Design process – General Design rules for Manufacturability – Basic principles of designing for economical production – Creativity in design.

Materials: Selection of Materials for design – Developments in Material Technology – Criteria for material selection – Material selection interrelationship with process selection – process selection charts.

MODULE II: Machining Process [8 Periods]

Overview of various machining processes – general design rules for machining - Dimensional tolerance and surface roughness – Design for Machining ease – Redesigning of components for machining ease with suitable examples, General design recommendations for machined parts.

Metal Casting: [6 Periods]

Appraisal of various casting processes, Selection of casting process, General design considerations for casting – casting tolerances – Use of Solidification Simulation in casting design – Product design rules for sand casting.

MODULE III: Metal Joining [10Periods]

Appraisal of various welding processes, Factors in design of weldments – General design guidelines – pre and post treatment of welds – Effects of thermal stresses in weld joints – Design of brazed joints.

FORGING – Design factors for forging – Closed die forging design – parting lines of dies – Drop forging die design – General design recommendations

MODULE-IV: Extrusion, Sheet Metal Work [8 Periods]

Design guidelines for Extruded sections - Design principles for Punching, Blanking, Bending, and Deep Drawing – Keeler Goodman Forming Limit Diagram – Component Design for Blanking.

MODULE-V: Design of Manual Assembly [10 Periods]

General design guidelines for Manual Assembly - Development of Systematic DFA Methodology - Assembly Efficiency - Classification System for Manual handling- Classification System for Manual Insertion and Fastening - Effect of part symmetry on handling time - Effect of part thickness and size on handling time - Effect of weight on handling time - Effect of symmetry , Further design guidelines.

TEXT BOOKS:

1. Geoffrey Boothroyd, "**Assembly Automation and Product Design",** Marcel Dekker Inc., NY, 1992.
2. George E. Deiter, "**Engineering Design - Material & Processing Approach",** McGraw Hill Intl. 2nd Ed, 2000.
3. Geoffrey Boothroyd & Marcel and Dekken **"Hand Book of Product Design"**, N.Y. 1990.

REFERENCE BOOKS:

1. Geoffrey Boothroyd, Peter Dewhurst & Winston Ansthony Knight, **"Product Design for Manufacturing and Assembly",** CRC Press,3rd Edition, 2010.
2. Surender Kumar & Goutham Sutradhar, "**Design and Manufacturing"**, Oxford & IBH Publishing Co.Pvt .Ltd., New Delhi, 1998.
3. ASM Handbook, Vol.20.

2015-16

MALLAREDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53310 **Credits: 4**

M.Tech - I Semester

GEOMETRIC MODELING

(OPEN ELECTIVE – I)

MODULE – I: Introduction **[6 Periods]**

Definition, Explicit and implicit equations, parametric equations. Wireframe modelling, Geometric Entities, Analytical curves, Synthetic curves, Splines.

Cubic Splines: **[6 Periods]**

Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves, Problems

MODULE – II: Bezier Curves **[6 Periods]**

Bernstein basis, equations of Bezier curves, properties, derivatives. Problems

B-Spline Curves: **[6 Periods]**

B-Spline basis, equations, knot vectors, properties and derivatives. Problems

MODULE – III: Surfaces **[8 Periods]**

Bicubic surfaces, Coon's surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, Sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature. Surface manipulations

MODULE – IV: Transformations **[8 Periods]**

Homogenous Transformations, 2D transformation of Translation, Scaling, Rotation, Rotation about arbitrary axis, concatenation, Introduction to 3D Transformations, reflection

Solids: **[4 Periods]**

Tricubic solid, Algebraic and geometric form.

MODULE – V: Solid Modeling Concepts **[10 Periods]**

Boundary representation, Half space Modeling, spatial cell, cell decomposition, Part Modeling, Assembly modelling, Mass Properties, mechanical tolerancing.

TEXT BOOKS:

1. Ibrahim Zeid, "**CAD/CAM",** Tata McGraw Hill, 2nd Edition 2014.
2. Alavala, "**CAD/CAM concepts and Applications",** PHI,5th Edition,2013.
3. Micheal E. Mortenson, "**Geometric Modeling",** McGraw Hill Publishers

REFERENCE BOOKS:

1. K.Lalit Narayan, K.Mallikarjuna Rao & MMM Sarcar, "**Computer Aided Design and Manufacturing",** PHI Publishers
2. Roger & Adams, "**Elements of Computer Graphics",** Tata McGraw Hill

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53311 **Credits: 4**

M.Tech - I Semester

MECHATRONICS

(OPEN ELECTIVE – I)

MODULE-I: Mechatronics systems [10 Periods]

elements, levels of Mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of Mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

MODULE-II: Solid state electronic devices [10 Periods]

PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

MODULE-III: Hydraulic and pneumatic actuating systems [10 Periods]

Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems Mechanical actuating systems and electrical actuating systems.

MODULE-IV: Digital electronics and systems [10 Periods]

Digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

MODULE-V: System and interfacing and data acquisition [10 Periods]

DAQS , SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of Mechatronics systems & future trends.

TEXT BOOKS:

1. KP Ramachandran & GK Vijaya Raghavan, "**MECHATRONICS Integrated Mechanical Electronics Systems" ,**WILEY India Edition,2008
2. W Bolton, **"Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering**" , Pearson Education Press,5th Edition, 2013..
3. Newton C Braga, "**Mechatronics Source Book"** ,Thomson Publications, Chennai,2002.

REFERENCE BOOKS:

1. N. Shanmugam, "**Mechatronics"** ,Anuradha Agencies Publishers,2009.
2. Devdas shetty Richard, "**Mechatronics System Design"** ,Thomson,2nd Edition,2010.
3. M.D.Singh "**Mechatronics" ,** J.G.Joshi,PHI.
4. W. Bolton, "**Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg" ,** 4th Edition, Pearson, 2012
5. Godfrey C. Onwubolu, **"Mechatronics – Principles and Application" ,** Elsevier, 2006 Indian print.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53111 **Credits: 4**

M.Tech - I Semester
NANO TECHNOLOGY
(OPEN ELECTIVE – I)

MODULE-I: General Introduction **[6 Periods]**

Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

Silicon Carbide: **[4 Periods]**

Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,

Nano particles of Alumina and Zirconia: **[4 Periods]**

Nano materials preparation, Characterization, Wear materials and nano composites.

MODULE-II: Mechanical properties **[4 Periods]**

Strength of nano crystalline SIC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Electrical properties: **[4 Periods]**

Switching glasses with nanoparticles,Electronic conduction with nano particles

Optical properties: **[4 Periods]**

Optical properties, special properties and the coloured glasses

MODULE-III: Processes **[6 Periods]**

Process of synthesis of nano powders, Electro deposition, Important naon materials

Investigating and manipulating materials in the nanoscale: **[6 Periods]**

Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

MODULE- IV: Nanobiology **[10 Periods]**

Interaction between bimolecules and nano particle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, naoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology,Current status of nano Biotechnology, Future perspectives of Nanobiology, Nanosensors.

MODULE- V: Nano Medicines **[12 Periods]**

Developing of Nanomedicens Nanosytems in use,Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

TEXT BOOKS:

1. A.K.Bandyopadhyay, "**Nano Materials" ,** New Age Publishers,2011.
2. T.Pradeep , **"Nano Essentials"** ,TMH Publishers,2007.

REFERENCE BOOKS:

1. Charles P.Poole Jr "**Introduction to Nanotechnology",** Frank J.Owens, Wiley India Pvt. Ltd.
2. Chatopadhya.K.K, Benerjee A.N. **"Introduction to Nano science and Nanotechnology"**

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53312 **Credits: 2**

M.Tech. - I Semester
KINEMATICS AND DYNAMICS LABORATORY

(A Minimum of 10 experiments are to be conducted)

Experiments:

1. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
2. Determination of steady state amplitude of a forced vibratory system.
3. Static balancing using steel balls.
4. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
5. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors.
6. To verify the Dunkerley's Rule
7. To study the free vibrations of two rotor system and to determine the natural frequency of vibration theoretically and experimentally.
8. To study the Torsional vibration (undamped) of single Rotor shaft System.
9. To study the undamped free vibration of equivalent spring mass system.
10. To supply the longitudinal vibrations of helical spring and to determine the frequency or period of vibration (oscillation) theoretically and actually by experiment
11. To determine the radius of gyration of given bar by using Bi-Filer suspension
12. To study the Forced Vibrations of Equivalent Spring Mass System.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code:53123 **Credits: 4**

M.Tech. - II Semester

ADVANCED FINITE ELEMENT ANALYSIS

MODULE-I: Introduction **[12 Periods]**

Introduction to FEM, basic concepts, historical back ground, applications of FEM, general description, comparison of FEM with other methods, variational approach, Glerkin's Methods. Co-ordinates, basic element shapes, interpolation function, Virtual energy principle, Rayleigh – Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain-displacement relations.

MODULE-II: 1D Structural Problems **[4Periods]**

Axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape functions and problems.

Analysis of Trusses: **[4Periods]**

Plane Trusses and Space Truss elements and problems

Analysis of Beams: **[4 Periods]**

Hermite shape functions – stiffness matrix – Load vector – Problems.

MODULE-III: 2D Problems **[6 Periods]**

CST, LST, force terms, Stiffness matrix and load vectors, boundary conditions, Isoparametric elements – quadrilateral element, shape functions – Numerical Integration. Finite element modelling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements.

3D Problems: **[4 Periods]**

Tetrahedran element – Jacobian matrix – Stiffness matrix.

MODULE-VI: Scalar Field Problems **[8 Periods]**

1D Heat conduction-Slabs – fins - 2D heat conduction problems – Introduction to Torsional problems.

MODULE-V: **[10 Periods]**

Dynamic considerations, Dynamic equations – consistent mass matrix – Eigen Values, Eigen vector, natural frequencies – mode shapes – modal analysis.

TEXT BOOKS:

1. SS Rao "**The Finite Element Methods in Engineering"**Elsevier publisher,5th Edition,2010.
2. Alavala, **"Finite Element Methods: Basic Concepts and applications" ,** PHI,2008.
3. Chandrupatla, Ashok and Belegundu **"Introduction to Finite Elements in Engineering"** Prentice – Hall,3rd Edition,2002.

REFERENCES BOOKS

1. J. N. Reddy **"An Introduction to Finite Element Method",** Mc Grawhill, 3rd Edition, 2006
2. O.C. Zienkiewicz **"The Finite element method in engineering science",** Mc Grawhill, 2nd Edition,2007
3. Robert Cook **"Concepts and applications of finite element analysis",** Wiley, 3rd Edition, 1989
4. K.J Bathe **"Finite Element Procedures in Engineering analysis",** Prentice- Hall,1982
5. S.Md.Jalaludeen **"Introduction to Finite Element Analysis"**, Anuradha Publications,2015
6. G Ram Murthy **"Applied finite element analysis"**, I.K. International, 2nd Edition,2010

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53314 **Credits: 4**

M.Tech - II Semester
EXPERIMENTAL STRESS ANALYSIS

MODULE-I: Introduction **[8 Periods]**

Theory of Elasticity, Plane stress and plane strain conditions, compatibility conditions, problem using plane stress and plane strain conditions, three-dimensional stress strain relations.

Strain measurement methods: **[4 Periods]**

various types of strain gauges, electrical resistance strain gauges, semiconductor strain gauge circuits.

MODULE-II: Recording Instruments **[10 Periods]**

Introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies, telemetry systems.

MODULE-III: Brittle Coatings **[6 Periods]**

Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings and resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

Moire Methods: **[6 Periods]**

Introduction, mechanism of formation of Moire fringes, the geometarical approach to moiré-fringe analysis, the displacement field approach to Moire-fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of moiré-fringes, experimental procedure and techniques.

MODULE-IV: Photo Elasticity **[8 Periods]**

Photo elasticity, polariscope, plane and circularly polarized light, bright and dark filed setup, photo elasticity materials,, Isochromatic fringes – Isoclinics.

MODULE-V:Three Dimensional Photo Elasticity **[6 Periods]**

introduction, locking in model deformation, materials for three dimensional photo elasticity, machining cementing and slicing three dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear-difference method in three dimensions, applications of the Frozen-stress method, the scattered-light method

Birefringent coating: **[6 Periods]**

Introduction, coating stress and stains, coating sensitivity, coating materials, application of coatings, effective of coating thickness, fringe-order determinations in coatings, stress separation methods.

TEXT BOOKS:

1. Timoshenko and Goodier Jr , "**Theory of elasticity" ,**3rd Edition,2010.
2. Dally and Riley, "**Experimental Stress analysis" ,** Mc Graw-Hill,3rd Edition,1991.

REFERENCE BOOKS:

1. LOVE A.H., "**A treatise on Mathematical theory of elasticity",** Dover Publications, 2007.
2. Frocht , "**Photo Elasticity**" J. Wiley , 3rd Edition, 2006
3. Sadhu singh, "**Experimental Stress Analysis" ,** Khanna Publications, 2009.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53315 **Credits: 4**

M.Tech. - II Semester

ADVANCED MECHANICAL ENGINEERING DESIGN

MODULE – I: Design Philosophy [10 Periods]

Design process, Problem formation, Introduction to product design, Various design models-Shigley model, Asimov model and Norton model, Need analysis, Strength considerations - standardization. Creativity, Creative techniques, Material selections, Notches and stress concentration, design for safety and Reliability

MODULE – II: Product Design [6 Periods]

Product strategies, value, planning and specification, concept generation, concept selection, concept testing.

Design for manufacturing: **[6 Periods]**

Forging design, Casting design, Design process for non metallic parts, Plastics, Rubber, Ceramic, Wood and Glass parts like. Material selection in machine design

MODULE – III: Failure Theories [10 Periods]

Static failure theories, Distortion energy theory, Maximum shear stress theory, Coulomb-Mohr's theory, Modified Mohr's theory, Fracture

mechanics theory., Fatigue mechanisms, Fatigue failure models, Design for fatigue strength and life, creep: Types of stress variation, design for fluctuating stresses, design for limited cycles, multiple stress cycles, Fatigue failure theories ,cumulative fatigue damage, thermal fatigue and shock, harmful and beneficial residual stresses, Yielding and transformation

MODULE – IV: Surface Failures [12 Periods]

Surface geometry, mating surfaces, oil film and their effects, design values and procedures, adhesive wear, abrasive wear, corrosion wear, surface fatigue, different contacts, dynamic contact stresses, surface fatigue failures, surface fatigue strength,

MODULE – V: Economic Factors Influencing Design [10 Periods]

Economic analysis, Break-even analysis, Human engineering considerations, Ergonomics, Design of controls, Design of displays. Value engineering, Material and process selection in value engineering, Modern approaches in design.

TEXT BOOKS:

1. Robert L. Norton, "**Machine Design An Integrated Approach" ,**Prentice-Hall New Jersey, USA,5th Edition,2013.
2. George E Dieter "**Engineering Design" ,** McGraw Hill,5th Edition, 2012
3. J.E. Shigley and L.D. Mitchell, "**Mechanical Engineering Design",** McGraw Hill International Book Company, New Delhi,4th Edition,1993.

REFERENCE BOOKS:

1. Hamrock, Schmid and Jacobian, "**Fundamentals of machine elements",**2nd edition McGraw-Hill International,2nd Edition,2007
2. Karl T. Ulrich and Steven D. Eppinger, "**Product design and development",** 3rd edition, Tata McGraw Hill,5th Edition,2012.
3. A.K. Chitale and R.C. Gupta "**Product Design and Manufacturing",** Prentice Hall,6th Edition,2013.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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4	-	-

Course Code: 53316 **Credits: 4**

M.Tech - II Semester

DESIGN OPTIMIZATION

(PROFESSIONAL ELECTIVE – III)

MODULE- I: **Introduction** **[10 Periods]**

General Characteristics of mechanical elements, adequate and optimum design, principles of Optimization, formulation of objective function, design constraints, classification of optimization Problems. Single and multivariable optimization techniques

MODULE- II: **[8 Periods]**

Technique of unconstrained minimization. Golden section, Random, Pattern and Gradient search methods, interpolation methods, equality and inequality constraints.

MODULE-III: **[8 Periods]**

Direct methods and indirect methods using penalty function, Lagrange multipliers, Geometric programming, stochastic programming, Genetic algorithms

MODULE-IV: **[10 Periods]**

Engineering applications, structural-design application axial and transverse loaded members for minimum cost, maximum weight. Design of shafts and torsion members, design optimization of springs.

MODULE-V: **[10 Periods]**

Dynamics applications for two degree freedom system. vibration absorbers. Application in mechanisms.

TEXT BOOKS:

1. Singerusu S. Rao, "**Engineering Optimization -Theory and Practice**", New Age.
2. Johnson Ray C, "**Optimum Design of Mechanical elements",** Wiley, John & Sons

REFERENCE BOOKS:

1. Goldberg D. E. Addison, "**Genetic Algorithms in search, Optimization and Machine"** Wesley, NewYork..
2. Kalyanamoy Deb, "**Optimization for Engineering Design Algorithms and Examples",** Prentice Flail of India.
3. Jasbir S. Arora "**Introduction to Optimum Design**", Academic Press, Everest, 3rd Edition

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53317 **Credits: 4**

M.Tech - II Semester

THEORY OF PLATES AND SHELLS

(PROFESSIONAL ELECTIVE – III)

MODULE –I: Bending Of Long Rectangular Plates to A Cylindrical Surface [6 Periods]

Differential equation for cylindrical bending of plates - Cylindrical bending of uniformly loaded rectangular plates with simply supported edges - Cylindrical bending of uniformly loaded rectangular plates with built-in edges

Pure bending of plates: [6 Periods]

Slope and curvature of slightly bent plates - Relations between bending moments and curvature in pure bending of plates - Particular cases of pure bending - Strain energy in pure bending of plates.

MODULE –II: Symmetrical Bending Of Circular Plates [6 Periods]

Differential equation for symmetrical bending of laterally loaded circular plates - Uniformly loaded circular plates - Circular plate with a circular hole at the center - Circular plate concentrically loaded - Circular plate loaded at the center.

Small deflections of laterally loaded plates: [6 Periods]

The differential equation of the deflection surface - Boundary conditions - Alternate method of derivation of the boundary condition - Reduction of the problem of bending of a plate to that of deflection of a membrane

MODULE –III: Simply Supported Rectangular Plates [6 Periods]

Simply supported rectangular plates under sinusoidal load - Navier solution for simply supported rectangular plates.

Rectangular plates with various edge conditions: [6 Periods]

Bending of rectangular plates by moments distributed along the edges - Rectangular plates with two opposite edges simply supported and the other two edges clamped.

MODULE –IV: Continuous Rectangular Plates [6 Periods]

Simply supported continuous plates - Approximate design of continuous plates with equal spans - Bending symmetrical with respect to a center.

Deformation of shells without bending: [6 Periods]

Definition and notation - Shells in the form of a surface of revolution and loaded symmetrically with respect to their axis - Particular cases of shells in the form of surfaces of revolution - Shells of constant strength.

MODULE –V: General Theory Of Cylindrical Shells [10 Periods]

A circular cylindrical shell loaded symmetrically with respect to its axis - Particular cases of symmetrical deformation of circular cylindrical shells - Pressure vessels.

TEXT BOOKS:

1. Timoshenko, "**Theory of Plates and Shells",** S. and Woinowsky-Krieger, S,Text Book Publisher,2nd Edition,2003.
2. Ansel C. Ugural, "**Stress in Beams, Plates and Shells",** CRC Press ,3rd Edition,2010.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53318 **Credits: 4**

M.Tech - II Semester

ADVANCED ENGINEERING DESIGN

(PROFESSIONAL ELECTIVE – III)

MODULE-I: Engineering statistics [4 Periods]

Analysis of variance (ANOVA), factorial design and regression analysis, Reliability theory, design for reliability, Hazard analysis and fault tree analysis.

Fatigue and Creep: [8 Periods]

Introduction, Fatigue strength, factors affecting fatigue behavior, Influence of super imposed static stress, Cumulative fatigue damage, fatigue under complex stresses, Fatigue strength after over stresses, True stress and true strength, mechanism of creep of material at high temperature, Exponential creep law, hyperbolic sine creep law, stress relaxation, bending etc.

MODULE-II: Optimization [4 Periods]

Introduction, multivariable search methods, linear & geometric programming, structural and shape optimization and simplex method.

Composite materials: [8 Periods]

Composite materials and structures, classical lamination theory, elastic stress analysis of composite material, Fatigue strength improvement techniques, stresses, stress concentration around cutouts in composite laminates, stability of composite laminate plates and shells, Hybrid materials, applications.

MODULE-III: Design for Materials and Processes [4 Periods]

Design for brittle fracture, Design for fatigue failure, Design for different machining process, assembly & safety etc.

Design of Mechanical components: [8 Periods]

Gear Design:

Involute gears, tooth thickness, interference, undercutting, rackshift etc. Profile modification of spur, helical gears etc.

Spring Design: Vibration and surging of helical springs, helical springs for maximum space efficiency, analysis of Belleville springs, ring spring, volute spring & rubber springs. Design for spring suspension.

MODULE-IV: Design of Miscellaneous components [4 Periods]

Cam shaft with valve opening mechanism, piston, cylinder, connecting rod etc.

Cams: **[8 Periods]**

Basic curves, cam size determination, calculating cam profiles, advance curves, polydyne cams, dynamics of high speed cam systems, surface materials, stresses and accuracy, ramps.

MODULE-V: Computer Aided Design [10 Periods]

Philosophy of computer aided design, Interactive design software and basic advantages of analysis software, Design of machine components (springs, gears, temporary fasteners, permanent fasteners, belts and ropes) through interactive programming.

TEXT BOOKS:

1. M.F. Spotts, "**Mechanical Design Analysis"**
2. Robert Norton, "**Machine Design"**
3. D.W. Dudley, "**Practical Gear design"**
4. -R. C. Johnson , "**Optimum design"**

REFERENCE BOOKS:

1. A.M. Wahl , "**Mechanical Springs"**
2. D. Hull and T.W. Clyne , "**An introduction to composite materials"**
3. V Ramamurti**"Computer Aided Mechanical Design and Analysis"**(Third Edition), Tata McGraw-Hill
4. G.E. Dieter, "**Mechanical Metallurgy" ,** Tata McGraw-Hill, New Delhi.
5. G.E. Dieter, "**Engineering Design: A Materials and Processing Approach**" , McGraw-Hill

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53319 **Credits: 4**

M.Tech.- II Semester
FRACUTRE MECHANICS
(PROFESSIONAL ELECTIVE – IV)

MODULE-I: Introduction to fracture Mechanics **[6 Periods]**

The Crack Tip Plastic Zone, Methods for Measuring Fracture Toughness.

MODULE-II: **[10 Periods]**

Strength of cracked bodies- potential energy and surface energy – Griffith's theory – Irwin – Orwin extension of Griffith's theory to ductile materials – Stress analysis of cracked bodies – Effect of thickness on fracture toughness – Stress intensity factors for typical geometries.

MODULE-III: PHYSICAL ASPECTS OF FATIGUE **[10 Periods]**

Phase in fatigue life - Crack initiation – Crack growth - Final fracture - Dislocation – Fatigue fracture surfaces. Safe Life and Fail safe design philosophies Importance of Fracture Mechanics in Aerospace structure – Applications to composite materials and structures.

MODULE-IV: STATICAL ASPECTS OF FATIGUE BEHAVIOUR **[12 Periods]**

Low cycle and high cycle fatigue - Coffin- Manson's Relation –Transition Life – Cyclic strain hardening and softening – Analysis of load histories – Cycle counting techniques – Cumulative damage – Miner's theory, other theories.
Analysis of Fatigue:

MODULE-V: **[10 Periods]**

Dynamic Fracture, Stress Corrosion Cracking, Corrosion Fatigue, Fatigue - Crack Propagation under Variable - Amplitude Load Fluctuation, Fatigue - Crack Initiation, Fatigue - Crack Propagation under Constant - Amplitude Load Fluctuation.

TEXT BOOKS:

1. Anderson T.L & Boca Raton, "**Fracture Mechanics: Fundamental and Applications**" CRC Press, Florida, 3rd Edition,2005.
2. Richard W Hertz , "**Deformation and Fracture mechanics of Engineering Materials"** Wiley,5th Edition,2012.
3. W.F. Chen and D.J,. "**Plasticity for structural Engineers"** HaSpringer newyork,2012.

REFERENCE BOOKS:

1. D.R.J. Owen and A.J. Fawkes, "**Engineering Fracture Mechanics"** Pincridge press, Swansea, U.K.
2. S.T. Rolfe and J.M. Barsom, "**Fracture and fatigue control in structures" ,** Printice Hall, Eglewood cliffs, N.J,3rd Edition,1999.
3. B.R. Lawn and T.R. Wilshaw, "**Fracture of brittle solids"** ,Cambridge university press,2nd Edition,1993.
4. R.W.K. Honeycombe, "**Plastic deformation of Metals** "2nd edition, Edward Arnold,1984.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53320 **Credits: 4**

M.Tech - II Semester

VEHICLE DYNAMICS

(PROFESSIONAL ELECTIVE – IV)

MODULE – I: Introduction [10 Periods]

Fundamental Principles, Vehicle tires performance, cornering characteristics, Mechanics of Vehicle Terrain interaction. Vehicle Kinematics, Fundamental principles of velocity, acceleration. Two dimensional mechanisms, Forward Vehicle Dynamics.

MODULE – II: [10 Periods]

Three dimensional Mechanisms, Multi-Body Systems Design, Introduction to 3D vehicle design

MODULE – III: Suspension Design [10 Periods]

Computer models using Bond Graph Technology, Drive train dynamics, vehicle performance

MODULE – IV: Steering Mechanisms: [12Periods]

Two and three dimensional analysis, Mechanics of Vehicle Terrain interaction. Vehicle Collations, Fundamental laws of motion, energy and momentum, Forces and Moments 2D and 3D. The Dynamics of vehicle rollovers.

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MODULE – V: Wheeled Vehicle Handling [10 Periods]

Handling control loop, vehicle transfer function, Kinematic behavior of vehicles with rigid wheels and with complaint tyres: Neutral steer point, static margin, over and under-steer. Solution with two degree of freedom in the steady state: Stability factor, characteristic and critical speeds. Tracked Vehicle Handling – Analysis of sprocket torques and speeds, required to skid steer a tracked vehicle. Extension of theory to include three degrees of freedom.

TEXT BOOKS:

1. Giri N.K, "**Automotive Mechanics" ,** Khanna Publishers, 2002.
2. Rao J.S and Gupta. K , "**Theory and Practice of Mechanical Vibrations**",Wiley Eastern Ltd., New Delhi -2, 2002.
3.Heldt.P.M , "**Automotive Chassis**",Chilton Co., New York- 1992
4. Ellis.J.R , "**Vehicle Dynamics**",Business Books Ltd., London- 1991
5. Giles.J.G.Steering,"**Suspension and Tyres**", Illiffe Books Ltd., London- 1998

REFERENCE BOOKS:

1 . Ham B, Pacejka, "**Tyre and Vehicle Dynamics" ,**SAE Publication - 2002.
2. Gillespie T.D, "**Fundamentals of Vehicle Dynamics**", SAE USA 1992.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53321 **Credits: 4**

M.Tech - II Semester

DESIGN AND ANALYSIS OF EXPERIMENTS
(PROFESSIONAL ELECTIVE – IV)

MODULE I: Experimental Design Fundamentals [10 Periods]
Importance of experiments, experimental strategies, basic principles of design,terminology, ANOVA, steps in experimentation, sample size, normal probability plot, linear regression model.

MODULE II: Single Factor Experiments [12 Periods]
Completely randomized design, Randomized block design, Latin square design Statistical analysis, estimation of model parameters, model adequacy checking, pair wise comparison tests.

MODULE III: Multifactor Experiments [10 Periods]
Two and three factor full factorial experiments, 2K factorial Experiments,Confounding and Blocking designs.

MODULE IV : Special Experimental Designs [10 Periods]
Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methodology, Experiments with random factors, rules for expected mean squares, approximate F-tests.

MODULE V: Taguchi Methods [10 Periods]
Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design- control and noise factors, S/N ratios, parameter design, case studies.

TEXT BOOKS:

1. Montgomery, D.C., / Design **and Analysis of experiments**/John Wiley and Sons 2003.
2. Nicolo Belavendram/ **Quality by Design; Taguchi techniques for industrial perimentation**/ Prentice Hall, 1995.

REFERENCE BOOKS:

1. Phillip J.Rose/**Taguchi techniques for quality engineering**/McGraw Hill, 1996.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 50B16 **Credits: 4**

M.Tech - II Semester

ADVANCED OPTIMIZATION TECHNIQUES AND APPLICATIONS

(Open Elective-II)

MODULE- I: Single Variable Non-Linear Unconstrained Optimization [10 Periods]

One dimensional Optimization Methods:- Uni-modal function, elimination method, Fibonacci method, golden section method, interpolation methods- quadratic & cubic interpolation methods.

MODULE – II: Multi Variable Non-Linear Unconstrained Optimization [12 Periods]

Direct search method – Univariant Method – pattern search methods – Powell's – Hook – Jeeves, Rosenbrock search methods – gradient methods, gradient of function, steepest decent method, Fletcher reeves method. Variable metric method.

MODULE – III: Geometric Programming [4 Periods]

Polynomials – arithmetic – geometric inequality – unconstrained G.P – constrained G.P

Dynamic Programming: [8 Periods]

Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory. Allocation, scheduling replacement.

MODULE IV: Linear Programming [10 Periods]

Formulation – Sensivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction – Types – Steps – application – inventory – queuing – thermal system.

MODULE V: Integer Programming [4 Periods]

Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method.

Stochastic Programming: [8 Periods]

Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution – stochastic linear, dynamic programming.

TEXT BOOKS:

1. S.S Rao, "**Optimization theory & Applications" ,** New Age International,4th Edition,2009.
2. Kasan & Kumar, "**Introductory to operation research" ,**Springar,2004.
3. M.C Joshi, "**Optimization Techniques theory and practice" ,**K.M Moudgalya,Narosa Publications,2004.

REFERENCE BOOKS:

1. H.A. Taha , "**Operation Research" ,**TMH,8th Edition,2011
2. R.L Rardin , "**Optimization in operations research" ,** 3rd Edition,1998.
3. Benugundu & Chandraputla, "**Optimization Techniques**",Person Asia,2nd Edition,2014

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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Course Code: 53116 **Credits: 4**

M.Tech - II Semester

COMPUTATIONAL FLUID DYNAMICS

(Open Elective-II)

MODULE- I: Introduction [4 Periods]

Finite difference method, finite volume method, finite element method, governing equations and boundary conditions, Derivation of finite difference equations.

Solution methods: [8 Periods]

Solution methods of elliptical equations — finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

MODULE– II: Hyperbolic equations [10 Periods]

Explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations. Burgers equations: Explicit and implicit schemes, Runge - Kutta method.

MODULE- III: Formulations of Incompressible Viscous Flows [10 Periods]

Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods. Treatment of compressible flows: potential equation, Euler equations, Navier-stokes system of equations, flow field-dependent variation methods, boundary conditions.

MODULE- IV: Finite Volume Method [8 Periods]

Finite volume method via finite difference method, formulations for two and three-dimensional problems.

MODULE- V: Standard Variational Methods [10 Periods]

Linear fluid flow problems, steady state problems,Transient problems.

TEXT BOOKS:

1. T. J.C'hung, "**Computational fluid dynamics",** Cambridge University press,2002.
2. Frank Choriton, "**Text book of fluid dynamics",** CBS Publishers & distributors, 1985
3. Suhas V. Patankar, "**Numerical heat transfer and fluid flow",** Hema shava Publishers Corporation & Mc Graw Hill.

REFERENCE BOOKS:

1. Sunder rajan &Muralidaran, "**Computational Fluid Flow and Heat Transfer",** Narosa Publications,2nd Edition,2010.
2. John D. Anderson., " **Computational Fluid Dynamics: Basics with applications" ,**Mc Graw Hill,2010.
3. Tapan K. Sengupta, "**Fundamentals of Computational Fluid Dynamics",** Universities Press,2004.
4. C. Pozrikidis, "**Introduction to Theoretical and Computational Fluid Dynamics",**Oxford University Press,2nd Edition,2011.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
4	-	-

Course Code: 53124 **Credits: 4**

M.Tech - II Semester

ENERGY MANAGEMENT

(Open Elective-II)

MODULE- I: Introduction [12 Periods]

Principles of Energy Management – Managerial Organization – Functional Areas for i. Manufacturing Industry ii. Process Industry iii. Commerce iv. Government. Role of Energy Manager in each of these organizations. Initiating, Organising and Managing Energy Management Programs.

MODULE- II: Energy Audit [6 Periods]

Definition and Concepts, Types of Energy Audits – Basic Energy Concepts – Resources for Plant Energy Studies – Data Gathering – Analytical Techniques.

Energy Conservation: [8 Periods]

Technologies for Energy Conservation , Design for Conservation of Energy materials – energy flow networks – critical assessment of energy usage – formulation of objectives and constraints – synthesis of alternative options and technical analysis of options – process integration.

MODULE- III: Economic Analysis [10 Periods]

Scope, Characterization of an Investment Project – Types of Deprecication – Time Value of money – budget considerations, Risk Analysis.

MODULE- IV: Methods of Evaluation of Projects [10 Periods]

Payback – Annualised Costs – Investor's Rate of return – Present worth – Internal Rate of Return – Pros and Cons of the common methods of analysis – replacement analysis.

MODULE- V: Alternative Energy Sources [12 Periods]

Solar Energy – Types of devices for Solar Energy Collection – Thermal Storage System – Control Systems-Wind Energy – Availability – Wind Devices – Wind Characteristics – Performance of Turbines and systems.

TEXT BOOKS:

1. W.C. Turner **"Energy Management Hand book",** 6th Edition,2006
2. H.Koontz and Cyrill O Donnell **"Management",** 3rd Edition,2008

REFERENCE BOOKS:

1. S.C. Kuchhal **"Financial Management",8th** Edition,1982.
2. W.R.Murthy and G.Mc Kay **"Energy Management"**,
3. CB Smith **"Energy Management Principles"**, Edition,1981.

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
-	-	4

Course Code: 53322 **Credits: 2**

M.Tech - II Semester

COMPUTER AIDED TESTING, ANALYSIS AND MODELING LABORATORY

Testing

1. Preparation and study of the Micro Structure of ferrous metals and alloys.
2. Preparation and study of the Microstructure of nonferrous metals and alloys.
3. Effect of tempering time on the hardness of quenched carbon steels.
4. Effect of tempering temperature on the hardness of a hardened carbon steels.
5. Preparation of metallic specimens by electro polishing.
6. Study of work hardening characteristics of a pure metal.
7. Determination of carbon percentage in the given ferrous specimen.

Modeling

1. Surface modeling.
2. Solid modeling.
3. Drafting.
4. Assembling.

Analysis of Structures Using Fea Packages

1. Static Analysis.
2. Modal Analysis.
3. Harmonic Analysis.
4. Spectrum Analysis.
5. Buckling Analysis.
6. Analysis of Composites.
7. Fracture mechanics.
8. Transient analysis

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
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Course Code: 53324 **Credits: 4**

M.Tech - III Semester

Comprehensive Viva-Voce

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
-	-	16

Course Code: 53325 **Credits:8**

M.Tech - III Semester

Project work Part I

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
-	-	16

Course Code: 53326 **Credits: 8**

M.Tech - IV Semester

Project work Part II

2015-16

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

L	T	P
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Course Code: 53327 **Credits:12**

M.Tech - IV Semester

Project Viva-Voce