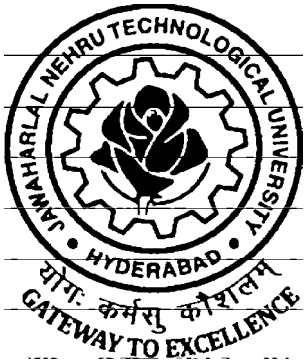
ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

M.TECH
ENGINEERING DESIGN

(Applicable for the batches admitted from 2013-14)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.

ACADEMIC REGULATIONS R13 FOR M. TECH. (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech. (Regular) Course from the Academic Year 2013-14 and onwards

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

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program 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 University 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 he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work.

2.2 A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.

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

2.4 The minimum instruction days in each semester are 90.

3.0 A. COURSES OF STUDY

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

1. Advanced Manufacturing Systems
2. Aerospace Engineering/ Aeronautical Engineering
3. Automation
4. Biomedical Signal Processing and Instrumentation
5. Bio-Technology
6. CAD/CAM
7. Chemical Engineering
8. Communication Systems
9. Computer Networks
10. Computer Networks and Information Security
11. Computer Science
12. Computer Science and Engineering
13. Computers and Communication Engineering.
14. Construction Management
15. Control Engineering
16. Control Systems
17. Cyber Forensic / Cyber Security & Information Technology
18. Design for Manufacturing/ Design and Manufacturing
19. Digital Electronics and Communication Engineering.
20. Digital Electronics and Communication Systems
21. Digital Systems and Computer Electronics
22. Electrical Power Engineering
23. Electrical Power Systems
24. Electronics & Instrumentation

25. Electronics and Communication Engineering
26. Embedded Systems
27. Embedded Systems and VLSI Design
28. Energy Systems
29. Engineering Design
30. Environmental Engineering
31. Geoinformatics and Surveying Technology
32. Geotechnical Engineering.
33. Heating Ventilation & Air Conditioning.
34. Highway Engineering
35. Image Processing
36. Industrial Engineering and Management
37. Information Technology
38. Infrastructure Engineering
39. Machine Design
40. Mechatronics.
41. Microwave & Radar Engineering
42. Nano Technology
43. Neural Networks
44. Parallel Computing
45. Power and Industrial Drives
46. Power Electronics
47. Power Electronics and Electrical Drives
48. Power Engineering and Energy Systems
49. Power Plant Engineering & Energy Management
50. Power System Control and Automation
51. Power System with Emphasis H.V. Engineering / H.V. Engineering
52. Production Engineering.
53. Real Time Systems
54. Software Engineering
55. Structural Engineering
56. Systems & Signal Processing
57. Thermal Engineering.
58. Transportation Engineering
59. VLSI
60. VLSI and Embedded System/ Electronics Design Technology
61. VLSI Design
62. VLSI System Design
63. Web Technologies
64. Wireless and Mobile Communication

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

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

Civil Engg.	Construction Management Environmental Engineering Geoinformatics and Surveying Technology Geotechnical Engineering Highway Engineering Infrastructure Engineering Structural Engineering Transportation Engineering
EEE	Control Engineering Control Systems Electrical Power Engineering Electrical Power Systems Power and Industrial Drives Power Electronics Power Electronics and Electrical Drives Power Engineering and Energy Systems Power Plant Engineering & Energy Management Power System Control and Automation Power System with Emphasis H.V. Engineering / H.V. Engineering
ME	Advanced Manufacturing Systems Automation CAD/CAM Design for Manufacturing/ Design and Manufacturing Energy Systems Engineering Design Heating Ventilation & Air Conditioning Industrial Engineering and Management Machine Design Mechatronics. Power Plant Engineering & Energy Management Production Engineering Thermal Engineering.
ECE	Biomedical Signal Processing and Instrumentation Communication Systems Computers and Communication Engineering. Digital Electronics and Communication Engineering. Digital Electronics and Communication Systems Digital Systems and Computer Electronics Electronics & Instrumentation Electronics and Communication Engineering Embedded Systems Embedded Systems and VLSI Design

	Microwave & Radar Engineering Systems & Signal Processing VLSI VLSI and Embedded System/ Electronics Design Technology VLSI Design VLSI System Design Wireless and Mobile Communication
CSE	Computer Networks Computer Networks and Information Security Computer Science Computer Science and Engineering Cyber Forensic / Cyber Security & Information Technology Image Processing Information Technology Neural Networks Parallel Computing Real Time Systems Software Engineering Web Technologies
Aeronautical Engg.	Aerospace Engineering / Aeronautical Engineering
Bio-technology	Bio-Technology
Chemical Engg.	Chemical Engineering
Nano Technology	Nano Technology

4.0 ATTENDANCE

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

4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

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

4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class and their registration shall stand cancelled.

4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

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

4.7 A candidate shall put in a minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next 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.

4.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the previous semester including the days of attendance in sports, games, NCC and NSS activities.

5.0 EVALUATION

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 Internal Evaluation and End Semester Examination.

5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (16 marks) which consists of four sub-questions and carries 4 marks each and Part B with 3 questions to be answered out of 5 questions each question for 8 marks. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University. The details of the Question Paper pattern for End Examination (Theory) is given below:

- The End semesters Examination will be conducted for 60 marks which consists of two parts viz. i).Part-A for 20 marks, ii). Part –B for 40 marks.
- Part-A is compulsory question where it consists of five questions one from each unit and carries four marks each. This will be treated as Question 1.
- Part-B consists of five Questions (numbered from 2 to 6) carries 8 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer only one question)

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance as Internal Marks.

5.3 There shall be two seminar presentations during I year 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 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5.5 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 End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.5) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.

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

offered.

5.8 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 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.

6.1 A Project Review Committee (PRC) shall be constituted with Principal as Chairperson, Heads of all the Departments offering the M. Tech. programs and two other senior faculty members.

6.2 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.

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Academic Committee for approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the Project work.

6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Departmental Academic Committee. However, the Departmental Academic Committee 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.

6.5 A candidate shall submit his status report in a bound-form in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course 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 Principal through Head of the Department and make an oral presentation before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/ School/Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

A. Excellent

B. Good

C. Satisfactory

D. Unsatisfactory

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

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva- Voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

The marks in internal evaluation and end examination shall be shown separately in the memorandum of marks.

8.0 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.

9.0 TRANSITORY REGULATIONS

9.1 Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.

9.2 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 R13 academic regulations.

10. GENERAL

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

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

10.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

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

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 subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/ year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the 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 subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

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

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH - ENGINEERING DESIGN

COURSE STRUCTURE AND SYLLABUS

I Year I Semester

Code	Group	Subject	L	P	Credits
		Mechanical Behaviour of Engineering Materials	3	-	3
		Advanced Mechanics of Machinery	3	-	3
		Advanced Mechanics of Solids	3	-	3
		Geometric Modeling	3	-	3
	Elective -I	Advanced Optimization Techniques and Applications Modern Control Theory Computer Simulations of Machines Vibration Analysis of Mechanical Systems Advanced Metal Forming	3	-	3
	Elective -II	Experimental Stress Analysis Instrumentation and Control Systems Computer Aided Manufacturing Design for Process and Product Development Theory of Elasticity and Plasticity	3	-	3
	Lab	Kinematics and Dynamics Lab	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

I Year II Semester

Code	Group	Subject	L	P	Credits
		Advanced Machine Design	3	-	3
		Industrial Robotics	3	-	3
		Finite Element and Boundary Element Methods	3	-	3
		Design for Manufacturing and Assembly	3	-	3
	Elective–III	Applied Tribology Applied Random Vibrations Product Data Management Materials Handling Equipment Design Fracture Mechanics	3	-	3
	Elective–IV	Digital Image Processing and Computer Vision Advanced Mechanics of Composite Materials Vehicle Dynamics Advanced Tool Design Nano Composites Design and Synthesis	3	-	3
	Lab	Computer Aided Testing, Analysis and Modeling Lab	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

II Year - I Semester

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	-	3	2
		Project Work	-	-	18
		Total Credits	-	3	22

II Year - II Semester

Code	Group	Subject	L	P	Credits
		Project Work and Seminar	-	-	22
		Total Credits	-	-	22

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

MECHANICAL BEHAVIOUR OF ENGINEERING MATERIALS

UNIT-I

Griffiths Analysis: Concept of energy release rate, G and fracture energy, R. Modification for ductile materials, loading conditions. Concept of R curves.

UNIT-II

Linear Elastic Fracture Mechanics (LEFM): Three loading modes and the state of stress ahead of the crack tip, stress concentration factor, stress intensity factor and the material parameter, the critical stress intensity factor.

UNIT-III

Elastic-plastic Fracture Mechanics (EPFM): The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral. Measurement of parameters and examples of use.

UNIT-IV

Fatigue: definition of terms used to describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. S-N curves. Goodman's rule and Miners rule. Micro mechanisms of fatigue damage, fatigue limits and initiation and propagation control leading to a consideration of factors enhancing fatigue resistance. Total life and damage tolerant approaches to life prediction.

UNIT-V

Creep Deformation: The evolution of creep damage, primary, secondary and tertiary creep, Micro mechanisms of creep in materials and the role of diffusion, Ashby creep deformation maps. Stress dependence of creep – power law dependence. Comparison of creep performance under different conditions – extrapolation and the use of Larson-Miller parameters, Creep-fatigue interactions, Examples.

REFERENCE:

1. Mechanical Metallurgy / Dieter / McGraw Hill.
2. Fracture Mechanics: Fundamental and Applications /Anderson T.L & Boca Raton/ CRC Press, Florida, 1998.
3. Deformation and Fracture mechanics of Engineering Materials / Richard W Hertz /Wiley.
4. Plasticity for structural Engineers / W.F. Chen and D.J,. Ha.
5. Engineering Fracture Mechanics/ D.R.J. Owen and A.J. Fawkes /Pincridge press, Swansea, U.K.
6. Fracture and fatigue control in structures/ S.T. Rolfe and J.M. Barsom/ Printice Hall, Eglewood cliffs, N.J.
7. Fracture of brittle solids/ B.R. Lawn and T.R. Wilshaw/ Cambridge university press.
8. Plastic deformation of Metals/ R.W.K. Honeycombe/ 2nd edition, Edward Arnold.
9. Elements of Fracture Mechanics/Prasanth Kumar/TMH.
10. F.R.N. Nabarro, H.L. deVilliers, The Physics of Creep, Taylor and Francis, (1995).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

ADVANCED MECHANICS OF MACHINERY

UNIT – I

Advanced Kinematics of Plane Motion- I: 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.

UNIT - II

Advanced Kinematics of Plane Motion - II: 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.

UNIT – III

Introduction to Synthesis-Graphical Methods - I: 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.

UNIT - IV

Introduction to Synthesis-Graphical Methods - II: 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.

UNIT – V

Introduction to Synthesis - Analytical Methods: 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.

REFERENCE:

1. Kinematics and Dynamics of plane mechanisms/ Jeremy Hirschhorn/McGraw-Hill,1962.
2. Theory of Machines and Mechanisms/ J.E Shigley and J.J . Uicker Jr./ McGraw-Hill, 1995.
3. Theory of Mechanisms and Machines/ Amitabh Ghosh and Ashok Kumar Mallik/ E.W.P.Publishers.
4. Kinematics and Linkage Design/ Allen S.Hall Jr./ PHI,1964.
5. Kinematics and Dynamics of Machinery/Charles E Wilson/Pearson/3rd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

ADVANCED MECHANICS OF SOLIDS

UNIT - I

Shear Centre: 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.

UNIT - II

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

UNIT - III

Torsion: 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.

Axi-Symmetric Problems: Rotating Discs – Flat discs, Discs of uniform thickness, Discs of Uniform Strength, Rotating Cylinders.

UNIT - IV

Theory of Plates: 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: 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.

UNIT - V

Contact Stresses: 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.

REFERENCES:

1. Advanced Mechanics of materials/Seely and Smith/ John Willey.
2. Advanced Mechanics of materials / Boresi & Sidebottom/wiely international.
3. Advanced strength of materials / Den Hortog J.P./Torrent.
4. Theory of Plates /Timoshenko/
5. Strength of materials / Sadhu singh/ Khanna Publishers.
6. Mechanics of Materials / Beer & Jhonson / McGraw Hill.
7. Theory of Plates & Shells / Timoshenko/ McGraw Hill/ 2nd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

GEOMETRIC MODELING

UNIT - I

Introduction, Definition, Explicit and implicit equations, parametric equations.

Cubic Splines: 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.

UNIT - II

Bezier Curves: Bernstein basis, equations of Bezier curves, properties, derivatives.

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

UNIT – III

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

UNIT – IV

Transformations: 2-D and 3D

Solids: Tricubic solid, Algebraic and geometric form.

UNIT – V

Solid Modeling Concepts: Wire frames, Boundary representation, Half space modeling, spatial cell, cell decomposition, classification problem.

REFERENCE:

1. CAD/CAM / Ibrahim Zeid/ Tata McGraw Hill.
2. CAD/CAM concepts and Applications/ Alavala/ PHI.
3. Geometric Modeling/ Micheal E. Mortenson/ McGraw Hill Publishers.
4. Computer Aided Design and Manufacturing/ K.Lalit Narayan, K.Mallikarjuna Rao & MMM Sarcar/ PHI Publishers.
5. Elements of Computer Graphics / Roger & Adams/ Tata McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

ADVANCED OPTIMIZATION TECHNIQUES AND APPLICATIONS

(Elective- I)

UNIT- I

Single Variable Non-linear Unconstrained Optimition: One dimensional Optimization methods, Uni-modal function, elimination method, Fibonacci method, golden section method, interpolation methods-quadratic & cubic interpolation methods.

UNIT - II

Multi Variable Non-linear Unconstrained Optimization: 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.

UNIT - III

Geometric Programming: Polynomials – arithmetic – geometric inequality – unconstrained G.P – constrained G.P

Dynamic Programming: 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.

UNIT IV

Linear Programming: Formulation – Sensitivity 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.

UNIT V

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

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

REFERENCES:

1. Optimization theory & Applications/ S.S Rao/ New Age International.
2. Introductory to operation research/Kasan & Kumar/Springar.
3. Optimization Techniques theory and practice / M.C Joshi, K.M Moudgalya/ Narosa Publications.
4. Operation Research/H.A. Taha/TMH.
5. Optimization in operations research/R.L Rardin.
6. Optimization Techniques/Benugundu & Chandraputla/Person Asia.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

MODERN CONTROL THEORY

(Elective- I)

UNIT-I

Mathematical Preliminaries: Fields, Vectors and Vector Spaces, Linear combinations and Bases – Linear Transformations and Matrices, Scalar Product and Norms, Eigen values, Eigen Vectors and Canonical form representation of Linear operators, The concept of state, State Equations for Dynamic systems, Times Invariance and Linearity No uniqueness of stage model, State diagrams for Continuous, Time state models.

UNIT-II

State Variable Analysis, Controllability and Observability: Linear continuous time models for physical systems, Existence and uniqueness of solutions to continuous, Time state equations, solutions of linear time invariant continuous, time state equation, state transition matrix and its properties.

General concept of controllability, General concept of Observability, Controllability tests for continuous, Time Invariant systems, Controllability and Observability of state Model in Jordan Canonical form, Controllability and Observability canonical forms of state model.

UNIT-III

Non Linear Systems: Introduction, Non linear systems, Types of Non, Linearities, Saturation, Dead, Zone, Backlash, Jump Phenomenon etc;, SINGULAR POINTS, Introduction to linearization of nonlinear systems, Properties of Non linear systems, Describing function –Describing Function Analysis of Non linear systems, stability analysis of Non-linear systems through describing functions.

Introduction to phase, plan analysis, Method of Isoclines for constructing Trajectories, Singular points, Phase, plane analysis of nonlinear control systems.

UNIT-IV

Stability Analysis of Non Linear Systems: Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems – stability Analysis of the Linear continuous time invariant systems by Lyapunov second method, Generation of Lyapunov Functions, Variable Gradient Method – Krasooviski's method. Static feedback controllers and Observers, State feedback controller design through pole assignment, state observers: Full order and Reduced order.

UNIT-V

Optimal Control: Introduction to optimal control, Formulation of optimal control Problems, calculus of variations, fundamental concepts, functionals, variations of functionals, fundamental theorem of Calculus of variations – boundary conditions- constrained minimization- formulation using Hamiltonian method- Linear Quadratic regulator.

REFERENCE:

1. Modern control system theory/ M. Gopal/ New Age International/1984.
2. Modern Control Engineering / Ogata.K/Prentice Hall/1997.
3. Optimal control/Donald E. Kirk/Dover Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

COMPUTER SIMULATIONS OF MACHINES

(Elective- I)

UNIT- I

Introduction, 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.

UNIT - II

Solutions of the Position Problem: 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.

UNIT- III

Kinematic Simulations Using Simulink: What is a Kinematic Simulation, Velocity Solution via Kinematic Simulation, Acceleration Solution via Kinematic Simulation, The Consistency Check, Kinematic Simulation of a Four-Bar Mechanism.

UNIT - IV

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

UNIT - V

Two-link Planar Robot: Overview, Vector Equations, Dynamic Equations, The Simultaneous Constraint matrix, Dynamic Simulation, Robot Coordinate Control.

REFERENCE:

1. Simulation Of Machines using Mat Lab and Simulink/John F. Gardner/ India Edition (IE).
2. CAD/CAM / Ibrahim zeid/ TMH.
3. Mat Lab / Raj Kumar Bansal / Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

VIBRATION ANALYSIS OF MECHANICAL SYSTEMS

(Elective- I)

UNIT-I

Fundamentals Of Vibration: Basic concepts of Vibration, Vibration, Elementary parts of vibrating systems, Degree of freedom.

Free Vibration of Single Degree of Freedom Systems: Introduction, Free Vibration of an Undamped Translational System, Equation of Motion using Newton's second law of motion, Equation of motion using other methods, Equation of motion of a spring, mass system in vertical position, solution, Harmonic Motion Free Vibration of an Undamped Torsional System- Equation of motion. Free Vibration with Viscous Damping- Equation of motion.

UNIT-II

Forced Vibration of Single Degree of Freedom Systems: Introduction, Response of an Undamped system under harmonic force, Total response, Beating Phenomenon. Response of a Damped System under Harmonic Force- Total Response, Quality Factor and Bandwidth, Response of a Damped system under the Harmonic Motion of the base, Force Transmitted, Relative Motion.

UNIT- III

Two Degree of Freedom Systems: Introduction, Equations of Motion for forced Vibration, Free Vibration Analysis of and undamped system, Torsional system, Coordinate Coupling and Principal Coordinates, forced Vibration Analysis, Semi definite Systems, Self- Excitation and stability Analysis.

UNIT-IV

Multi-degree of Freedom Systems: Introduction Modeling of Continuous systems as Multi-degree of Freedom systems, Using Newton's second law to derive equations of motion, Influence Coefficients. Potential and kinetic energy expressions in matrix form, Generalized coordinates and generalized forces, Using Lagrange's equations to derive equations of motion, Equations of motion of undamped systems in matrix form, Eigen value problem, solution of the Eigen value problems – solution of the characteristic equation, orthogonality of normal modes, repeated Eigen values.

UNIT-V

Determination of Natural Frequencies and Mode Shapes: Introduction, Dunkerley's formula, Rayleigh's Method- Properties of Rayleigh's Quotient, Computation of the Fundamental Natural Frequency, Fundamental Frequency of Beams and Shafts. Holzer;s Method-Torsional systems, Spring Mass Systems. Jacobis method, Standard Eigen value Problems.

REFERENCE:

1. Mechanical Vibrations/Groover/Nem Chand and Bros.
2. Elements of Vibration Analysis by Meirovitch, TMH, 2001.
3. Mechanical Vibrations/Schaum Series/ McGraw Hill.
4. Mechanical Vibrations / SS Rao/ Pearson/ 2009, Ed 4.
5. Mechanical Vibrations/Debabrata Nag/Wiley.
6. Vibration problems in Engineering / S.P. Timoshenko.
7. Mechanical Vibrations and sound engineering/ A.G.Ambekar/ PHI.
8. Theory and Practice of Mechanical Vibrations/JS Rao & K. Gupta/New Age Intl. Publishers/Revised 2nd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

ADVANCED METAL FORMING

(Elective- I)

UNIT I:

Fundamentals of Metal Forming: Classification of forming processes, mechanism of metal forming, temperature of metal working, hot working, cold working, friction and lubricants.

Rolling of Metals: 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.

UNIT II:

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

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

UNIT III:

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

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

UNIT IV:

Advanced Metal Forming Processes: HERF, Electromagnetic forming, residual stresses, in-process heat treatment, computer applications in metal forming.

Press Tool Design: 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.

UNIT V:

Jigs And Fixture Design: Principles of location, six-point location principle, clamping elements and methods.

REFERENCE:

1. Mechanical Metallurgy / G.E. Dieter / Tata McGraw Hill, 1998. III Edition.
2. Principles of Metal Working / Sunder Kumar.
3. Principles of Metal Working processes / G.W. Rowe.
4. ASM Metal Forming Hand book.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

EXPERIMENTAL STRESS ANALYSIS

(Elective - II)

UNIT-I

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

UNIT-II

Recording Instruments: 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.

UNIT-III

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

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical 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.

UNIT-IV

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

UNIT-V

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

REFERENCES:

1. Theory of elasticity / Timoshenko and Goodier Jr.
2. Experimental Stress analysis/ Dally and Riley, Mc Graw-Hill.
3. A treatise on Mathematical theory of elasticity / LOVE A.H./ Dover Publications.
4. Photo Elasticity / Frocht/ Wiley / 3rd Edition.
5. Experimental Stress Analysis / Sadhu singh / Khanna Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

INSTRUMENTAION AND CONTROL SYSTEMS

(Elective - II)

UNIT – I

Introduction: Generalized scheme of a measurement system – basic methods of measurements - Errors in measurements–types of errors - Statistical analysis of measurement data - mean, standard deviation – probability of errors – Gaussian distribution – probable error, limiting errors. Reliability of measurement systems – failure rate – reliability improvement, Availability, redundancy. Different types of noises in measurements and its Suppression methods.

Static and Dynamic Characteristics: Static characteristics of instruments – accuracy, precision, sensitivity, linearity, resolution, hysterisis, threshold, input impedance, loading effect – generalized mathematical model of measurement systems – dynamic characteristics – Modelling of Transducers – operational transfer function – zero, first and second order instruments – impulse, step, ramp and frequency response of the above instruments.

UNIT-II

Inductive and Capacitive Transducers: Induction potentiometers – variable reluctance transducers – Inductive proximity pick up and Capacitive proximity pickup– Synchros – LVDT construction - signal conditioning circuit – applications – RVDT, Magneto strictive transducer. Capacitive transducers – variable area type – variable air gap type – variable permittivity type – signal conditioning circuit – Blumlein bridge – Capacitor microphone – frequency response. Piezoelectric transducers – piezoelectric crystals – charge amplifier.

Resistance Transducers: Resistance potentiometer – loading effect – strain gauges – gauge factor – types of strain gauges – rosettes – semiconductor strain gauges – installation of strain gages – strain measuring circuits – resistance thermometers, materials, construction, characteristics – Thermo wells – Thermistors and photo resistors (LDR) – hot wire anemometer – constant current and constant temperature operation – humidity sensors. Signal conditioning circuits for RTD. Thermocouple. Thermistor and strain gage. Linearization techniques for Thermistors.

UNIT – III

Mechanical Transducers : Measurement of Temperature – Force – torque-pressure – level – flow – viscosity - density **–** speed transducers – Classification - basic working principles and their uses.

UNIT – IV

Miscellineous and Smart Transducers: Accelerometer and Vibrometer – Eddy current transducers. Hall effect transducers – Photo electric detector, different types and characteristics – Optical sensors, IC sensor for temperature – AD 590,LM335. Introduction to fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors. Intelligent and smart transducers - principle- design approach-interface design, configuration support, and communication in smart transducer networks.

Process Control Instrumentation: Introduction - Pharmaceutical industries – Paper and textile industries - Food Processing industry - Aero space industry - Nuclear power industry - Bio Process industry - Field Instrumentation.

UNIT-V:

Control System and Their Classification: Introduction - Classification of control systems -Transfer function, block diagrams, signal flow graphs - systems stability-Routh stability - Hurwitz stability- Niquvist plot-bode

plot.

Hydraulic and Pneumatic Controls Systems: Functional operation of a control-proportional control-Reset control-Proportional plus integral control - Proportional plus derivative control- Proportional plus derivative plus integral control - Hydraulic control systems – Pneumatic control systems.

REFERENCE:

1. Measurement Systems: Applications & Design / D.S Kumar/ Anuradha Agencies.
2. Instrumentation, Measurement & Analysis/ B.C.Nakra & K.K.Choudhary/ TMH.
3. Principles of Industrial Instrumentation and Control Systems/ Chennakesava R Alavala/ Cengage Learning.
4. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
5. Experimental Methods for Engineers / Holman/Mc Graw Hill.
6. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
7. Mechanical Measurements / Sirohi and Radhakrishna / New Age.
8. Instrumentation &Mech. Measurements / A.K. Tayal /Galgotia Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

COMPUTER AIDED MANUFACTURING

(Elective - II)

UNIT - I

Compute-aided Programming: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors .Introduction to CAD/CAM software, Automatic Tool Path generation.

UNIT - II

Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages arid disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control of machining processes like turning, grinding.

UNIT - III

Post Processors for CNC:

Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP — based- Post Processor: Communication channels and major variables in the DAPP — based Post Processor, th creation of a DAPP — Based Post Processor.

UNIT - IV

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory:, counters, timers and serial data I/O interrupts. Selection of Micro Controllers Embedded Controllers, Applications and Programming of Micro Controllers. Programming Logic Controllers (PLC' s): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.

UNIT - V

Computer Aided Process Planning: Hybrid CAAP System, Computer Aided Inspection and quality control, Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, Optical Inspection Methods, Artificial Intelligence and expert system: Artificial Neural Networks, Artificial Intelligence in CAD, Experts systems and its structures.

REFERENCES:

1. Computer Control of Manufacturing Systems / Yoram Koren / Mc Graw Hill. 1983.
2. Computer Aided Design Manufacturing – K. Lalit Narayan, K. Mallikarjuna Rao and M.M.M. Sarcar, PHI, 2008.
3. CAD/CAM Principles and Applications, P.N.Rao, TMH.
4. CAD / CAM Theory and Practice,/ Ibrahim Zeid,TMH.
5. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age.
6. Principles of Computer Aided Design and Manufacturing, Farid Amirouche, Pearson.
7. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson/2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

DESIGN FOR PROCESS AND PRODUCT DEVELOPMENT

(Elective - II)

UNIT- I

Introduction to Product Design, Thoughts For the Reader and Students of Product Design, Product Development Versus Design, Types of Design and Redesign, Customer Satisfaction- Voice of the Customer, Customer Populations , types of Customer Needs, Customer Need Models, Gathering Customer Needs Need Gathering Methods, Organizing and Prioritizing Customer Needs, Grouping Interpreted Needs, Grouping the Needs- Affinity Diagram Method.

UNIT- II

Establishing Product Function - Why Functional Decomposition?, Motivation, Function Modeling Basics, Functions and Constraints, Modeling Process.

UNIT- III

Generating Concepts, Concept Generating Process, Basic Methods; Information Gathering and Brainstorming, Information Gathering – Conventional Aids, Traditional Brainstorming, Advanced Methods, Directed search, systematic search with physical principles, systematic search with classifying schemes, theory of inventive problem solving, Morphological Analysis - Develop concepts for each product function, Combining Solution Principles - Digression - function sharing, Product Application fingernail clipper, Concept Selection - Introduction, Factors that determine effective decision making, design evaluations, information quality, estimating technical risibility, concept selection process.

UNIT- IV

Environmental Objectives, global issues, Regional and Local issues. Basic DFE Methods; Design Guidelines, application. Life cycle assessment, weighted sum assessment methods. Life cycle assessment method. Techniques to reduce environmental impact - design to minimize material usage, design for disassembly design for recyclability and design for remanufacturing design for high - impact material reduction design for energy efficiency.

UNIT- V

Physical Models and Experimentation: Design of experiments - basic of designed experiments, basic method - two factorial experiments , extended method – interactions, Design of experiments: Reduced tests and fractional experiments, full factorial inefficiencies, orthogonality, base design method, Higher dimensions fractional factorial designs. Stastical analysis of experiments - degrees of freedom, correlation coefficient.

Design for Robustness: Quality design theory, general robust design model, robust design model construction. Basic method: Taguchi's method, noise variable matrix, design variable matrix, experimental matrix, single to noise ratios, selection of a target design, parameter design and the Taguchi philosophy. Advantage analysis - Probability Theory Sizing the variation, general robust design Problem formulation.

REFERENCE:

1. Integrated product and process design and development/Edward B.Magrab, Satyandra K Gupta / CRC Press/ 2nd Edition.
2. Engineering Design/George E. Dieter, Linda C. Schmidt/ McGraw- Hill/ 4th Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

THEORY OF ELASTICITY AND PLASTICITY

(Elective - II)

UNIT - I

Elasticity: Two dimensional stress analysis - Plane stress - Plane strain - Equations of compatibility - Stress function - Boundary conditions.

Problem in Rectangular Coordinates - Solution by polynomials - Saint Venent's principles - Determination of displacement - Simple beam problems.

Problems in Polar Coordinates - General equations in polar coordinates - Stress distribution symmetrical about axis - Strain components in polar coordinates - Simple and symmetric problems.

UNIT - II

Analysis of Stress and Strain in Three Dimensions: Principle stresses - Homogeneous deformations - Strain spherical and deviatoric stress - Hydrostatic strain.

General Theorems: Differential equations of equilibrium and compatibility - Displacement - Uniqueness of solution - Reciprocal theorem.

UNIT - III

Bending of Prismatic Bars: Stress function - Bending of cantilever beam - Beam of rectangular cross-section - Beams of circular cross-section.

UNIT - IV

Plasticity: Plastic deformation of metals - Structure of metals - Deformation - Creep stress relaxation of deformation - Strain rate condition of constant maximum shear stress - Condition of constant strain energy - Approximate equation of plasticity.

UNIT - V

Methods of Solving Practical Problems: The characteristic method - Engineering method - Compression of metal under press - Theoretical and experimental data drawing.

REFERENCES:

1. Theory of Elasticity/Timoshenko S.P. and Goodier J.N./Koakusha Publishers.
2. An Engineering Theory of Plasticity/E.P. Unksov/Butterworths.
3. Applied Elasticity/W.T. Wang/TMH.
4. Theory of Plasticity for Engineers/Hoffman and Sacks/TMH.
5. Theory of Elasticity and Plasticity/Sadhu Singh/ Khanna Publishers.
6. Theory of Elasticity and Plasticity/Harold Malcolm Westergaard/Harvard University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. Engg Design

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. Field balancing of the thin rotors using vibration pickups.
6. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors.
7. Determination of natural frequency of given structure using FFT analyzer.
8. Diagnosis of a machine using FFT analyzer.
9. Direct Kinematic analysis of a robot.
10. Inverse Kinematic analysis of a robot.
11. Trajectory planning of a robot in joint space scheme.
12. Palletizing operation using Robot programming.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

ADVANCED MACHINE DESIGN

UNIT- I

Shafts and Axles: Introduction, Causes of failure in Shafts and Axles And Stresses in Shafts, Materials for Shafts and Axles, Methods of Manufacturing of Shafts, Designing of Straight Shafts, Pure Tensional Load, Designing for Rigidity and Stiffness, Design of Axles, Flexible Shafts.

UNIT- II

Rope Drive: Fibre ropes, rope drives for power transmission, fibrous Ropes used in Hoisting Tackle, Wire Ropes, Materials, Wire Rope Construction, Applications of Ropes, properties of various types of Ropes, Approximate wire Diameters and Effective Cross- section of Ropes: Fiber cores for steel wire ropes, Working loads, Friction and Efficiency wire rope, sheaves and Drum, rope fasteners, Selection of wire rope, design procedure.

UNIT- III

Chain Drives: Types of Chain drives, construction of Chains, Roller Chains, Silent Chains, selection of a chain, Design of the chain Drive, Good design practice.

UNIT- IV

Gear Drives: Design calculations for helical gears, Definitions, double helical , Gear tooth proportions, Design calculations, forces acting in a Bevel gear, Worm gear drives, worm wheel, designation of a worm gear drive, Materials, efficiency of Drive, Heat Dissipation, Design of worm Gearing, Forces on worm gears, advantages and disadvantages of worm gear drives.

UNIT- V

Power Screws: Function, Types of Power screws , Multiple threads, Comparison of square and trapezoidal threads, Power screw drive, Efficiency of screws, square threads, Trapezoidal Threads, stresses in screws design calculations, design procedure, other types of screws, differential and compounds screws , ball baring screws.

REFERENCE:

1. Machine Design/Dr. P.C. Sharma/ S.K.Kataria & sons.
2. Machine Design/ Maleev and Hartman/C.B.S Publishers.
3. Machine Design/Schaum series/TMH.
4. Mechanical Engineering design/J.E. Shigley/Mc Graw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

INDUSTRIAL ROBOTICS

UNIT - I

Introduction, 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: basic concept and medias controllers control system analysis, robot activation and feedback components. Positions sensors, velocity sensors, actuators sensors, power transmission system.

UNIT - II

Motion Analysis And Control: Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller.

UNIT - III

End Effectors: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics.

Machine Vision: 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.

UNIT - IV

Robot Programming: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINONAL AND DELAY commands, Branching capabilities and Limitations. **Robot Languages:** Textual robot Languages, Generation, Robot language structures, Elements in function.

UNIT - V

Robot Cell Desgin and Control: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detection, Work wheel controller.

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

REFERENCES:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control / J J Craig/ Pearson / 3rd edition.
3. Robotics / Fu K S/ McGraw Hill.
4. Robotic Engineering / Richard D. Klafter, Prentice Hall.
5. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
6. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.
7. Robotics and Control / Mittal R K & Nagrath I J / TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

FINITE ELEMENT AND BOUNDARY ELEMENT METHODS

UNIT - I

Introduction to FEM, basic concepts, application of FEM, general description, One Dimensional problems: Stiffness equations for a axial bar element in local co-ordinates using Potential Energy approach and Virtual energy principle - Stiffness equations for a truss bar element oriented in 2D plane - Finite Element Analysis of Trusses – Plane Truss elements – methods of assembly.

Analysis of Beams: Hermite shape functions – Element stiffness matrix – Load vector – Problems.

UNIT -II

2-D Problems: CST - Stiffness matrix and load vector - Isoparametric element representation – Shape functions – convergence requirements – Problems. Two dimensional four noded isoparametric elements - Numerical integration.

3-D Problems : Stiffness Matrix - Tetrahedron element – Hexahedron Element.

UNIT - III

Scalar Field Problems: 1-D Heat conduction – 1D fin elements – 2D heat conduction - analysis of thin plates – Composite slabs - problems.

Dynamic Analysis: Dynamic equations – Lumped and consistent mass matrices – Eigen Values and Eigen Vectors – mode shapes – modal analysis for bars and beams.

UNIT - IV

Boundary Element Method: Potential Problems: Introduction, boundary Element Approach-Fundamental solution, Another form of boundary integral equation, Volume integral of $?^2\omega$ at source point. Numerical Implementation - Determination of Ci, Final Relation, Consideration of internal heat generation (body force term), Three-dimensional analysis, tackling kernel singularity, Axi-Symmetric kernel, Mixed boundary condition. Analyzing Time Domain (Transient Case) – Three dimensional formulation, Numerical implementation. Illustrative Examples – Temperature distribution in cutting tool, Thermal design of blast furnace bottom, Laser heating and hardening.

UNIT - V

Boundary Element Formulation for Electrostatic Problems: Introduction, Basic Relation- Boundary condition, other relations. Boundary Integral Relation, Fundamental solution, Discretizatin and Matrix Formulation – Determination of term C(p)m. Determination of stresses, Other cases, Illustrative Examples – Loose - fit , loaded pin in hole, Cam- tappet contact problem.

REFERENCE:

1. Finite and Boundary Element Methods in Engineering by O.P.Gupta, Oxford & IBH Publishing Co. Pvt. Ltd.
2. The finite element methods in Engineering – S.S. Rao – Elsevier – 4th edition.
3. Finite Element Methods, Alavala, PHI.
4. Introduction to finite elements in engineering – Tirupathi K. Chandrupatla and Ashok D. Belagundu.
5. Introduction of Finite Element Analysis – S.Md.Jalaludeen – Anuradha publications.
6. An Introduction to Finite Element Methods – J. N. Reddy – Mc Grawhill.
7. The Finite element method in engineering science – O.C. Zienkowitz, Mc Grawhill.
8. Finite Element Methods/ Alavala/TMH.
9. Concepts and applications of finite element analysis – Robert Cook - Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

DESIGN FOR MANUFACTURE AND ASSEMBLY

(Elective - IV)

UNIT I:

Introduction: 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.

UNIT II:

Machining Process: 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: 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.

UNIT III:

Metal Joining: 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 dies forging design - parting lines of dies drop forging die design - general design recommendations. Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing - Keeler Goodman Forming Line Diagram - Component Design for Blanking.

UNIT-IV

Assemble Advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

AUTOMATIC ASSEMBLY TRANSFER SYSTEMS : Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

UNIT-V:

Design Of Manual Assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the 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, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

REFERENCES:

1. Assembly Automation and Product Design/ Geoffrey Boothroyd/ Marcel Dekker Inc., NY, 1992.
2. Engineering Design - Material & Processing Approach/ George E. Deiter/McGraw Hill Intl. 2nd Ed. 2000.
3. Hand Book of Product Design/ Geoffrey Boothroyd/ Marcel and Dekken, N.Y. 1990.
4. Computer Aided Assembly London/ A Delbainbre/.
5. Product Design for Manufacturing and Assembly/ Geoffrey Boothroyd, Peter Dewhurst & Winston Ansthony Knight/CRC Press/2010.
6. Design and Manufacturing / Surender Kumar & Goutham Sutradhar / Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi, 1998.
7. ASM Handbook, Vol.20.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

APPLIED TRIBOLOGY

(Elective - III)

UNIT - I

Historical background - 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.

UNIT - II

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.

UNIT - III

Elastohydrodynamic Lubrication: 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.

UNIT - IV

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

UNIT - V

Laws of friction - 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.

REFERENCES:

1. Introduction to Tribology of Bearings / Majumdar, B.C.
2. Friction. Wear, Lubrication : A Text book in Tribology / Kenneth C Ludema / CRC Press / 1st Edition.
3. Engineering Tribology / John Williams / Cambridge University Press / 2005.
4. Introduction to Tribology / Bharat Bhushan / Wiley / 2nd Edition.
5. Engineering Tribology / Prasanta Sahoo / PHI Learning.
6. Engineering Tribology / Stachowiak & Batchelor / Butterworth – Heinimann / 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

APPLIED RANDOM VIBRATIONS

(Elective - III)

UNIT I

Probability Theory: Random Vibrations - Probability distribution and density functions - Excreted values - Conditional probability - Characteristic and log characteristic functions - Chebycshev inequality - Functions of random variables.

UNIT - II

Random Processes - I: Concept of stationary and ergodicity - Evolutionary nonostationary process - Auto and cross correlation and covariance Functions - Mean square limit, differentiability and inerrability- Spectral decomposition.

UNIT III

Random Processes - II: Power spectral and cross spectral density Factions - Wiener - Khintchine relations - Properties of Gaussian. Poisson and Markov processes –Fokker - Planck Equation - Broad band and narrow band random processes - white noise.

UNIT IV

Random Vibrations - I: Response of linear single and multi - degree of freedom systems to stationary excitation - Response of continuous systems - Normal mode method.

UNIT V

Random Vibrations - II: Level crossing, peak and envelop statistics - First excursion and fatigue.

REFERENCE:

1. Probabilistic Methods in the Theory of Structures/ lishakoff, I./ John Wiley, New York, 1983.
2. An Introduction to Random Vibrations and Spectral Analysis/ Newland, D.E./, Longman Inc./ New York, Second Edition, 1984.
3. Introduction to Random Vibrations/ Nigam, N.C./MIT Press, Cambridge, Massachusettes, 1983
4. Applications of Random Vibrations/ Nigam, N.C. and Narayanan, S./ Narosa Publications, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

PRODUCT DATA MANAGEMENT

(Elective - III)

UNIT I:

Introduction -Need for IPPD – strategic importance of product development – integration of customer, designer, material supplier and process planner, Competitor and costumer – behavior analysis. Understanding customer – promoting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specification.

UNIT II:

Concept Generation and Selection: Task – Structured approaches – Clarification – Search – Externally and internally – explore systematically – reflect on the solutions and process – concept selection – methodology – benefits.

Product Archetecture: Implications – Product change – variety – component standardization – product performance – manufacturability.

UNIT III:

Product Development Management: Establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

Industrial Design: Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – simulating product performance and manufacturing processing electronically – Need for industrial design – impact – design process.

UNIT IV:

Investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design.

UNIT V:

Design For Manufacturing and Product Development: Definition – Estimation of manufacturing cost – reducing the component costs and assembly costs – Minimize system complexity. Prototype basics – Principles of prototyping – planning for prototypes – Economics analysis – Understanding and representing tasks – baseline project planning – accelerating the project execution.

REFERENCES:

1. Product Design and Development / Kari T. Ulrich and Steven D. Eppinger / McGraw Hill International Edns. 1999.
2. Concurrent Engg/integrated Product development / Kemnneth Crow / DRM Associates, 26/3, Via Olivera, Palos Verdes, CA 90274(310)377-569, Workshop Book.
3. Effective Product Design and Development / Stephen Rosenthal / Business One Orwin, Homewood, 1992, ISBN, 1-55623-603-4.
4. Tool Design–Integrated Methods for Successful Product Engineering / Staurt Pugh / Addsion Wesley Publishing, Neyourk, NY, 1991, ISBN 0-202-41369-5.
5. Production and Operations Management/Chase/TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

MATERIALS HANDLING EQUIPMENT DESIGN

(Elective - III)

UNIT- I

Elements of Material Handling System: Importance, Terminology, Objectives and benefits of better Material Handling; Principles and features of Material Handling system; Interrelationships between material handling and plant layout, physical facilities and other organizational functions, classification of Material Handling Equipment.

UNIT- II

Selection of Material Handling Equipments: Factors affecting for selection, Material Handling Equation; Choices of Material Handling Equipment; General analysis Procedures, Basic Analytical techniques; The unit load concept; Selection of suitable types of systems for applications; Activity cost data and economic analysis for design of components of Material Handling System; functions and parameters affecting service; packing and storage of materials.

UNIT- III

Design of Mechanical Handling Equipments: Design of Hoists: Drives for hoisting, components and hoisting mechanisms; rail travelling components and mechanisms; hoisting gear operation during transient motion; selecting the motor rating and determining breaking torque for hoisting mechanisms.

Design of Cranes: Hand propelled and electrically driven E.O.T overheat Traveling cranes; Traveling mechanisms of cantilever and monorail cranes; design Considerations for structures of rotary cranes with fixed radius; fixed post and overhead travelling cranes; Stability rotary and travelling rotary cranes.

UNIT- IV

Design of Load Lifting Attachments: Load chains and types of ropes used in Material Handling System; Forged, Standard and Ramshor Hooks; Crane Grabs and Clamp; Grab Buckets; Electromagnet; Design Consideration for conveyor belts; Application of attachments.

UNIT- V

Study of Systems and Equipments Used for Material Storage: Objectives of storage; Bulk material handling; Gravity flow of solids through slides and chutes; Storage in bins and hoppers; Belt conveyors; Bucket-elevators; Screw conveyors; Vibratory Conveyors; Cabin Conveyors; Mobile racks etc.

REFERENCES:

1. N.Rudenko,' Material Handling Equipments ' Peace Publishers, MOSCOW.
2. James M. Apple,' Material Handling System Desing' John- Willwy and Sons Publication, New York.
3. John R. Immer, ' Mateial Handling ' McGRAWhILL Co. Ltd., New York.
4. Colin Hardi,' Matrial Handling in Machine Shops, Machinery Publication Co. Ltd., Landon.
5. M.P. Nexandrn,' Material Handling Equipment' MIR Publication, MOSCOW.
6. C.R.Cock an Dj. Mason,' Bulk Solid Handling' Leonard Hill Publication Co. Ltd ., U.S.A.
7. Spivakovsy, A.O. and Dyachkov, V.K., 'Conveying Machines' , Volume I and II, MIR publishers, 1985.
8. Kulwiac R.a., ' Material Handling Hand BOOK', 2nd edition, JohnWilly Publication, New York.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

FRACTURE MECHANICS

(Elective - III)

UNIT I:

Introduction to Fracture Mechanics: The Crack Tip Plastic Zone, Methods for Measuring Fracture Toughness.

UNIT II:

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.

UNIT III:

Physical Aspects of Fatigue: 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.

UNIT IV:

Statical Aspects of Fatigue Behaviour: 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.

UNIT V:

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.

REFERENCE:

1. Introduction to Fracture Mechanics/Hellan K/ McGraw Hill.
2. Fracture Vol II/ Liebowitz, H.Editor/ Academic Press.
3. The Practical Use of Fracture Mechanics/ Broek.D, Kluwer/ Academic Publisher.
4. Elementary Engineering Fracture Mechanics / Broek.D, Martinus Nijhoff/Kluwer Academic Publishers/ 4th revised edition.
5. Fatigue of Aircraft Structures/ Barrpos. W., and Ripley, E.L./Pergamon Press, Oxford, 1983.
6. Mechanics of Fracture Vol.1 / Sih, C.G./ Sijthoff and Noordhoff International Publishing Co., Netherlands, 1989.
7. Fundamentals of Fracture Mechanics/Knott , J.F./ Butterworth & Co., (Publishers) Ltd., London. 1983.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

DIGITAL IMAGE PROCESSING AND COMPUTER VISION

(Elective - IV)

UNIT I

Digital Image Fundamentals: Introduction, An image model, sampling & quantization, basic relationships between pixels, image geometry.

Image Transforms: Properties of 2-D Fourier transform FFT algorithm and other separable image transform. Walsh transform, Hadamard, cosine, Haar, Slant transforms, KL transforms and their properties.

UNIT II

Image Enhancement: Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, colour image processing.

UNIT III

Image filtering and restoration - Degradation model, Digitalization of circulant and block circulant matrices, Algebraic approach to restoration. Inverse filtering, least mean squares restoration, constrained least square and interactive restoration, geometric transformations.

UNIT IV

Image Segmentation: detection of discontinuities, edge linking and boundary detection threshold, region oriented segmentation, use of motion in segmentation.

Representation and Description: Various schemes for representation, boundary descriptors, regional descriptor.

UNIT V

Computer Vision: Introduction to machine vision, sensing and digitizing function in machine vision, Image processing & analysis, Training and vision systems, Applications of computer vision.

REFERENCE:

1. Fundamentals of Digital Image Processing/ A.K. Jain/ PHI.
2. Digital Image Processing/ C. Gonzalez & R.E . Woods/ Addison Wesley.
3. Industrial robotics / Mikell P.Groover / McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

ADVANCED MECHANICS OF COMPOSITE MATERIALS

(Elective - IV)

UNIT – I

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

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

UNIT – II

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

UNIT – III

Coordinate Transformation: 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: Elastic constants of lamina, relation ship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

UNIT – IV

Strength of Unidirectional Lamina: 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.

UNIT – V

Analysis of Laminated Composite Plates: Introduction thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

REFERENCES:

1. Mechanics of Composite Materials/ R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.
3. Analysis and performance of fibre Composites/ B. D. Agarwal and L. J. Broutman/ Wiley- Interscience, New York, 1980.
4. Mechanics of Composite Materials/ Second Edition (Mechanical Engineering)/ Autar K. Kaw ,Publisher: CRC.
5. Analysis of Laminated Composite Structures/ L. R. Calcote/ Van Nostrand Rainfold, New York, 1969.
6. Advanced Mechanics of Composite Materials/ Vasiliev &Morozov/Elsevier/Second Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

VEHICLE DYNAMICS

(Elective - IV)

UNIT I:

Introduction: 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.

UNIT II:

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

UNIT III:

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

UNIT IV:

Steering Mechanisms: 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.

UNIT V:

Wheeled Vehicle Handling – 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.

REFERENCE:

1. Vehicle Dynamics: Theory and Application/Reza Jazar/Springer 2008
2. Theory of Ground Vehicles/ J.Y.Wong/ John Wiley.
3. Vehicle stability/ Dean Karnopp/ Dekker Mechanical Engineering
4. Modeling & Simulation of Mechatronics Systems/ Karnoop Margolis, Rosenberg, /Wiley/ 2007.
5. Suspension and Tyres / Giles J.G. Steering/ Illiffe Books Ltd., London.
6. Fundamental of Vehicle Dynamics/ Gillespie/ T.D, SAE USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

ADVANCED TOOL DESIGN

(Elective - IV)

UNIT – I:

Tool Materials:

Prosperities of materials: Tools steels, Cast Iron, Mild or low carbon steels, Non metallic and nonferrous materials, Heat treating.

UNIT – II:

Design Of Cutting Tools:

Single Point cutting tools: Milling cutters, Drills, Selection of carbide steels – Determination of shank size for single point carbide tools, Determining the insert thickness for carbide tools

UNIT – III:

Design of Jigs and Fixtures:

Basic principles of location and clamping: Locating methods and devices, Jigs-Definition Types, General considerations in the design of Drill jigs, Drill bushing, Methods of Construction. Fixtures-Vice fixtures, Milling, Boring Lathe Grinding fixtures.

UNIT – IV:

Design of Sheet Metal Blanking and Piercing Dies:

Fundamentals of Die cutting operation, Power press types, General press information, Materials Handling equipment. Cutting action in Punch and die operations. Die clearance, Types of Die construction. Die design fundamentals-Banking and piercing die construction, pilots, stripper and pressure pads presswork material, Strip layout, Short run tooling for piercing.

UNIT – V:

Design of Sheet Metal Bending, Forming and Drawing Dies:

Bending dies, Drawing dies, Forming dies, Drawing operations, Variables that effect metal flow during drawing. Determination of blank size, Drawing force, Single and double action draw dies.

REFERENCES:

1. Donaldson “Tool Design”/ Tata Mc Graw Hill.
2. Production Technology/HMT/Tata McGraw Hill/
3. Production Technology by R.K. Jain and S.C. Gupta.
4. Mechanical Metallurgy/ George F Dieter/ Tata Mc Graw Hill.
5. Machine Tools/C Elanchezhian & M. Vijayan/Anuradha Publications.
6. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.
7. Hand Book of Metal forming/ Kurt Lange/ Mc Graw-Hill,.1987.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

NANO COMPOSITES DESIGN AND SYNTHESIS

(Elective - IV)

UNIT-I :

Introduction to Nano composites, Composites Material, Mechanical properties of Nano composite material: stress-strain relationship, toughness, strength, plasticity.

UNIT-II:

Ceramic-Metal Nanocomposites, ceramic based nanoporous composite, metal mat nanocomposites, Polymer-based nano composites carbon nanotube based nanocomposites and Natural nano bicomposites, Biomimetic nanocomposites and Biologically inspired nanocomposites; Nano composites for hard coatings; DLC coatings; Thin film nanocomposite ; Modeling of nanocomposites.

UNIT-III:

Synthesis methods for various nanocomposite materials : sputtering, mechanical alloying, sol-gel synthesis, thermal spray synthesis etc.

UNIT-IV:

Nano Indentation, Types of indentation: OLIVER & Pharr, Joslin- Oliver, Vickers indenter process.

UNIT-V:

Processing of polymer Nanocomposites, properties of nanocomposites, Salt infiltrator Powder mixing, Intrusion method, exfoliation & interaction, Gel-casting impregnation techniques: Hot melt impregnation, solution impregnation.

REFERENCE:

1. Nanocomposite Science & Technology/ P.M.Ajayan, I.S.Schadler and P.V.Brun/ Wiley- VCH GmbH Co.
2. Introduction to Nano Technology/ Charles. P.Poole Jr and Frank j.Owens/ Wiley India Pvt Ltd.
3. Nanotechnology, A gentle introduction to the next big idea/Mark Tanter, Daniel Ranner/Pearson education.
4. Encyclopedia of Nanotechnology/ H.S. Nalwa.
5. Encyclopedia of Nano Technology/ M. Balakrishna Rao and K. Krishna Reddy. Vol I/ X Campus books.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. Engg Design

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.