

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR ANANTAPUR-515002 (A.P) INDIA**



**ACADEMIC REGULATIONS COURSE STRUCTURE
AND
DETAILED SYLLABI
OF
MASTER OF TECHNOLOGY
IN
ADVANCED MANUFACTURING SYSTEMS**

**(Regular Two Year P.G. Degree Course (Applicable for
the batches admitted from 2012-13))**



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
Academic Regulations For The Award Of Full Time M.Tech. P.G. Degree
(WITH EFFECT FROM THE ACADEMIC YEAR 2012-13)

The Jawaharlal Nehru Technological University Anantapur shall confer M.Tech. Post Graduate degree to candidates who are admitted to the Master of Technology Programs and fulfill all the requirements for the award of the degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the University for each programme, from time to time.

Admissions shall be made either on the basis of merit rank obtained by the qualified candidates at an Entrance Test conducted by the University or on the basis of GATE / PGECET score, subject to reservations prescribed by the University or Government policies from time to time.

2.0 COURSE WORK:

- 2.1 A Candidate after securing admission must pursue the M.Tech. course of study for Four semesters duration.
- 2.2 Each semester shall be of 20 weeks duration including all examinations.
- 2.3 A candidate admitted to a programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

3.0 ATTENDANCE:

- 3.1 A candidate shall be deemed to have eligibility to write end semester examinations if he has put in atleast 75% of attendance on cumulative basis of all subjects/courses in the semester.
- 3.2 Condonation of shortage of attendance up to 10% i.e., from 65% and above and less than 75% may be given by the college on the recommendation of the Principal.
- 3.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.
- 3.4 If the candidate does not satisfy the attendance requirement he is detained for want of attendance and shall reregister for that semester. He / she shall not be promoted to the next semester.

4.0. 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.

- 4.1 For the theory subjects 60% of the marks will be for the External End Examination. While 40% of the marks will be for Internal Evaluation, based on the better of the marks secured in the two Mid Term-Examinations held, one in the middle of the Semester (I-IV units) and another immediately after the completion of instruction (V-VIII) units with Three questions to be answered out of four in 2hours, evaluated* for 40 marks.

*Note: All the Questions shall be of equal weightage of 10 marks and the marks obtained for 3questions shall be extrapolated to 40 marks, any fraction rounded off to the next higher mark

- 4.2 For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day to day performance.
- 4.3 For Seminar there will be an internal evaluation of 50 marks. A candidate has to secure a minimum of 50% to be declared successful. The assessment will be made by a board consisting of HOD and two internal experts at the end of IV semester instruction.
- 4.4 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 Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 4.5 In case the candidate does not secure the minimum academic requirement in any of the subjects (as specified in 4.4.) he has to reappear for the Semester Examination either supplementary or regular in that subject, or repeat the course when next offered or do any other specified subject as may be required.

5.0 RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL EVALUATION MARKS:

Following are the conditions to avail the benefit of improvement of internal evaluation marks.

- 5.1 The candidate should have completed the course work and obtained examinations results for I & II semesters.
- 5.2 He should have passed all the subjects for which the Internal evaluation marks secured are more than 50%.
- 5.3 Out of the subjects the candidate has failed in the examination due to Internal evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of three Theory subjects for Improvement of Internal evaluation marks.
- 5.4 The candidate has to re-register for the chosen subjects and fulfill the academic requirements.
- 5.5 For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D. in favour of the

Registrar, JNTUA payable at Anantapur along with the requisition through the Principal of the respective college.

- 5.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

6.0 EVALUATION OF PROJECT WORK:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ institute.

- 6.1 Registration of Project work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Sem)
- 6.2 An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor and one internal senior expert shall monitor the progress of the project work.
- 6.3 The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The candidate can submit Project thesis with the approval of I.D.C. after 36 weeks from the date of registration at the earliest and one calendar year from the date of registration for the project work. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.
- 6.4 The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.
- 6.5 A candidate shall be allowed to submit the thesis / dissertation only after passing in all the prescribed subjects (both theory and practical) and then take viva voce examination of the project. The viva-voce examination may be conducted once in two months for all the candidates submitted during that period.
- 6.6 Three copies of the Thesis / Dissertation certified in the prescribed form by the supervisor & HOD shall be presented to the HOD One copy is to be forwarded to the University and one copy to be sent to the examiner.
- 6.7 The college shall submit a panel of three experts for a maximum of 5 students at a time. However, the thesis / dissertation will be adjudicated by one examiner nominated by the University.
- 6.8 If the report of the examiner is favorable viva-voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the thesis / dissertation. The board shall jointly report candidates work as:
- | | | |
|----|------------------|---------|
| 1. | Very Good | Grade A |
| 2. | Good | Grade B |
| 3. | Satisfactory | Grade C |
| 4. | Not satisfactory | Grade D |

If the report of the viva-voce is not satisfactory (Grade D) the candidate will retake the viva-voce examination 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 unless the candidate is permitted to revise and resubmit the thesis.

7.0 AWARD OF DEGREE AND CLASS:

A candidate shall be eligible for the award of respective degree if he satisfies the minimum academic requirements in every subject and secures 'satisfactory' or higher grade report on his thesis/dissertation and viva-voce. Based on overall percentage of marks obtained, the following class is awarded.

First class with Distinction:	70% or more
First class	below 70% but not less than 60%
Second class	below 60% but not less than 50%

8.0 WITH – HOLDING OF RESULTS:

If the candidate has not paid dues to the university or if any case of in-discipline is pending against him, the result of the candidate shall be withheld and he will not be allowed/ promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

9.0 TRANSITORY REGULATIONS:

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course in earlier regulations and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to 4.5 and 2.3 sections. Whereas they continue to be in the academic regulations they were first admitted.

10.0 GENERAL:

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Disciplinary action for Malpractice / improper conduct in examinations is appended.
- iii. There shall be no places transfer within the constituent colleges and affiliated colleges of Jawaharlal Nehru Technological University Anantapur.
- iv. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- v. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- vi. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.

RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate</i>	
1.	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.
(a)	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.	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.

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.	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.
6.	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.

7.	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 impostor is an outsider, he will be handed over to the police and a case is registered against him.
8.	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.

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.	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.
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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**Course Structure and syllabi for
M.Tech- Advanced Manufacturing Systems
Offered by Department of Mechanical Engineering
for affiliated Engineering Colleges 2012-13**

I YEAR I Semester

S. No	Course code	Subject	Theory	Lab.	Credits
1.	12D87101	Automation in Manufacturing	4		4
2.	12D87102	Advanced Manufacturing Processes	4		4
3.	12D87103	Product Design & Development	4		4
4.	12D87104	Advanced Computer Aided Design	4		4
5.	12D87105	FEA in Manufacturing	4		4
6.		Elective-I	4		4
	12D87106a	a. Theory of Metal Cutting & Tool Design			
	12D87106b	b. Advanced Metal forming			
	9D15105	c. Material Technology			
7.	12D87107	Advanced Computer Aided Design & Analysis Lab		3	2
		contact periods/week	24	3	
			Total	27	26

I YEAR II Semester

S. No	Course code	Subject	Theory	Lab.	Credits
1.	12D87201	Total Quality Management	4		4
2.	12D87202	Intelligent Manufacturing Systems	4		4
3.	12D87203	Simulation & Modeling of Manufacturing Systems	4		4
4.	12D87204	Design for Manufacturing and Assembly	4		4
5.	12D87205	Advanced Production & Operation Management	4		4
6.	12D87206a 12D87207 12D87208	Elective-II a. Optimization Techniques and its applications b. Design and manufacturing of MEMS and MICRO systems c. Industrial Robotics	4		4
7.	12D87209	Manufacturing Simulation Lab		3	2
		contact periods/week	24	3	
			Total	27	26

II YEAR (III & IV Semesters)

S. No	Course code	Subject		credits
1	12D87401	Seminar		2
2	12D87402	Project work		16

(12D87101) AUTOMATION IN MANUFACTURING

UNIT-I:

Introduction to Automation: Automation in Production Systems-Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies.

UNIT-II

Manufacturing operations, Production Concepts and Mathematical Models. Costs of Manufacturing Operations, Basic Elements of an Automated Systems, Advanced Automation Functions, Levels of automation.

UNIT-III:

Introduction to Material Handling, Overview of Material Handling Equipment, Considerations in Material Handling System Design, The 10 Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems.

UNIT-IV

Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.

UNIT -V:

Manual Assembly Lines - Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Design for Assembly, Analysis of Single Model Assembly Lines,

UNIT-VI

Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design.

UNIT-VII:

Transfer lines, Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.

UNIT-VIII:

Automated Assembly Systems, Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi- Station Assembly Machines, Single Station Assembly Machines , Partial Automation.

TEXT BOOKS:

1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover, Pearson Education.

REFERENCE BOOKS:

1. CAD CAM : Principles, Practice and Manufacturing Management, Chris Mc Mohan, Jimmie Browne , Pearson edu. (LPE)
2. Automation, Buckinghm W, Haper & Row Publishers, New York, 1961
3. Automation for Productivity, Luke H.D, John Wiley & Sons, New York, 1972.

(12D87102) ADVANCED MANUFACTURING PROCESSES

UNIT - I:

Surface treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT - II:

Non-Traditional Machining: Introduction, need, AJM, Parametric Analysis, Process capabilities, USM –Mechanics of cutting, models, Parametric Analysis, WJM –principle, equipment ,process characteristics , performance, EDM – principles, equipment, generators, analysis of R-C circuits, MRR , Surface finish, WEDM.

UNIT - III:

Laser Beam Machining – Principle of working, equipment, Material removal rate, Process parameters, performance characterization, Applications.
Plasma Arc Machining – Principle of working, equipment, Material removal rate, Process parameters, performance characterization, Applications.

UNIT-IV

Electron Beam Machining - Principle of working, equipment, Material removal rate, Process parameters, performance characterization, Applications.
Electro Chemical Machining – Principle of working, equipment, Material removal rate, Process parameters, performance characterization, Applications.

UNIT - V:

Processing of Ceramics : Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying , sintering, Hot compaction, Area of application , finishing of ceramics.

UNIT-VI

Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT - VII:

Fabrication of Microelectronic devices: Crystal growth and wafer preparation, Film

Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics.

UNIT-VIII

E-Manufacturing, nanotechnology, and micromachining, High speed Machining

TEXT BOOKS:

1. Manufacturing Engineering and Technology, Kalpakijian, Adisson Wesley, 1995.
2. Process and Materials of Manufacturing, R. A. Lindburg, 4th edition, PHI 1990.
3. Foundation of MEMS, Chang Liu, Pearson, 2012.
4. Advanced Machining Processes, V.K.Jain, Allied Publications.
5. Introduction to Manufacturing Processes, John A Schey, Mc Graw Hill.

(12D87103) PRODUCT DESIGN AND DEVELOPMENT

UNIT- I:

Introduction: Need for IPPD – strategic importance of product development – integration of customer, designer, material supplier and process planner, Competitor and customer – 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 concept selection: Activity of concept generation – Structured approaches – Five step Method: clarify – Search-Externally and internally – explore systematically – reflect on the solutions and processes – **Concept selection** – Integral part of PDD process-methodology – benefits.

UNIT III:

Product architecture: Implications – Product change – variety – component standardization – product performance – manufacturability

UNIT-IV

Industrial design: Assessing the need for industrial design, impact – design process

Integrate design process – assessing the quality of industrial design.

ROBUST DESIGN-introduction, various steps in robust design.

UNIT V:

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 –VI:

Design for manufacturing: Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs –cost of supporting production. Minimizing System complexity.

UNIT-VII

Prototyping: Prototype basics – Principles of prototyping – planning for prototypes – Economic analysis.

Understanding and representing tasks – baseline project planning – accelerating the project execution.

UNIT-VIII

Competitive Aspects of Product Design, Product Quality, Reliability , Concurrent engineering aspects, Substitution of materials , SQC and SPC

TEXT BOOKS:

1. Product Design and Development , Kari T. Ulrich and Steven D. Eppinger ,McGraw Hill International Edns. 1999.
2. Effective Product Design and Development , Stephen Rosenthal , Business One Orwin, Homewood, 1992, ISBN, 1-55623-603-4.

REFERENCE BOOKS:

1. Concurrent Engg, integrated Product development , Kemneth Crow , DRM Associates,26/3, Via Olivera, Palos Verdes, CA 90274(310)377-569, Workshop Book
2. Tool Design – Integrated Methodds for Successful Product Engineering , Staurt Pugh , Addison Wesley Publishing, Neyourk, NY, 1991, ISBN 0-202-41639-5.

(12D87104) ADVANCED COMPUTER AIDED DESIGN

UNIT – I:

Typical Product Cycle, Implementation of CAD process, Application of CAD and their advantages, Requirements of geometric modeling, Geometric construction methods, Modeling features: Drafting features, modeling features, editing features, annotations, dimensioning, tolerance and hatching features, display control features, analysis and optimization features, programming features, plotting features.

UNIT – II:

Modeling Tools: Coordinate system, limits, grid, snap, line type and line weight, basic geometric commands, layers, display control commands, editing commands.

Feature based Modeling: Introduction, Feature Entities, Parametric, Feature Manipulations.

UNIT-III

Geometric Modeling: Types of curves and curve manipulations, Types of surfaces and surface manipulations, Solid modeling: Geometry and Topology, Boundary representation (B-rep), Constructive Solid Geometry (CSG) – Euler – Poincare formula - examples, Sweeping, Solid manipulations.

UNIT - IV:

Transformations: 2D and 3D Transformations.

Product data Exchange: Evaluation of data – exchange format, IGES data representations and structure, STEP Architecture.

UNIT – V:

Geometric tolerancing: Datums, types of tolerances, tolerance modeling and representation, tolerance analysis: worst-case arithmetic method, worst-case statistical method, Monte Carlo simulation method.

UNIT-VI

Mass Property Calculations: Mass, centroid, Moment of inertia, second moments and product of inertia, property mapping.

Collaborative Design: Traditional design, Collaborative Design, Principles and Approaches.

UNIT – VII:

Assembly Modeling: Introduction, Assembly Modeling, Assembly Tree, Assembly Planning, Mating Conditions, Bottom – Up and Top – Down Assembly Approaches with examples

UNIT-VIII

Visualization: Introduction, Model clean up, Hidden-Line Removal, Hidden Surface Removal, Hidden Solid Removal, Shading, Colors.

Computer Animation: Introduction, Animation Types, Key Frame Technique

TEXT BOOK:

1. Mastering CAD/CAM, Ibrahim Zeid, TMH, New Delhi
2. CAD/CAM Concepts and Applications, Alavala, PHI, New Delhi

REFERENCES:

1. CAD/CAM, PN Rao, PHI
2. Computer Graphics, Alavala, PHI, New Delhi
3. Computer integrated Manufacturing, Harrington, Huntington, New York.
4. Computer integrated design and Manufacturing, Bedworth D.D, McGraw Hill, New York.
5. Computer Graphics and Animation, M.C.Trivedi, JAICO
6. Computer aided Design in Manufacturing, Valliere, Prentice Hall, New Jersey.

(12D87105) FEA IN MANUFACTURING

UNIT - I:

Introduction to FEM: basic concepts, application of FEM, general description, advantages of FEM, comparison of FEM with other methods : finite difference method, variational method, Galerkin Method, basic element shapes, interpolation function. Virtual energy principle, treatment of boundary conditions, solution of system of equations, basic equations of elasticity, strain displacement relations.

UNIT - II:

1-D structural problems : axial bar element – stiffness matrix, load vector, temperature effects, quadratic shape function, analysis of trusses – plane truss and space truss elements.

UNIT-III

Analysis of beams and frames – Hermite shape functions, stiffness matrix, load vector problems, analysis.

UNIT - IV:

2-D problems – CST, force terms, stiffness matrix and load vector, boundary conditions, Iso-parametric element, Quadric element, shape functions, Numerical Integration, 3-D problems – Tetrahedron element, Jacobian matrix, stiffness matrix.

UNIT - V :

Axis Symmetric formulations, Finite Element Modeling- Triangular element, Problem modeling and Boundary conditions

UNIT - VI :

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

UNIT-VII

Applications of FEM in Analysis of Manufacturing process: Applications of FEM in various metal forming process- Extrusion , deep drawing , closed die forming etc. Metal mechanics- Eulers and Lagrange approach. Applications of FEM in solidification of castings- Applications of FEM in welding

UNIT-VIII

Computer Implementations : Pre-processing, mesh generation, elements connecting, boundary conditions, input of material and process characteristics – solution and post processing- overview and application packages.

TEXT BOOKS :

1. Finite Element Methods, Alavala, PHI
2. Introduction to finite elements in engineering, Tirupathi K. Chandrupatla and Ashok D. Belagundu.

REFERENCE BOOKS :

1. An Introduction to Finite Element Methods, S.S. Rao, Pergamon, New York.
2. The Finite element method in Engineering Science, O.C. Aienkowitz, Mc. Graw Hill.
3. Concepts and applications of finite element analysis, Robert Cook.
4. Finite Element Methods in Engineering analysis, K.J. Bathe.
5. Metal forming and the finite elements methods- Kobayashi.S, Soo-ik-oh and Altam.T- Oxford university press, 1989

(12D87106a) THEORY OF METAL CUTTING AND TOOL DESIGN
(Elective-I)

UNIT -I:

Mechanics of Metal Cutting: Geometry of Metal Cutting Process, Chip formation, Chip Thickness ratio, radius of chip curvature, cutting speed, feed and depth of cut - Types of Chips, Chip breakers.

Orthogonal and Oblique cutting processes-definition, Forces and energy calculations (Merchant's Analysis).- Power consumed – MRR – Effect of Cutting variables on Forces, Force measurement using Dynamometers.

UNIT -II:

Single Point Cutting Tool: Various systems of specifications, single point cutting tool geometry and their inter-relation. Theories of formation of built-up edge and their effect, design of single point contact tools throwaway inserts.

UNIT -III:

Multipoint Cutting Tools: Drill geometry, design of drills, Rake and Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speed and feed – machining time – design - from cutters.

UNIT-IV

Grinding: Specifications of grinding of grinding wheel, mechanics of grinding, Effect of Grinding conditions on wheel wear and grinding ratio. Depth of cut, speed, machining time, temperature, power.

UNIT -V:

Tool Life and Tool Wear: Theories of tool wear-adhesion, abrasive and diffusion wear mechanisms, forms of wear, Tool life criteria and machinability index.

Types of sliding contact, real area of contact, laws of friction and nature of frictional force in metal cutting. Effect of Tool angle, Economics, cost analysis, mean co-efficient of friction.

UNIT-VI

Cutting Temperature: Sources of heat in metal cutting, influence of metal conditions. Temperature distribution, zones, experimental techniques, analytical approach. Use of tool-work thermocouple for determination of temperature. Temperature distribution in Metal Cutting.

UNIT -VII:

Tool Design: Determination of shank size for single point carbide tools, Determining the insert thickness for carbide tools.

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

UNIT-VIII

Cutting tool Materials and Cutting fluids : Carbon and Medium alloy steels, High Speed steels, Cast-Cobalt alloys, Carbides, Coated tools, Alumina based ceramics, Carbon boron Nitride, SNB Ceramics, Whisker-Reinforced tool materials, tool reconditioning, Types of cutting fluids , Classification and selection of cutting fluids.

TEXT BOOKS:

1. Metal Cutting Principles , M C Shaw , Oxford and IBH Publications, New Delhi,1969
2. Fundamentals of Machining , Boothryd , Edward Arnold publishers Ltd. 1975

REFERENCE BOOKS:

1. Fundamentals of Metal cutting and Machine tools , B.L.Juneja, G. S. Sekhom and Nitin Seth , New Age International publishers
2. Tool Engineering, G.R.Nagpal, Khanna Publishers

(12D87106b) ADVANCED METAL FORMING
(Elective-I)**UNIT - I:**

Fundamentals of Metal Forming: Classification of forming processes, mechanisms of metal forming: slab method, Upper and lower bound analysis, Deformation energy method and finite element method temperature of metal working, hot working, cold working, friction and lubricants.

UNIT - II:

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, Problems.

UNIT - III:

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. problems on flow stress, true strain and forging load.

UNIT - IV

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:

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

UNIT - VI

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

UNIT - VII:

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

UNIT - VII

Advanced Metal forming processes: HERF, Electromagnetic forming, residual stresses, in-process heat treatment and computer applications in metal forming. problems on Blanking force, Blank diagram in Cup Diagram, Maximum considering shear.

Text Books:

1. Mechanical Metallurgy , G.E. Dieter , Tata McGraw Hill, 1998. III Edition
2. Principles of Metal Working , Sunder Kumar

References:

1. Principles of Metal Working processes , G.W. Rowe
2. ASM Metal Forming Hand book.

AMTUA

(9D15105) MATERIAL TECHNOLOGY
(Elective-I)

UNIT – I:

Elasticity in metals and polymers, mechanism of plastic deformation, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening

UNIT-II

Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity, deformation of non crystalline material.

UNIT – III:

Griffith's Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller Parameter, Deformation and Fracture mechanism maps.

UNIT – IV:

Fatigue, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis.

UNIT – V:

Selection for Surface durability, Corrosion and Wear resistance, Relationship between Materials Selection and Processing, Case studies in Materials Selection with relevance to Aero, Auto, Marine, Machinery and Nuclear Applications.

Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep

UNIT – VI:

Modern Metallic Materials: Dual Phase Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Intermetallics, Ni and Ti Aluminides

UNIT-VII

Smart Materials, Shape Memory alloys, Metallic Glass, Quasi Crystal and Nano Crystalline Materials. Metal-Matrix composites

UNIT-VIII

Nonmetallic Materials: Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, Structure, Properties and Applications of engineering Polymers

TEXT BOOKS:

1. Mechanical Behaviour of Materials, Thomas H. Courtney, 2nd Edition, McGraw Hill,2000.
2. Mechanical Metallurgy, George E. Dieter, McGraw Hill,1998.

REFERENCE BOOK:

1. Selection and use of Engineering Materials,Charles J.A, Butterworth Heiremann.

AMTUA

**(12D87107) ADVANCED COMPUTER AIDED DESIGN AND ANALYSIS
LABORATORY**

Note : Conduct at least any Ten exercises from the list given below :

1. Two- dimensional drawing using CAD software.
2. Three-dimensional drawing using CAD software.
3. Various Dimensioning and tolerance techniques on typical products using CAD software.
4. Assembly and animation of simple assemblies like screw jack, bolt-nut mechanism, etc.
5. Truss analysis using FEA software.
6. Beam analysis using FEA software.
7. Frame analysis using FEA software.
8. Buckling analysis of columns using FEA software.
9. Harmonic analysis using FEA software.
10. Fracture analysis using FEA software.
11. Analysis of laminated composites using FEA software.
12. Couple-field analysis using FEA software.
13. Modal Analysis
14. Transient dynamic analysis.
15. Spectrum analysis

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87201) TOTAL QUALITY MANAGEMENT

Unit I:

Introduction: The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems. Management of Process Quality, Definition of quality

Unit II :

Quality Control: a brief history, Product Inspection vs Process Control, Statistical Quality Control , Control Charts and Acceptance Sampling.

Unit III :

Customer Focus and Satisfaction : Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction , role of Marketing and Sales , Buyer – Supplier relationships.

Unit IV :

Bench Marketing : Evolution of Bench Marketing ; meaning of Bench Marketing , benefits of bench marketing, the bench marketing process , pitfalls' of bench marketing.

Unit V :

Organizing for TQM : The systems approach , Organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles, Productivity

Unit VI :

Quality and Reengineering : The leverage of Productivity and Quality , Management systems Vs. Technology , Measuring Productivity , Improving Productivity Re-engineering.

Unit VII:

The cost of Quality : Definition of the Cost of Quality , Quality Costs , Measuring Quality Costs, use of Quality Cost Information , Accounting Systems and Quality Management.

Unit VIII:

ISO9000 : Universal Standards of Quality : ISO around the world , The ISO9000 ANSI/ASQCQ-90, series standards / benefits ISO 9000 Certification , the third party

audit, Documentation ISO 9000 and services , the cost of Certification implementing the system.

References :

1. Total Quality Management, ,Joel E.Ross
2. Beyond TQM ,Robert LJ Flood
3. Statistical Quality Control, E.L.Grant
4. Total Quality Management, Bestfield

AMTUA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87202) INTELLIGENT MANUFACTURING SYSTEMS

UNIT - I:

Computer Integrated Manufacturing Systems – Structure and functional areas of CIM system - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM.

UNIT-II

Manufacturing Communication Systems – MAP/TOP, OSI Model, Data Redundancy, Top-down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing – System Components, System Architecture and Data Flow, System Operation.

UNIT - III:

Components of Knowledge Based Systems – Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Inference Engine, Knowledge Acquisition.

UNIT - IV:

Machine Learning – Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing

UNIT - V:

Automated Process Planning – Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning

UNIT-VI

Knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design, Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KBSES.

UNIT - VII:

Group Technology: Models and Algorithms – Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation – Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method.

UNIT-VIII

Knowledge Based Group Technology - Group Technology in Automated Manufacturing System, Structure of Knowledge based system for group technology (KBSGT) – Data Base, Knowledge Base, Clustering Algorithm.

TEXT BOOKS:

1. Intelligent Manufacturing Systems, Andre Kusaic.
2. Artificial Neural Networks, Yagna Narayana
3. Automation, Production Systems and CIM, Groover M.P.
4. Neural Networks, Wassarman.

AMTUA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87203) SIMULATION AND MODELLING OF MANUFACTURING SYSTEMS

UNIT - I:

System – ways to analyze the system – Model - types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages and Disadvantages.

UNIT-II

Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypothesis- steps – types 1 & 2 errors – Framing – Strang law of large numbers.

UNIT - III:

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model.

UNIT-IV

Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.

UNIT - V:

Generation of random variants – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – Weibull – normal Bernoullie – Binomial – uniform – Poisson.

UNIT-VI

Simulation languages – comparison of simulation languages with general purpose languages – Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages. QUEST, WITNESS, PROMODEL and AUTOMOD

UNIT - VII :

Output data analysis – Types of Simulation with respect to output data analysis – warm up period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons

UNIT – VIII :

Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

TEXT BOOKS:

1. Simulation Modelling and Analysis, Law, A.M.& Kelton , McGraw Hill, 2nd Edition, New York, 1991.
2. Discrete Event System Simulation, Banks J. & Carson J.S., PH , Englewood Cliffs, NJ, 1984.
3. Simulation of Manufacturing Systems, Carrie A. , Wiley, NY, 1990.
4. A Course in Simulation, Ross, S.M., McMillan, NY, 1990.
5. Simulation Modelling and SIMNET , Taha H.A. , PH, Englewood Cliffs, NJ, 1987
6. Performance modeling and analysis of manufacturing systems, Viswanat Narahari, PHI

MANUVA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87204) DESIGN FOR MANUFACTURE AND ASSEMBLY

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

UNIT-III

METAL CASTING: Appraisal of various casting processes, Selection of casting process, Factors affecting casting design. General design considerations for casting – Use of Solidification Simulation in casting design – Product design rules for sand casting.

UNIT IV

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.

UNIT-V

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

UNIT VI:

EXTRUSION, SHEET METAL WORK: Design guidelines for Extruded sections - Keeler Goodman Forming Limit Diagram – Component Design for Blanking.

UNIT-VII

PLASTICS: Viscoelastic and Creep behavior in plastics – Design guidelines for Plastic components – Design considerations for Injection Moulding.

UNIT VIII:

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

TEXT BOOKS:

1. Engineering design-Material and Processing Approach, George E. Deiter, Mc. Graw Hill Intl. 2nd Ed.2000.
2. Product design for Manufacture and Assembly, Geoffrey Boothroyd, Marcel Dekker Inc. NY, 1994.

REFERENCE BOOKS:

1. Product design and Manufacturing , A.K Chitale and R.C Gupta , Prentice, Hall of India, New Delhi, 2003.
2. Design and Manufacturing , Surender Kumar & Goutham Sutradhar , Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi, 1998.
3. Hand Book of Product Design, Geoffrey Boothroyd Marcel Dekken Inc. NY, 1990.
4. Product Design, Kevin Otto and Kristin Wood, Pearson Education

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87205) ADVANCED PRODUCTION AND OPERATIONS MANAGEMENT

UNIT- I

Overview of Production and Operations Management (POM): Introduction-Definition-Importance- Historical Development of POM-POM scenario today

Product Development: Role of product development- Product development process-Tools for efficient product development(brief treatment)

UNIT- II

Process Design and Value Analysis

Determination of process characteristics- Types of processes and operations systems- Continuous –Intermittent-Technology issues in process design- Flexible Manufacturing Systems- Automated Material Handling Systems

Value Analysis: Definition- Objectives; Types of Values-Phases- Tools; FAST diagram-Steps-Advantages-Matrix method-Steps.

UNIT -III

Plant Location and Plant layout: Factors affecting locations, decisions-Location planning methods-Location factor rating -Centre of Gravity method-Load distance method. Plant layout-Definition-Objectives-Types of layouts-Design of product layout-Line balance-Terminology-RPW method.

UNIT- IV

Aggregate Planning: Definition- Objectives-Basic strategies for aggregate production planning-Aggregate production planning method-Transportation model- Master Production Scheduling-MRP-I & MRP-II Systems.

Material Requirement Planning: Terminology-Logic-Lot sizing methods-Advantages and Limitations , MRP for multilevel multi product environments.

UNIT - V

Work Study : Work study: method study –definition-objectives-steps-Charts used- Work measurement-Time study- Definition-steps- Determination of standard time- Performance rating-Allowances. Work sampling- steps- comparison with time study.

UNIT -VI

Quality Management: Economics of quality assurance-Control charts for variables and for attributes –Acceptance sampling plans-Total Quality Management-ISO 9000 series standards-Six sigma

UNIT - VII

Scheduling: Need-basis for scheduling- Scheduling rules- Flow shop and Job shop scheduling. Line of Balance and dispatching rules in scheduling.

UNIT -VIII

Project management: PERT- Critical path determination- Probability of completing project in a given time- CPM- Types of floats- Critical path determination- Crashing of simple networks- Optimum project schedule.

TEXT BOOKS:

1. Operations Management for Competitive Advantages- Chase Aquinano - TMH, 2009
2. Operations Management: Theory and Practice: B.Mahadevan Pearson.
3. Industrial Engineering and Mangement: Dr.Ravi Shankar- Galgotia.

REFERENCES:

1. Modern Production and Operations Managemet: Buffa, Wiley
2. Theory and Problems in Production and Operations Managemet:SN Chary TMH.
3. Operations Management 8e Process and Value Chains: Lee Krajewski et. all Pearson
4. Operations Management, Amol Gore, Roberto Pawzzolo, Lengage,2012

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87206) OPTIMIZATION TECHNIQUES AND ITS APPLICATIONS
(ELECTIVE II)

UNIT- I:

Introduction: Engineering Applications of optimization- statement of an optimization problem – Classification of optimization problems.

UNIT-II

Single Variable Non-Linear Unconstrained Optimization: One dimensional Optimization methods:- Uni-modal function, elimination methods, Fibonacci method, golden section method, interpolation methods – quadratic and cubic interpolation methods.

UNIT- III:

Multi variable non-linear unconstrained optimization: Direct search method – Univariate 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- IV:

Linear Programming – Graphical method-Simplex method- Dual simplex method-Revised simplex method- Parametric linear programming- Goal Programming
Simulation- types of simulations- Applications of simulations to inventory, queuing and thermal systems.

UNIT- V:

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

UNIT-VI

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

UNIT- VII:

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

UNIT- VIII

Non Traditional Optimization Algorithms: Genetics Algorithm-Working Principles, Similarities and Differences between Genetic Algorithm and Traditional Methods. Simulated Annealing- Working Principle-Simple Problems. Application in production problems.

TEXT BOOKS:

1. Optimization theory and Applications, S.S.Rao, New Age International.
2. Optimization for Engineering Design, Kalyanmoy Deb, PHI

REFERENCE BOOKS:

1. Operations Research, S.D.Sharma,
2. Operation Research, H.A.Taha ,TMH
3. Optimization in operations research, R.L.Rardin
4. Optimization Techniques, Belagundu & Chandraputla, Pearson Asia.
5. Optimization Techniques theory and practice, M.C.Joshi, K.M.Moudgalya, Narosa Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87207) DESIGN AND MANUFACTURING OF MEMS AND MICRO SYSTEMS
(Elective-II)

UNIT - I:

Overview and working principles of MEMS and Microsystems: MEMS and Microsystems, Evolution of Micro fabrication, Microsystems and Microelectronics, Microsystems and miniaturization, Applications of MEMs in Industries, Micro sensors, Micro actuation, MEMS with Micro actuators Micro accelerometers, Micro fluidics

UNIT - II:

Engineering Science for Microsystems Design and Fabrication: Atomic structure of Matter, Ions and Ionization, Molecular Theory of Matter and Intermolecular Forces, Doping of Semiconductors, The Diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics.

UNIT - III:

Engineering Mechanics for Microsystems Design: Static Bending of Thin plates, Mechanical Vibration, Thermo mechanics , Fracture Mechanics, Thin- Film Mechanics, Overview of Finite Element Stress Analysis

UNIT - IV:

Thermo Fluid Engineering and Microsystems Design: Overview of Basics of Fluid Mechanics in Macro and Mesoscales, Basic equations in Continuum Fluid Dynamics, Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Micro conduits, Fluid flow in Sub micrometer and Nano scale,

UNIT V

Overview of Heat conduction in Solids, Heat Conduction in Multilayered Thin films and in solids in sub micrometer scale, Design Considerations, Process Design

UNIT VI

Mechanical Design, Mechanical design using FEM, Design of a Silicon Die for a Micro pressure sensor.

UNIT VII & VIII

Materials for MEMS and Microsystems and their fabrication: Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon compounds, Silicon Piezo resistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers,

Photolithography, Ion implantation, Diffusion and oxidation, Chemical and Physical vapor deposition, etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process.

TEXT BOOK:

1. MEMS and Microsystems. Design and Manufacturing, Tia-Ran Hsu, TMH 2002
2. Foundation of MEMS, Chang Liu, Pearson, 2012

REFERENCES:

1. An Introduction to Microelectromechanical Systems Engineering. Maluf, M., Artech House, Boston 2000
2. "Micro robots and Micromechnaical Systems", Trimmer , W.S.N., Sensors & Actuators, Vol 19, 1989
3. Applied Partial Differential Equations, Trim., D.W., PWS-Kent Publishing, Boston, 1990

AMU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

Th	C
4	4

(12D87208) INDUSTRIAL ROBOTICS
(Elective-II)

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.

UNIT-II

CONTROL SYSTEM AND COMPONENTS: basic concept and modals controllers control system analysis, robot actuators and feedback components (sensors): Internal and External Sensors, Positions sensors, velocity sensors - Desirable features, tactile, proximity and range sensors, uses sensors in robotics , Power Transmission Systems.

UNIT - III:

MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation Homogeneous transformation, D-H Notation, D-H Transformation Matrix, Forward and Inverse transformations, problems on planar and spatial manipulators,

UNIT-IV

Differential Kinematics, Jacobian Formulation, problems, manipulator path control: Slew, Joint Interpolated and Straight line motions, trajectory planning: Joint space scheme, Cartesian space scheme, Cubic Polynomial fit without and with via point, blending.

UNIT - V:

ROBOT DYNAMICS: Lagrange – Euler and Newton Euler formulations, problems on two link planar manipulators, configuration of robot controller.

UNIT-VI

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

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 - VII:

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

ROBOT LANGUAGES: Textual robot languages, Generation, Robot language structures, Elements and functions.

UNIT - VIII:

ROBOT CELL DESIGN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work cell design, Work cell control, Inter locks, Error detection, Work cell controller.

ROBOT APPLICATIONS: Material transfer, Machine loading/unloading. Processing operations, Assembly and Inspection, Future Applications.

TEXT BOOKS:

1. Introduction to Robotics Mechanics and Control, John J.Craig, Pearson
2. Industrial robotics , Mikell P.Groover , McGraw Hill.
3. Modelling and Control of Robot Manipulators, L.Sciavicco & B.Siciliano, Springer

REFERENCE BOOKS:

1. Robotics , K.S.Fu , McGraw Hill.
2. Robot Analysis, Lung Wen Tsai, John Wiley & Sons
3. Robotics and control ,RK Mittal & IJ Nagrath, Tata McGrawHill
4. Fundamentals of Robotics,Robert J.schilling,PHI
5. Robotics ,Saha, TMG
6. Robotic Engineering, Richard D.Klafter, Thomas A.Chmielewski, PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M. Tech. II SEM (AMS)

L	C
3	2

(12D87209) MANUFACTURING SIMULATION LAB

1. Study of elements , entities , activities and basic models of a simulation package modeling and simulation
2. Throughput analysis of a individual production facility using simulation.
3. Modeling of a typical manufacturing facility and study its performances.
4. Breakdown analysis of a production facility with one machine
5. Breakdown analysis of a production system having multiple machines
6. Modeling and Simulation of layouts
7. Study of transport system in a shop floor
8. Buffer size design
9. Identification of bottleneck machine on a given shop floor
10. Study of conjunction, collision and dead locks through simulation

Lab Facilities

Adequate number of Computer Systems in Networked Environment

- Packages :
1. QUEST
 2. PROMODEL
 3. FLEXXSIM
 4. AUTOMOD
 5. WITNESS