

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**MECHANICAL ENGINEERING**

*For*

**B.TECH FOUR YEAR DEGREE COURSE**  
*(Applicable for the batches admitted from 2002-2003)*



**JAWAHARLAL NEHRU  
TECHNOLOGICAL UNIVERSITY**  
KUKATPALLY, HYDERABAD - 500 072.



# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

## **B. Tech. (Regular) Four Year Degree Course (Revised) Academic Regulations**

(Effective for the students studying I year from the Academic Year  
2002-2003 and onwards)

### **1. Award of B.Tech. Degree:**

A student will be declared eligible for the award of the B. Tech. Degree if he fulfills the following academic regulations:

- i. He has pursued a course of study for not less than four academic years and not more than eight academic years.
- ii. He has registered for and studied all the subjects for a total of 212 credits and secured all the 212 credits.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in the course and their seat shall stand cancelled.

### **3. Courses of study:**

The following courses of study are offered at present for specialization for the B. Tech. Degree:

1. Aeronautical Engineering
2. Bio-Medical Engineering
3. Bio-Technology
4. Chemical Engineering
5. Civil Engineering
6. Computer Science and Engineering
7. Computer Science and Systems Engineering

8. Electrical and Electronics Engineering
9. Electronics and Communication Engineering
10. Electronics and Computer Engineering
11. Electronics and Control Engineering
12. Electronics and Instrumentation Engineering
13. Electronics and Telematics Engineering
14. Information Technology
15. Instrumentation and Control Engineering
16. Mechanical (Mechatronics) Engineering
17. Mechanical (Production) Engineering
18. Mechanical Engineering
19. Metallurgical Engineering
20. Metallurgy and Material Technology

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

**4. Credits:**

	Semester Pattern		Yearly Pattern	
	Periods / Week	Credits	Periods/Week	Credits
Theory	04	04	03	06
Practicals	03	02	03	04
Practicals	06	04	06	08
Project	08	08	—	—

**5. Distribution and Weightage of Marks:**

- i. The performance of a student in each semester / I year shall be evaluated subject-wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, project shall be evaluated for 200 marks.
- ii. For theory subjects the distribution shall be 20 marks for Internal Evaluation and 80 marks for the End-Examination.

- iii. For theory subjects, there shall be 5 objective type tests for a duration of 20 minutes each during the semester. Each test shall contain 20 objective type questions for 20 marks. The best 4 tests will be considered for awarding 20 sessional marks. For the I year class which shall be on yearly basis, there shall be 6 tests of the same duration and weightage as mentioned above. However, the performance in the best 4 tests will be considered for awarding 20 sessional marks.
- iv. For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 End Examination marks. Of the 25 marks for internal, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned and another member of the staff of the same institution.
- v. For the subject having design and / or drawing, and estimation, the distribution shall be 20 marks for internal evaluation (10 marks for day-to-day work and 10 marks for internal tests). There shall be two internal tests in a Semester and the better of the two will be taken into consideration. However in the I year class, there shall be three tests and the best two will be taken into consideration for a maximum of 20 marks. The End Examination shall be for a total of 80 marks.
- vi. The Engineering Drawing Practice Course wherever offered is to be treated as a practical course. Evaluation method adopted for practicals shall be followed here also.
- vii. Out of a total of 200 marks for the project work, 40 marks shall be for Internal Evaluation and 160 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by a board of examiners consisting of Guide, Head of the Department and an external examiner. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

- viii. Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever felt desirable. The uniform distribution of awarding of Sessional marks and Laboratory marks will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they visit the College.

#### 6. Attendance:

- i. A student has to put in a minimum of 75% of attendance in aggregate of all the subjects for acquiring credits in the I year and / or each semester thereafter.
- ii. *Shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each Semester or I year to be condoned by the Vice-Chancellor on the recommendations of the Sub-Committee of the Academic Senate on valid and genuine grounds.*
- iii. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year.
- iv. Shortage of Attendance below 65% in aggregate shall in no case be condoned.
- v. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled. They may seek re-admission for that semester / I year when offered next.
- vi. Condonation of shortage of attendance as stipulated in 6 (ii) above shall be granted on genuine and valid grounds with supporting evidence.
- vii. A stipulated fee shall be payable towards condonation of shortage of attendance.

#### 7. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 6.

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
- ii. A student shall successfully complete all the I year subjects from 3 regular consecutive examinations and 3 supplementary consecutive examinations of I year from the date of admission. If he has failed to do so he shall forfeit the seat in course and his seat shall stand cancelled.
- iii. *A student shall be promoted from II to III year only if he fulfils the academic requirement of 56 credits from one regular and one supplementary examinations of I year, and one regular and one supplementary examinations of II year I semester, and one regular examination of II year II semester irrespective of whether the candidate takes the examination or not.*
- iv. *A student shall be promoted from third year to fourth year only if he passes all the subjects of I year and fulfils the academic requirements of total 100 credits (including 56 credits of I year) from the examinations,*
  - a. *Two regular and two supplementary examinations of I year.*
  - b. *Two regular and two supplementary examinations of II year I semester.*
  - c. *Two regular and one supplementary examinations of II year II semester.*
  - d. *One regular and one supplementary examinations of III year I semester.*
  - e. *One regular III year II semester examination.*
- v. A student shall earn all the 212 credits offered as indicated in the course structure.
- vi. Students who fail to earn all the 212 credits offered as indicated

in the course structure within eight academic years from the year of their admission shall forfeit their seat in the course and their seat shall stand cancelled.

**8. Withholding of Results:**

The result of a student shall be withheld if:

- i. He has not cleared any dues to the Institution / Hostel;
- ii. A case of disciplinary action against him is pending disposal;

**9. Course pattern:**

- i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.
- ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the supplementary examination.

**10. Award of Class :**

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

First Class with Distinction	70% and above	From the aggregate marks secured for 212 Credits.
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 marks memorandum)

**11. Minimum Instruction Days :**

The minimum instruction for each semester / I year shall be 90/180 working days excluding examination days.

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

- 13. There shall be no place transfer within the Constituent Colleges of Jawaharlal Nehru Technological University for B.Tech. Regular / FDH / CCC and P. G. Programmes.

**General:**

- 14. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- 15. The academic regulation should be read as a whole for the purpose of any interpretation.
- 16. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 17. 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.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

**Academic Regulations for B. Tech. (Lateral Entry Scheme)**

(Effective for the students getting admitted into II year from the Academic Year 2003-2004 and onwards)

1. The Students have to acquire 156 credits from II to IV year of B.Tech. Programme (Regular) for the award of the degree.
2. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
3. The same attendance regulations are to be adopted as that of B. Tech. (Regular).
4. Promotion Rule:

*A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 44 credits from the examinations.*

- a. *Two regular and two supplementary examinations of II year I semester.*
- b. *Two regular and one supplementary examinations of II year II semester.*
- c. *One regular and one supplementary examinations of III year I semester.*
- d. *One regular III year II semester examination.*

5. Award of Class :

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

First Class with Distinction	70% and above	From the aggregate marks secured for 156 Credits. (i.e. II year to IV year)
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 marks memorandum)

6. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (LES)

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY:  
HYDERABAD (A.P.)**

I Year B.Tech.

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

**NOTATION:** ME= Mechanical Engineering  
MP= Mechanical Engineering (Production)  
MC= Mechanical Engineering (Mechatronics)  
[Common for B.Tech-I (Mechanical Engineering-Mechatronics) and B.Tech-I (Mechanical Engineering-Production)]

CODE	SUBJECT	T	P	D	C
ME 1021	English	3	0	0	6
ME 1022	Mathematics-I	3+1*	0	0	6
ME 1023	Engineering Physics	2+1*	0	0	4
ME 1024	Engineering Chemistry	2	0	0	4
ME 1025	Engineering Mechanics	2+1*	0	0	6
ME 1026	Introduction to Computers	3	0	0	6
ME 1027	Engineering Graphics	0	0	6	8
ME 1028	Engineering Physics LAB	0	3/2	0	2
ME 1029	Fuels & Lubricants LAB	0	3/2	0	2
ME 1030	Computer LAB	0	6	0	8
ME 1031	Work Shop	0	3	0	4
<b>Total</b>		<b>15+3*</b>	<b>12</b>	<b>6</b>	<b>56</b>

Note: T=Theory; P=Practical; \* = Tutorial; D=Drawing; C=Credits

**Note :** All University examinations (theory and practical) are of 3 hours duration.

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY :  
HYDERABAD (A.P.)**

II Year B.Tech - Semester I

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
ME 2121	Mathematics – II	MP 2121	MC 2121	4	0	0	4
ME 2122	Data Structures Through C	MP 2122	MC 2122	4	0	0	4
ME 2123	Electrical Engineering	MP 2123	MC 2124	4	0	0	4
ME 2124	Basic Electronics		MP 2124	4	0	0	4
ME 2125	Thermodynamics			4	0	0	4
ME 2126	Machine Drawing	MP 2126	MC 2126	0	0	6	4
ME 2127	Data Structures LAB	MP 2127	MC 2127	0	3	0	2
ME 2128	Electrical & Electronics LAB			0	3	0	2
<b>TOTAL</b>				<b>20</b>	<b>6</b>	<b>6</b>	<b>28</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

II Year B.Tech II Semester

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
ME 2221	Probability & Statistics	MP 2221	MC 2221	4	0	0	4
ME 2222	Mechanics of Solids	MP 2222	MC 2123	4	0	0	4
ME 2223	Mechanics of Fluids			4	0	0	4
ME 2224	Metallurgy & Materials Science	MP 2223	MC 2225	4	0	0	4
ME 2225	Instrumentation & Control Systems	MP 2224	MC 3222	4	0	0	4
ME 2226	Thermal Engineering – I			4	0	0	4
ME 2227	Metallurgy & Instrumentation LAB			0	3	0	2
ME 2228	Thermal Engineering LAB			0	3	0	2
<b>TOTAL</b>				<b>24</b>	<b>6</b>	<b>0</b>	<b>28</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

III Year B.Tech I Semester

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
ME 3121	Managerial Economics & Financial Analysis	MP 3121	MC 2223	4	0	0	4
ME 3122	Hydraulic Machinery & systems			4	0	0	4
ME 3123	Production Technology			4	0	0	4
ME 3124	Kinematic of Machines	MP 3124	MC 3125	4	0	0	4
ME 3125	Design of Machine Members – I		MP 3125	4	0	0	4
ME 3126	Thermal Engineering – II			4	0	0	4
ME 3127	Mechanics of solids, Mechanics of & Hydraulic Machines LAB			0	3	0	2
ME 3128	Production Technology LAB			0	3	0	2
<b>TOTAL</b>				<b>24</b>	<b>6</b>	<b>0</b>	<b>28</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

III Year B.Tech II Semester

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
ME 3221	Management Science	MP 3221	MC 3121	4	0	0	4
ME 3222	Metrology			4	0	0	4
ME 3223	Machine Tools			4	0	0	4
ME 3224	Dynamics of Machines	MP 3222	MC 3223	4	0	0	4
ME 3225	Design of Machine Members – II		MP 3223	4	0	0	4
ME 3226	Heat Transfer			4	0	0	4
ME 3227	Metrology & Machine Tools LAB			0	3	0	2
ME 3228	Heat Transfer LAB			0	3	0	2
<b>TOTAL</b>				<b>24</b>	<b>6</b>	<b>0</b>	<b>28</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

IV Year B.Tech I Semester

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
ME 4121	Operations Research	MP 4121	MC 4121	4	-	-	4
ME 4122	CAD/CAM	MP 4122	MC 4122	4	-	-	4
ME 4123	Automobile Engineering	MP 4123	MC 3226	4	-	-	4
ME 4124	Power Plant Engineering			4	-	-	4
	ELECTIVE – I			4	0	0	4
ME 4125	Refrigeration & Airconditioning			-	-	-	-
ME 4126	Jet Propulsion & Rocket Engineering			-	-	-	-
ME 4127	Non- Conventional Sources of Energy	MP 4127	MC 4127	-	-	-	-
	ELECTIVE - II			4	0	0	4
ME 4128	Un- Conventional Machining Process		MP 4128	-	-	-	-
ME 4129	Production Planning & Control	MP 4124	MC 4129	-	-	-	-
ME 4130	Automation in Manufacturing	MP 4130		-	-	-	-
ME 4131	CAD/CAM LAB			0	3	0	2
ME 4132	Production Drawing Practice			0	3	0	2
<b>TOTAL</b>				<b>24</b>	<b>6</b>	<b>0</b>	<b>28</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

IV Year B.Tech I Semester

**MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

CODE	SUBJECT	Common With	Common With	T	P	D	C
	ELECTIVE – III			4	0	0	4
ME 4221	Mechanical Handling Equipment	MP 4221	MC 4221	-	-	-	-
ME 4222	Finite Element Method	MP 4222	MC 3122	-	-	-	-
ME 4223	Microprocessors	MP 3122	MC 3221	-	-	-	-
	ELECTIVE – IV			4	0	0	4
ME 4224	Neural Networks & Fuzzy Logic	MP 4224	MC 4224	-	-	-	-
ME 4225	Robotics	MP 4225	MC 4123	-	-	-	-
ME 4226	Computer Graphics	MP 4226	MC 4126	-	-	-	-
ME 4227	PROJECT			-	-	-	8
<b>TOTAL</b>				<b>8</b>	<b>-</b>	<b>-</b>	<b>16</b>

**Note :** All University examinations (theory and practical) are of 3 hours duration.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD (A.P.)**

I Year B.Tech

ME1021

**ENGLISH**

(Common to all branches)

The following text books of English are prescribed for I B.Tech class of all branches in the Colleges of Engineering and Technology affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD. The exercises given are expected to be covered by the teacher in the classroom, the objective of the course being the development of linguistic skills of the learners.

1. A textbook of English for Engineers and Technologists, OL.
2. Masterminds, OL.

**UNIT I:**

1. Energy, Unit 3: Alternative Sources (from A textbook of English for Engineers and Technologists, OL).
2. Jagadish Chandra Bose, (a profile from The Trail Blazers in Masterminds, OL).

**UNIT II:**

1. Computers, Unit 2: New Frontiers (from A textbook of English for Engineers and Technologists, OL).
2. Chandrasekhara Venkata Raman (a profile from the World of Figures and Physics in Masterminds, OL).

**UNIT III:**

1. Technology, Unit 3: Evaluating Technology (from A Text book of English for Engineers and Technologists, OL).
2. S. S. Bhatnagar (a profile from the Institution Builders in Masterminds, OL).

**UNIT IV:**

1. Environment, Unit I: Pollution (from A Text book of English for Engineers and Technologists, OL).
2. Homi Jehangir Bhabha (a profile from the New Age in Masterminds, OL).

**UNIT V:**

1. Industry, Unit 2: Safety and Training (from A Text book of English for Engineers and Technologists, OL).
2. Salim Ali (a profile from The Living World in Masterminds, OL).

**UNIT VI:**

Common Errors, Sentence Completion, Synonyms and Antonyms, Analogy, Report Writing, Comprehension, General Essay, Situational Dialogues

**Note:** The establishment of an English Language laboratory in each Affiliated College of Engineering and Technology is recommended with effect from the Academic year 2002-03 for the following reasons:

1. To expose the students to TOEFL and GRE model of training and practice.
2. To help the students learn correct pronunciation, accent and intonation.
3. To enable the students to improve and strengthen their communicative skills.
4. To expose the students to different variations in English expression.

It is also recommended that the English Language Laboratory training and practice is treated as a non-examination item of the curriculum.

**Books Recommended:**

1. Strengthen your writing, by V. R. Narayana Swami (OL).
2. Success with Grammar and Composition, by K. R. Narayanaswamy (OL).
3. Examine your English, by Margaret Maison (OL).
4. English for Professional Students, by S. S. Prabhakara Rao.
5. TOEFL (ARCO & BARRONS, USA) & CLIFFS TOEFL.
6. GRE (ARCO & BARRONS, USA) & CLIFFS GRE.
7. Communication skills for Technical Students by T. M. Farhathulla (OL).
8. Strategies for Engineering Communication by Susan Stevenson & Steve Whitmore (John Wiley & Sons).
9. Basic Communication skills for technology, 2<sup>nd</sup> edition by Andrea J. Rutherford, (Pearson Education Asia).

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

I Year B.Tech

ME1022

**MATHEMATICS – I**  
(Common with Production Engg – and Mechatronics)

**UNIT – I:**

Sequences – Series – Convergence and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence.

Rolle's theorem – Lagrange's Mean Value theorem – Cauchy's Mean value Theorem – Generalized Mean Value theorem (Taylor's Theorem)

**UNIT – II:**

Functions of several variables – limit and continuity – partial differentiation – Chain rule – Total derivative – Euler's theorem, Jacobian – Functional dependence. Maxima and Minima of functions of two variables with and without constraints, Radius, Centre and Circle of Curvature – Evolutes and Envelopes.

**UNIT – III:**

Curve tracing – Cartesian, polar and Parametric curves. Applications of integration to lengths, volumes and surface areas in Cartesian and Polar coordinates.

**UNIT – IV:**

Differential equations of first order and first degree – formation. Exact, linear and Bernoulli.

Applications to Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories, Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomial in  $x$ ,  $e^{ax}V(x)$ ,  $xV(x)$ , method of variation of parameters.

**UNIT – V :**

Laplace transform of standard functions – Inverse transform – Linearity – first shifting Theorem. Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Differentiation and integration of transforms.

Multiple integrals : Double and triple integrals – change of variables – Change of order of integration.

**UNIT – VI :**

Vector Differential Calculus :

Gradient, Divergence, Curl and their related properties of sums, Products, Laplacian and second order operators.

Vector integral Calculus : Vector integration – Line integral – work done – Potential function – area, surface and volume integrals. Green's theorem, Stoke's and Gauss' Divergence Theorem. Verification of Green's, Stoke's and Gauss' Theorems. Curvilinear Coordinates – Cylindrical, Spherical Coordinates – Expressions of Grad, div, curl in Spherical, Cylindrical and Curvilinear Coordinates.

**TEXT BOOKS :**

1. A Text Book of Engineering Mathematics Volume – I, 2002  
T.K.V. Iyengar, B. Krishna Gandhi, and others, S. Chand and Company
2. Engineering Mathematics  
B.V. Ramana, Tata McGraw\_Hill 2002
3. Engineering Mathematics – I  
C. Sanakraiah, Vijaya Publications-2002
4. Engineering Mathematics – I - 2002  
P. Nageswara Rao, Y. Narsimhulu, Prabhakara Rao

**REFERENCES :****DEEPTI PUBLICATION**

1. Engineering Mathematics  
S.K.V.S. Sri Rama Chary, M. Bhujanga Rao, Shankar, B.S. Publications 2000
2. Advanced Engineering Mathematics (Eighth edition)  
Erwin Kreyszig, John Wiley & Sons (ASIA) Pvt. Ltd. 2001
3. Advanced Engineering Mathematics (Second edition)  
Michael D. Green Berg, Prentice Hall, Upper saddle River, New Jersey-1998
4. Sarveswara Rao Koneru  
Engineering Mathematics Orient Longman Pvt. Ltd. 2002
5. Engineering Mathematics – I  
N.P. Bali, Laxmi Publications (P) Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1023

**ENGINEERING PHYSICS**

(Common with Production Engg. – Mechatronics)

Unit –1: (A): Interference of light : Introduction – Superposition of waves- Young's double slit experiment – Coherence – Types of interference- Interference in thin films – Colour of thin films – Newton's rings.

(B): Diffraction of light : Introduction – Fraunhofer diffraction at a single slit, Fraunhofer diffraction due to two parallel slits-Fraunhofer diffraction due to n-parallel slits – Diffraction-a qualitative description – diffraction grating – Grating Spectrum – Fraunhofer diffraction at a circular aperture – Rayleigh's criterion for resolving power – electron microscope.

Unit – 2 (A): Polarization of light : Introduction – Representation of polarized and unpolarized light- Production of polarized light – Circular and elliptical polarization – calculation of the phase difference when a linearly polarized light passes through a double refracting crystal.

2(B) : Non-destructive Testing : Introduction – Theory and practice of ultrasonic testing – Ultrasonic testing systems – Ultrasonic testing methods – Applications of ultrasonics.

Unit – 3 (A) : Laser : Introduction – Characteristics of laser light – basic concepts of laser – Types of lasers : Ruby laser, He-Ne laser – Applications of lasers.

3(B) : Fibre Optics : Introduction – Basic principles – Light wave communication using optical fibres – numerical aperture – Acceptance angle – Fibre optics in medicine & industry.

Unit 4 (A) : Thermal properties: Specific heat of solids – Einstein model, Photons – Thermal conductivity – Thermal expansion – thermoelectric effect-thermo-analyses –thermo-gravimetry –Thermo-mechanical analysis.

4(B) : Dielectric materials : Introduction – Dielectric constant or relative permittivity – Loss tangent or dielectric loss- Polarization – Dielectric strength – Classification of dielectrics – Porcelain – Glass.

UNIT 5 (A) : Magnetic materials : Introduction – Magnetic moment of electrons and atoms – basic definitions – Classification of Magnetic materials – Diamagnetic materials – Paramagnetic materials – Ferromagnetic materials- Anti-ferromagnetic and Ferri-magnetic materials – Soft and Hard magnetic materials

5 (B) : Superconductivity : Introduction – Properties of superconductors – BCS theory of superconductivity – Applications of superconductors.

Unit 6 (A): Deformation & Creep in materials : Plastic deformation – Stress strain curve – deformation by slip – Strength of crystals – dislocations – multiplication of dislocations – mechanism of creep – creep resistant materials.

6(B) : Materials for Space Applications : Space programme – Structural materials and their properties – High temperature materials – materials for thermal protection.

**TEXT BOOK PRESCRIBED:**

1. Physics for engineers by M.R. Srinivasan,  
(New Age International, New Delhi).
2. Material Science & engineering, V Raghavan, (Prentice Hall India)  
New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1024

**ENGINEERING CHEMISTRY**

(Common with Production Engg. – Mechatronics)

**UNIT I: Science of Corrosion and Control against Corrosion:**

Definition – Electrochemical Theory of Corrosion – Corrosion Reactions – Factors Affecting Corrosion – Protection.

**a. Cathodic Protection**

1. Sacrificial Anode
2. Impressed Current.

**b. Metallic Coatings**

1. Anodic Coating.
2. Cathodic Coating.
3. Surface Conversion Coatings

**c. Inorganic Coatings**

**d. Organic Coatings**

1. Paints – Definition – Constituents and Their Functions.
2. Varnishes And Lacquers.

**UNIT II: Polymer Science and Technology:**

Polymerisation – Definition, Types of Polymerisation; Basic Concepts; Plastics – Definition and Classification; Thermosetting and Thermoplastics; Compounding and Fabrication of Plastics.

Composition, Properties and Engineering Uses of The Following : Polyethylene, PVC, Teflon, Bakelite, Nylon, Polymethyl Methacrylate, Urea-Formaldehyde and Silicon Resins.

Rubber – Processing of Natural Rubber, Vulcanisation and Compounding. Elastomers – Buna S, Buna N, Thiokol. Polyurethane Rubber, Silicon Rubber.

**UNIT III: Water Technology:**

Sources, Impurities in Water, Water Quality; Hardness of Water; Units – Its Determination; Boiler Troubles, Water Treatment, Lime-Soda Process, Zeolite Process, Ion-Exchange Process; Problems.

Water For Drinking Purposes and Its Treatment; Analysis of Water; Alkalinity; Chlorides and Dissolved Oxygen.

**UNIT IV: Fuels and Combustion :**

Definition and Classification.

1. Solid Fuels – Coal and Its Formation – Rxn and Ultimate Analysis of Coal and Significance of the Constituents – Metallurgical Coke.
2. Liquid Fuels – Petroleum – Origin – Extraction – Refining And Cracking – Knocking – Octane and Cetane Numbers – Synthetics of Petrol – Bergius Process – Fischer Tropsch Process.
3. Gaseous Fuels – Analysis of the Gas by Orsats Apparatus – Calorific Value of Fuels – Bomb Calorimeter – Junker's Gas Calorimeter.
4. Combustion – Problems.

**UNIT V: Refractories and Insulators:**

Refractories – Definition, Classification With Examples; Criterial of a Good Refractory Material; Causes For The Failure of a Refractory Material; Insulators – Definition and Classification with Examples; Characteristics of Insulating Materials; Thermal Insulators, Electrical Insulators, Their Characteristics and Engineering Applications.

**UNIT VI: Lubricants :**

Definition – Classification – Theories of Lubrication – Properties of Lubricants.

**BOOKS RECOMMENDED:**

1. Textbook of Engineering Chemistry by Jain & Jain.
2. Chemistry of Engineering materials by C.V. Agarwal.
3. Textbook of engineering Chemistry by P.C. Jain.
4. Textbook of Engineering Chemistry by M.S.N. Raju.
5. Engineering Chemistry by Dara, Published by Pearson Education, Asia.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1025

**ENGINEERING MECHANICS**  
(Common with Production Engg. – Mechatronics)

**UNIT – I****Introduction to Engg. Mechanics – Basic Concepts**

Systems of Forces :

Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces :

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

**UNIT – II**

Friction : Types of Friction – Limiting Friction – Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

Transmission of Power : Belt Drives : Open, Crossed and Compound – Length of Belt, Tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

**UNIT – III**

Centroid and Centre of Gravity : Centroids – Theorem of Pappus – Centroids of Composite Figures – Centre of Gravity of Bodies.

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures; Products of Inertia, Transfer Formula for Product of Inertia.

**UNIT – IV**

Mass Moment of Inertia : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

Kinematics : Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

**UNIT – V**

Kinetics : Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Work – Energy Method :

Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion.

Impulse momentum method.

**UNIT – VI**

Mechanical Vibrations : Definitions, Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums.

**TEXT BOOKS :**

Engineering Mechanics / Ferdinand . L. Singer / Harper – Collins.

**REFERENCE BOOKS :**

1. Engg. Mechanics / Irving. H. Shames; Prentice – Hall.
2. Engg. Mechanics / Timoshenko & Yound.
3. Engg. Mechanics / Umesh Regl / Tayal.
4. Engg. Mechanics / R.V. Kulkarni & R.D. Askhekar
5. Engg. Mechanics / S.S. Bharikati & J.G. Rajasekharappa
6. Strength of Materials & Applied Mechanics / IB Prasad
7. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
8. Engg. Mechanics / KL Kumar / Tata McGraw Hill.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1026

**INTRODUCTION TO COMPUTERS**  
(Common with Production Engg. – Mechatronics)

**UNIT – I :****(Computer Awareness – Qualitative Treatment only)**

Computers, capabilities, types of computers, application areas, computer anatomy, functional block diagram, central processing unit, functions of ALU and Control unit in CPU, purpose of Registers in CPU, micro-processors CISC / RISC processors, memory functions, address, word, RAM, ROM, Cache memory, Associate memory, magnetic disk, tape, floppy, optical disk, address bus, data bus, control bus, functions of I-O devices, key board, mouse, light pen, dot matrix printer, line printer, laser printer, ink jet printer, CRT monitor, Color monitor, CGA, Screen resolution, Flat panel display unit, machine language, compiler, Operating System, Types of operating systems, Number Systems, Binary, Hex, Octal, BCD Code, Character Codes, 3 methods of binary representation, of integers, floating point numbers.

**UNIT – II :** Computer Programming I :

Algorithm, flow chart program development steps, Basic Structures of C Language; C tokens, Data types, declaration of variables, assigning values, arithmetic, relational and logical operators, increment and decrement operators, control operator, bit-wise operators, expressions, evaluation, input-output operations, IF and SWITCH statements, WHILE, DO-WHILE, and FOR Statement, C programs covering all the above aspects.

**UNIT – III:** Computer Programming II :

String Variables in C, declaration, reading, writing, string handling functions, user-defined functions, variables and storage classes, structures, unions, pointers, file management in C, opening, closing and I-O operations on files. C programs covering the above aspects.

**UNIT – IV :** Numerical Methods – I :

Iterative methods, bisection, false position, Newton-Raphson, Successive approximation methods, algorithms, comparison of iterative methods, solution of linear simultaneous algebraic equations, Gauss Jordan and Gauss Siedel's methods, algorithms.

**UNIT – V :** Numerical Methods – II :

Interpolation, Lagrange's interpolation, forward difference, Backward difference and central difference interpolation methods, algorithms, errors in interpolation, least square approximation of functions, linear regression, polynomial regression, algorithms.

**UNIT – VI :** Numerical Methods – III :

Numerical integration by trapezoidal and Simpson's rules, algorithms, Numerical solution of differential equations, Euler Method, Runge-Kutta fourth order methods, Milne predictor corrector method, algorithms, comparison of Runge – Kutta and predictor – Corrector methods.

**TEXT BOOKS :**

1. Computer and Commonsense Shelly and Hunt, 4<sup>th</sup> Edn/PHI.
2. Programming in ANSIC / E Balaguruswamy.
3. Computer Oriented Numerical Methods / V Rajaraman.
4. Programming in C/D. Ravichandra / New Age.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1027

**ENGINEERING GRAPHICS**

(Common with Production Engg. – Mechatronics)

**UNIT – I****INTRODUCTION TO ENGINEERING DRAWING :**

Principles of Engineering Graphics and their Significance, Engineering Drawing – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.

Scales used in Engineering Practice and Representative Fraction – Construction of Plain, Diagonal and Vernier Scales.

**PLANE GEOMETRIC DRAWING :**

Construction of Polygons – Inscription and Superscription of Polygon given the diameter of the Circles.

Curves used in Engineering Practice and their Constructions.

- a) Conic Sections including the Rectangular Hyperbola – General method only.
- b) Cycloid, Epicycloid and Hypocycloid
- c) Involute.

**UNIT – II****DRAWING OF PROJECTIONS OR VIEWS****ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY :**

Principles of Orthographic Projections – Conventions – First and Third Angle Projections Projections of Points and Lines

Projections of Plane regular geometric figures.—Auxiliary Planes.

**UNIT – III**

Projections of Regular Solids – Auxiliary Views.

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.

**UNIT – IV**

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone.

Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT – V****ISOMETRIC PROJECTIONS :**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non-isometric lines. Isometric Projection of Spherical Parts.

**TRANSFORMATION OF PROJECTIONS :**

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.

**UNIT – VI****PERSPECTIVE PROJECTIONS :**

Perspective View : Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only)

**TEXT BOOKS :**

1. Engineering Drawing Narayana and Kannalah / Scietech Publishers.
2. Engineering Drawing N.D. Bhat / Charotar
3. Engineering Drawing and Graphics Venugopal / New age.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
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I Year B.Tech

ME1028

**ENGINEERING PHYSICS LAB**  
(Common with Production Engg. – Mechatronics)

Any Ten of the following experiments are to be performed during the academic year.

1. Determination of Rigidity Modules of the material of a wire (Torsional Pendulum).
2. Study of normal modes in a string using forced vibrations in rods (Melde's experiment).
3. Study of Resonance – Using audio generator.
4. Coupled Oscillator.
5. Diffraction grating.
6. Dispersion of Light – (Prism – Spectrometer method)
7. Determination of thickness of a thin object by optical method Parallel fringes.
8. Newton's Rings.
9. Lasers – Single slit and double slit experiments.
10. Study of electrical resonance – LCR circuit.
11. Time constant of an R-C Circuit
12. Sonometer – Verification of laws of stretched strings.
13. Frequency of A.C. Supply.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's Method.
15. Optical Fibres – Numerical aperture measurement.
16. Optical Fibres – Study of Losses.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1029

**FUELS AND LUBRICANTS LAB**  
(Common with Production Engg. – Mechatronics)

1. Determination of Flash and Fire points of Liquid Fuels / Lubricants
2. Carbon Residue Test : Liquid Fuels
3. Determination of Viscosity : Liquid Lubricants
4. Determination Calcrific Value: Solid/Liquid/Gaseous Fuels
5. Greese Penetration Test.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1030

**COMPUTER LAB**

(Common with Production Engg. – Mechatronics)

1. Write a C program the evaluates the following algebraic expressions after reading necessary values from the user:
  - a)  $ax+b/ax-b$
  - b)  $2.5 \log x + \cos 32^0 + |x^2 - y^2| + v 2xy$
  - c)  $1/av2? e- (x-m/ v2s)^2$
2. Write a C program for the following
  - a) Printing three given integers in ascending order
  - b) Sum of  $1 + 2 + 3 + \dots + n$
  - c)  $1 + x^2/2! + x^2/4! + \dots$  upto ten terms
  - d)  $x + x^3/3! + x^5/5! + \dots$  upto 7<sup>th</sup> digit accuracy
  - e) Read x and compute  $Y=1$  for  $x > 0$   
 $Y=0$  for  $x = 0$   
 $Y=-1$  for  $x < 0$
3. Write C program using FOR statement to find the following from a given set of 20 integers.
  - i) Total number of even integers. ii) Total number of odd integers.
  - iii) Sum of all even integers. iv) Sum of all odd integers.
4. Write a C program to obtain the product of two matrices A of size (3X3) and B of size (3X2). The resultant matrix C is to be printed out along with A and B. Assume suitable values for A & B.
5. Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer.  
(consider operators +, -, /, \* and %).
6. Write C procedures to add, subtract, multiply and divide two complex numbers  $(x+iy)$  and  $(a+ib)$ . Also write the main program that uses these procedures.
7. The total distance traveled by vehicle in 't' seconds is given by distance  $= ut + 1/2at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance traveled a

regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

8. A cloth show room has announced the following seasonal discounts on purchase of items.

Purchase Amount	Discount (Percentage)	
	Mill Cloth	Handloom items
1-100	-	5.0
101-200	5.0	7.5
201-300	7.5	10.0
Above 300	10.0	15.0

Write a C program using switch and If statements to complete the net amount to be paid by a customer.

9. Given a number, write C program using while loop to reverse the digits of the number. Example 1234 to be written as 4321.
10. The Fibonacci sequence of numbers is 1,1,2,3,5,8... based on the recurrence relation  $f(n) = f(n-1) + f(n-2)$  for  $n > 2$ .

Write C program using do-while to calculate and print the first m fibonacci numbers.

11. Write C programs to print the following outputs using for loop.

1	1
2 2	2 2
3 3 3	3 3 3
4 4 4 4	4 4 4 4
5 5 5 5 5	5 5 5 5 5

12. Write a C program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted starting with the nth character.

A Maruthi Car dealer maintains a record of sales of various vehicles in the following form:

Vehicle type	Month of sales	Price (Rs)
Maruthi – 800	02 / 87	75,000
Maruthi – DX	07 / 87	95,000
Gypsy	04 / 88	1,10,000
Maruthi Van	08 / 88	85,000

Write a C program to read this data into a table of strings and output the details of a particular vehicle sold during a specified period. The program should request the user to input the vehicle type and the period (Starting month & ending month).

14. Write a function that will scan a character string passed as an argument and convert all lower case characters into their upper case equivalents.
15.  $f(x) = x \sin x + \cos x = 0$  using bisection method. Write a program & Evaluate the root of the equation.
16.  $f(x) = x \sin x + \cos x = 0$  using false position method. Write a program & Evaluate the root of the equation.
17.  $f(x) = x \sin x + \cos x = 0$  using Newton Raphson method. Write a program & Evaluate the root of the equation.
18.  $f(x) = x \sin x + \cos x = 0$  using successive approximation method. Write a program & Evaluate the root of the equation.
19. Solve
  - $9x_1 + 2x_2 + 4x_3 = 0$  ..... (1)
  - $x_1 + 10x_2 + 4x_3 = 6$  ..... (2)
  - $2x_1 - 4x_2 + 10x_3 = -15$  ..... (3) using Gauss - Jordan method.

20. Solve
  - $9x_1 + 2x_2 + 4x_3 = 0$  ..... (1)
  - $x_1 + 10x_2 + 4x_3 = 6$  ..... (2)
  - $2x_1 - 4x_2 + 10x_3 = -15$  ..... (3) using Gauss - scidel method.
21. Write a computer program to implement LaGrange interpolation technique. Check the working of the program with suitable example.
22. Write a computer program to implement Newton - Gregory forward interpolation. Check the working of the program with suitable example.
23. Write a program to implement Trapezoidal method. Check the working of the program with suitable example.
24. Write a program to implement Simpson method. Check the working of the program with suitable example.
25. Implement, in C, the linear regression algorithm. Check the working of the program with suitable example.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

I Year B.Tech

ME1031

**WORKSHOP**

(Common with Production Engg. – Mechatronics)

- I. TRADES FOR EXERCISES :  
(Minimum of THREE exercises in each Trade)
1. Carpentry & Pattern Making
  2. Fitting
  3. Tin-Smithy
  4. Black Smithy
  5. House-wiring
  6. Foundry
- II. Trades for Demonstration & Exposure
1. Plumbing
  2. Welding
  3. Machine Shop

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech

ME12121

**MATHEMATICS – II**

**UNIT – I**

Matrices – brief review – Inverse of a matrix by adjoint, elementary row transformations – Rank – Normal form – echelon form. Augmented matrix – Consistency – solution of system of simultaneous linear homogeneous and non-homogeneous equations.

**UNIT – II**

Eigen values, eigen vectors – properties – Cayley – Hamilton Theorem (Inverse and powers of a matrix by Cayley – Hamilton theorem). Quadratic forms – positive, negative definite – Diagonalization of matrix. Calculation of powers of matrix – Modal and spectral matrices. Real matrices – Symmetric, skew-symmetric, orthogonal. Linear Transformation – Orthogonal Transformation. Quadratic forms – Reduction of quadratic form to canonical form – index – signature.

**Complex matrices :** Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of Complex matrices and their properties.

**UNIT – III : Fourier Series**

Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half – range Fourier sine and cosine expansions.

**UNIT – IV :**

Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of variables – Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

**UNIT – V**

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms. – properties – Inverse transforms – Finite Fourier transforms. Solution of one dimensional wave, heat equations and two dimensional Laplace's equation by Fourier transforms. Z-transform – Inverse z – transform – properties – Damping rule – shifting rule – Initial and final value theorems.

2002 – 2003

Convolution theorem – Solution of difference equations by Z – transforms.

**TEXT BOOKS :**

1. A Text Book of Engineering Mathematics Volume – II – 2002  
T.K.V. Iyengar, B. Krishna Gandhi and others, S. Chand and Company
2. Engineering Mathematics  
B.V. Ramana, Tata McGraw-Hill-2002
3. Engineering Mathematics – II – 2002  
C Sankaraiah, Vijaya Publications
4. Engineering Mathematics – II – 2002  
P. Nageswara Rao, Y. Narsimhulu, Prabhakar Rao

**DEEPTI PUBLICATION**

**SUGGESTED REFERENCES :**

1. Engineering Mathematics  
S.K.V.S.Sri Rama Chary, N. Bhujanga Rao, P. Bhaskara Rao, B.S.Publications 2000.
2. Advanced Engineering Mathematics (Eighth edition)  
Erwin Kreyszing, John Wiley & Sons ( ASIA) Pvt. Ltd. – 2001
3. Advanced Engineering Mathematics (Second edition)  
Michael D. Green Berg, Prentice Hall, Upper Saddle River, New Jersey – 1998.
4. Engineering Mathematics, Sarveswara Rao Konery, Orient Longman (Pvt.) Ltd. 2002
5. Engineering Mathematics – II  
N.P. Bali, Laxmi Publications (P) Ltd., New Delhi

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2122

**DATA STRUCTURES THROUGH “C”**

(Common with Mech.Engg – Production and Mech. Engg. – Mechatronics)

**UNIT – I**

One dimensional and multi – dimensional arrays, initialization, application, applications, program examples.

**UNIT – II**

Single linked list, double linked list, header, circular list, applications program examples.

**UNIT – III**

Stacks, representation, infix, postfix and prefix programs, recursion, recursion in C, applications of stacks queues, representation queues, circular queues applications, program examples.

**UNIT – IV**

Binary tree, representation, trees traversals, graph, representation, graph traversals, spanning trees.

**UNIT – V**

Searching techniques, linear and binary search methods, sorting method exchange sort, selection sort, quick sort, tree sort, C programs.

**TEXT BOOKS :**

Data Structures through 'C' / A.M. Tanenbaum and other / PHI.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2123

**ELECTRICAL ENGINEERING**

(Common with Mech.Engg – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

SI Unit's law, series, and parallel circuits, Kirchhoffs laws, Mechanical, Star-delta transformation – magnetic circuits – force on a current carrying conductor – electromagnetic induction, Faraday's law, Lenz's law – effects of hysteresis & eddy currents – Self and mutual inductances.

**UNIT – II**

Generation of an alternating emf – average and rms values of alternating quantity – representation of alternating quantities by phasors – single phase circuits – resonance – three phase balanced systems – single and three phase power calculations.

**UNIT – III**

Principle of operation of DC machines – emf equation – types of generators – Magnetization and Load characteristics of DC generators – types and characteristics of DC motors – torque equation – DC motor starters (three point) – Efficiency calculation and Swinburne's test 0 Speed control.

**UNIT – IV**

Construction and principle of operation of single phase transformer – emf equation O.C. & S.C. tests – efficiency and regulation - 3 $\Phi$  Transformers, Transmission and Distribution - principle and operation of three phase induction motors – types – slip torque characteristics – principle and operation of alternators – O.C. & S.C. tests – regulations by synchronous impedance method.

**UNIT – V**

Basic principles of indicating instruments – moving coil and moving iron instruments – dynamometer type wattmeters – induction types energy meter-measurement of single and three phase power.

**TEXT BOOKS :**

1. Electrical Engineering Fundamentals /Del Toro, 2<sup>nd</sup> edition / Prentice Hall Publishers
2. Fundamental of Electrical Engineering / Ashfaq Husain, 2<sup>nd</sup> edition / Dhanpat Rai & Co.
3. Theory and Problems of Basic Electrical Engineering / D.P.Kothari & I.J. Nagrath, PHI Publishers, 1998.
4. Basic Electrical Engineering / V.N.Mittle / TMH 1998.

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2024

**BASIC ELECTRONICS**

(Common with Mechatronics Engg –Production)

NOTE : Emphasis is on principles &amp; Functional Block Diagrams.

**UNIT – I****Semiconductors : P & N Type**

PN Junction, Junction Diode, V-I Characteristics

Diode as a Switch &amp; Diode as Rectifier, Basic Filter Circuits.

PNP and NPN Junction Transistor, Transistor as an Amplifier.

SCR Characteristics and Applications.

**UNIT – II**

Concept of Feedback and Oscillation :

Effect of Negative Feedback, and Amplifiers, RC Oscillators.

**UNIT – III**

Basic Timer Circuits – Applications Welding Circuits, Resistance Welding.

Energy storage Welding.

**UNIT – IV**

Introduction to dielectric heating. Cathode ray tube &amp; CRO, Simple Applications.

**UNIT – V**

Micro Processors, A to D &amp; D to A Convertors.

**REFERENCE BOOKS :**

1. Industrial Electronics / G.K. Mithal / Khanna
2. Electronic Instrumentation and Measurement Techniques / Hoper and Helfrich – 3<sup>rd</sup> ED / PHI
3. Industrial Electronics / S.N. Biswas / Dhanpat Rai

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2125

**THERMODYNAMICS**

**UNIT – I****Introduction : Basic Concepts :**

System Control Volume, Surroundings, Boundaries, Universe, Types of Systems, Macroscopic, and Microscopic views, Concepts of Continuum, Pure Substance, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

Zeroth Law of Thermodynamics – Concept of quality of temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale.

Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – steady flow Energy Equation.

**UNIT – II**

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump Parameters of performance

Second Law of Thermodynamics, Kelvin/Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation. Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

**UNIT - III**

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – flow processes – Deviations from perfect Gas Model – Vanderwalls Eqn. of State – Compressibility charts – variable specific Heats – Gas Tables, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Eqn. Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

**UNIT – IV**

Mixtures of perfect Gases – Mole Fraction, Mass fraction, Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Law of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

**UNIT - V**

**Thermodynamic Cycle :** Power Cycles : Otto, Diesel, Dual Combustion cycles, Brayton Cycle, Stirling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Joule and Rankine cycles – performance Evaluation – combined cycles.

**Refrigeration Cycles :** Bell-Coleman cycle, vapour compression cycle – performance Evaluation.

**TEXT BOOKS :**

1. An introduction to Thermodynamics / YVC Rao / New Age
2. Engineering Thermodynamics / PK Nag / TMH

**REFERENCE BOOKS :**

1. Thermodynamics & Heat Engines / Yadav / Central Book Depot. Allahabad
2. Basic Engineering Thermodynamics / Roy Choudhury / TMH
3. Engineering thermodynamic with Applications / Burghardt / Hooper & Row.
4. Thermal Engineering / RK Rajput / Laksnmi publications
5. Engineering Thermodynamics / Rogers and Mathew / Addison – Wesley (Work and Heat Transfer)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2126

**MACHINE DRAWING**

(Common with Mech.Engg – Mechatronics and Mech. Engg. – Production)

**I. Machine Drawing Conventions:**

Need for drawing conventions – introduction to ISI conventions

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- d) Title boxes, their size, location and details - common abbreviations and their liberal usage
- e) Types of Drawings – working drawings for machine parts.

**II. Drawing of Machine Elements and simple parts**

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cottered joints and knuckle joint.
- c) Rivetted joints for plates
- d) Shaft coupling, spigot and socket pipe joint.
- e) Journal, pivot and collar and foot step bearings.

**III. Assembly Drawings:**

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- a) Steam engine parts – stuffing boxes, cross heads, Eccentrics.
- b) Other machine parts - Screws jacks, Machine Vices, Petrol engine connecting rod, Plummer block
- c) Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

**NOTE :** First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

**TEXT BOOK :**

1. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

**REFERENCE BOOKS :**

1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Luzzader
3. Machine Drawing - Rajput

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech I Semester

ME2127

**DATA STRUCTURES LAB**

(Common with Mech.Engg – Mechatronics and Mech. Engg. – Production)

1. Implement the Following data structures using Arrays.
  - a) Stacks
  - b) Linear queues
  - c) Circular queues
  - d) De queue.
2. Implement polynomial addition and multiplication with linked list spare matrix.
3. Implement binary search tree using linked list and perform the following operations.
  - a) Insertion
  - b) Deletion
  - c) In order Traversal
  - d) Pre order traversal
  - e) Post Order Traversal.
4. Single linked list and double linked lists.
  - a) Insertion
  - b) Deletion
  - c) Loop up
5.
  - a) Implement stack using single linked list
  - b) Implement queue using single linked list.
  - c) Implement the following sorting techniques.

- d) Bubble sort
- e) Insertion Sort
- f) Quick Sort
- g) A cap Sort.
- 6. Implement the following searching method
  - a) Sequential Search
  - b) Binary Search
  - c) Fibbonacci Search
- 8. a) Conversion of Infix expression to post fix notation.  
b) Simple expression evaluation, that can handle : +, -, / and \*

**ELECTRICAL & ELECTRONICS LAB**

**Section A:**

The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator)
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.

In addition to the above four experiments, any one of the experiments from the following list is required to be conducted :

5. Speed control of D.C. Shunt motor by
  - h) Armature Voltage control motor
  - i) Field flux control method

**Section B:**

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class A Power Amplifier
6. Micro Processor

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II Year B.Tech II Semester

ME2221

**PROBABILITY AND STATISTICS**  
(Common to Computer Science, Civil Engineering)

**UNIT – I****PROBABILITY :**

Sample space and events – probability – The axioms of probability – Some elementary theorems – conditional probability – Baye's theorem.

**UNIT – II****PROBABILITY DISTRIBUTIONS :**

Random variables – Discrete and continuous – Distribution – Distribution function – Distributions – Binomial, poisson and normal distribution – related properties.

**UNIT – III****SAMPLING DISTRIBUTION :**

Populations and samples – sampling distributions of mean (known and unknown) Proportions, sums and differences.

**UNIT – IV****INFERENCES CONCERNING MEANS AND PROPORTIONS :**

Point estimation – Interval estimation – Bayesian estimation – Test of Hypothesis – Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests – Tests of significance, - Student t-test, F-tests,  $\chi^2$ - test. estimation of proportions.

**UNIT – V****CURVE FITTING :**

The method of least squares – inferences based on the least squares estimations – Curvilinear regression – multiple regression – Correlation for univariate and bivariate distributions.

**TEXT BOOKS :**

1. Probability and Statistics for Engineers by Irwin Miller and John E. Freund.  
Prentice-Hall of India Private Limited, 6<sup>th</sup> edition.
2. Engineering Mathematics – B.V. Ramana, Tata McGraw-Hill-2002

**REFERENCE BOOKS :**

1. Probability and Statistics for Engineers. By Walpole and Meyer.
2. Advanced Engineering Mathematics (Eighth edition)  
Erwin Kreyszig, John Wiley & Sons ( ASIA) Pvt Ltd., 2001

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech II Semester

ME2222

**MECHANICS OF SOLIDS**

(Common with Mech. Engg – Mechatronics and Mech. Engg. – Production)

**UNIT – I Simple Stresses and Strains :**

Elasticity, plasticity, ductility, malleability, hardness and brittleness of materials – Definition of Stress – Types of stress, compressive, tensile and shear – definition of strain, types of strains – factor of safety.

Elastic limit, Hooke's Law – Young's modulus and shear modulus. Tensile test on mild steel specimen bars of varying section – Extension of a tapering rod – stresses in bars of composite section – Temperature stresses – Lateral strain, Poisson's ratio and volumetric strain – element in a state of simple shear – Stresses on oblique sections. Definition of Bulk modulus, Relation between the three classic constants – Bars of uniform strength.

**UNIT – II Shear Forces and Bending moments :**

Definition of Beam, Types of beams – Cantilever, Freely supported, overhanging, fixed and continuous beams – Concept of shear force and bending moment – Shear force and bending moment diagrams for cantilevers, freely supported and overhanging beams due to point loads, uniformly distributed load, uniformly varying load and combination of the above loads – point of contra-flexure, relation between shear force and bending moment.

**UNIT – III Flexural Stresses :**

Theory of simple bending – Derivation of the equation  $M/I = f/y = E/R$  – Neutral axis – Assumptions in the theory of pure bending – Determination of bending stresses – Section modulus of solid and hollow rectangular and circular sections, L.T. Channel and Angle sections. Design of simple beam sections.

**Shear Stresses :**

Derivation of governing equation – Shear stress distribution over a cross section – rectangular, circular and structural sections.

**UNIT – IV Deflection of beams :**

Members bending into a circular arc – Slope, deflection and radius of curvature. Differential equation for the elastic line of a loaded beam – Deflections in the case of cantilevers, Freely supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load – Macaulay's method – Determination of slope and deflection of cantilevers, Simply supported beams, overhanging beams. Macaulay's theorems and moment area method – applications to simple cases.

**Thin Cylinders:**

Thin seamless cylindrical shells – Derivation of the formula for hoop stress and longitudinal stress – Hoop strain and longitudinal strain. Wire wound thin cylinders.

**UNIT – V Principal Stresses and Strains**

Introduction – Stress Components on inclined planes – Two perpendicular normal stresses accompanied with state of Simple shear – Mohr's circle – Determination of principal stresses and principal planes analytically and graphically – Principal strains.

**Torsion**

Theory of pure torsion – Torsional moment of Resistance – Assumptions in theory of pure torsion – polar modulus – Power transmitted by shaft keys and couplings – shear and torsional resistance – Shafts of circular cross sections – Combined bending and torsion and end thrust – Design of shafts based on theories of failure. Closely coiled and open coiled springs.

**TEXT BOOKS :**

1. Strength of Materials and Mechanics of solids – Vol. I / Punmia
2. Strength of Material / S. Ramamrutham

**REFERENCE :**

1. Solid Mechanics / Popov
2. Elementary Strength of Materials / Timoshenko & Young

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech II Semester

4-0-4 ME2223

**MECHANICS OF FLUIDS**

(Common with Metallurgy & Material Technology)

**UNIT 1: Fluid properties and Fluid statics:**

Density, specific weight, specific gravity, viscosity, Newtonian and Non-Newtonian Fluids, Vapor pressure, compressibility, capillarity, Forces on plane surfaces - total pressure and centre of pressure.

**Fluid Kinematics:**

Streamline, path line, streakline, stream tube, classification of flows, steady unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows - Continuity equation, stream function, velocity potential function.

**UNIT 2: Fluid Dynamics:**

Surface and Body forces - Euler's and Bernoulli's equation for flow along a streamline. Momentum equation, applications, vortex - Free and Forced, Forced vortex with free surface.

**Boundary layer flow:**

Development of boundary layer along a thin flat plate, Laminar boundary layer and turbulent boundary layer, Laminar sub layer, boundary layer separation, Drag and lift forces - Aerofoils, pressure and form Drags.

**UNIT 3: Flow of compressible fluids:**

Equation of state, gas laws, Equation of motion, equation of continuity and equation of energy, compressible flow regimes, Mach number, Mach cone. Shock Wave, Stagnation point, flow of compressible fluid through Venturi meter.

**UNIT 4: Laminar Flow through conduits.**

Flow through closed conduit, Reynold's number, laminar flow through circular tube -horizontal and tubes having slopes. Flow between parallel plates - distribution of shear stress and velocity across the section.

**Analysis of Pipe flow:**

Darcy - Weibach equation, Hydraulic gradient and total energy lines, loss of Head due to sudden enlargement and contraction, Syphon pipes, parallel pipes, pipes in series, power transmission through pipes.

**UNIT 5: Measurement of pressures and flows:**

Piezometer, manometers, pressure gauges, venturimeters and orificemeters, flow through notches and weirs, viscometers, Hot wire Anemometers

**BOOKS:**

1. P.H. Modi & S.M. Seth-Fluid Mechanics
2. A.K. Jain-Fluid Mechanics
3. K.L. Kumar-Fluid Mechanics

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

**II Year B.Tech II Semester**

**ME2224**

**METALLURGY & MATERIAL SCIENCE**

(Common with Mech. Engg – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

**Structure of Metals :** Bonds in Solids, Space lattices, Crystal systems and crystal structure of metals, Miller indices, Miller Bravis indices, crystallization of metals, grain and grain boundaries, crystal defects.

**Constitution of Alloys :** Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni, Al-Cu, Bi-Cd, Cu-Ag, Cu-Sn and Fe-Fe<sub>3</sub>C.

**UNIT – II**

**Cast Irons and Steels :** Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plane carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

**UNIT – III**

**Heat treatment of Alloys :** Effect of alloying elements on Fe-Fe<sub>3</sub>C system, Annealing, normalizing, Hardening, TTT DIAGRAMS Tempering, Hardenability surface hardening methods, Age hardening treatment.

**Non-ferrous Metals and Alloys :** Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

**UNIT – IV**

**Ceramic materials :** Crystalline ceramics, glasses, cermaets, abrasive materials.

**Powder Metalalurgy :** Basic Process – Methods of producing metal powders – milling atomisation – Granulation – Reduction – Electrolytic Deposition – Methods of manufacturing sintered parts – Factors deterring the use of powder metallurgy – Application of this process.

Sintering Secondary operations – Sizing, Coining and machining.

**UNIT – V**

**Composite materials :** Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

**TEXT BOOKS :**

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. A First course in Material Science / V. Raghavan / PHI
3. Elements of Material Science and Engineering / Van Vlack / Addison Wesley

**REFERENCE BOOKS :**

1. Science of Engineering Materials / Agarwal
2. Materials Science / Singh

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

II Year B.Tech II Semester

ME2225

**INSTRUMENTATION AND CONTROL SYSTEMS**

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

Definition – basic principles of measurement – Measurement systems, generalized configurations and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error, Error Analysis.

Theory and construction of various transducers to measure displacement – Piezo electric – Inductive capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

**MEASUREMENT OF TEMPERATURE :** Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

**UNIT – II**

**MEASUREMENT OF SPEED :** Mechanical Tachometers – Electrical tachometers – Stroboscope, Non- contact type of tachometer.

**MEASUREMENT OF PRESSURE :** Units – classification – different principles used. Monometers, Piston, Bourdon pressure gauges, Bellow – Diaphragm gauges. Low pressure measurement – Thermal conductive gauges – ionization pressure gauges, Mcleod pressure gauge.

**UNIT – III**

**MEASUREMENT OF LEVEL :** Direct method – Indirect methods – capacitative – radio active ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

**FLOW MEASUREMENT :** Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

**UNIT – IV**

**Measurement of Acceleration and Vibration :** Different simple instruments – Principle of Seismic instruments – Vibro meter and accelero meter using this principle.

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**STRESS STRAIN MEASUREMENTS :** Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strains, Strain gauge Rosettes.

**MEASUREMENT OF HUMIDITY –** Moisture content of gases

**UNIT – V**

**ELEMENTS OF CONTROL SYSTEMS ;**

Introduction, Importance – Classification – Open and closed systems, Servomechanisms – Examples with block diagrams – Temperature, speed position control systems.

Elementary treatment of Intelligent Systems.

**TEXT BOOKS :**

1. Mechanical Measurement / Beckwith, Marangoni and Lienhard/Addison – wesley
2. Control Systems : Principles & Design / M. Gopal / TMH

**REFERENCE BOOKS :**

1. Experimental Methods for Engineers / Holman
2. Measurement Systems Application and Design / E.O Daoblin
3. Mechanical and Industrial Measurements / R.K. Jain
4. Hydraulic & Pneumatic Power Control / Yeaple / N. Butterworths
5. Industrial Hydraulics / Pipperger & Hicks / Mc Graw Hill
6. Mechanical Measurements / Sirohi and Radhakrishna / New Age
7. Theory and Applications of Automatic Controls / B.C. Nakra / New Age.

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HYDERABAD**

II Year B.Tech II Semester

ME2226

**THERMAL ENGINEERING - I**

**UNIT – I****I.C. ENGINES :**

Classification, working principles and Ideal, air, air-fuel and actual cycles  
Engine systems – Fuel, Ignition, Cooling and Lubrication.

**UNIT – II**

**In S.I. Engines** – Normal Combustion and abnormal combustion –  
Importance of flame speed and effect of engine variables – Type of abnormal  
combustion, preignition and knocking (explanation of ) – Fuel requirements  
and fuel rating, anti knock additives – combustion chamber – requirements,  
types.

**In C.I. Engines** : Four stages of combustion – Delay period and its  
importance – Effect of engine variables – Diesel Knock, explanation of –  
Need for air movement, suction, compression and combustion induced  
turbulence – open and divided combustion chambers and nozzles used –  
fuel requirements and fuel rating.

**UNIT – III****Testing and Performance :**

Parameters of performance - measurement of cylinder pressure, fuel  
consumption, air intake, exhaust gas composition, Brake power –  
Determination of frictional losses and indicated power – Performance test –  
Heat balance sheet and chart, Valve and Port timing Diagrams.

**UNIT – IV**

**COMPRESSORS** – Classification – Fan, blower and compressor – positive  
displacement and dynamic types – reciprocating and rotary types.

**Reciprocating** : Principle of operation, work required, Isothermal efficiency  
volumetric efficiency and effect of clearance , stage compression,  
undercooling, saving of work, minimum work condition for stage compression.

**Rotary (Positive displacement type )** : Roots Blower, vane sealed  
compressor, Lysholm compressor – mechanical details and principle of  
working – efficiency considerations.

**Dynamic Compressors** : Centrifugal compressors : Mechanical details and  
principle of operation – velocity and pressure variation. Energy transfer-  
impeller blade shape-losses, slip factor, power input factor, pressure  
coefficient and adiabatic coefficient – velocity diagrams – power, need for  
and effect.

**Axial Flow Compressors** : Mechanical details and principle of operation –  
velocity triangles and energy transfer per stage degree of reaction, work  
done factor, isentropic efficient pressure rise calculations – polytropic  
efficiency.

**UNIT V**

**REFRIGERATION** : Mechanical Refrigeration and types – units of  
refrigeration – Air refrigeration system, details and principle of operation –  
applications of air refrigeration, vapour compression refrigeration systems –  
calculation of COP – effect of superheating and sub cooling desired properties  
of refrigerants and common refrigerants, vapour absorption system –  
mechanical details – working principle.

**AIR CONDITIONING** : Types – Requirements – Approach to air conditioning  
problem – schematic layout of a typical plant.

**REFERENCE BOOKS :**

1. I.C. Engines / V. GANESAN
2. I.C. Engines / GILL, SMITH AND ZIURYIS
3. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot.,  
Allahabad.
4. Thermal Engineering / Rajput / Lakshmi Publications.

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HYDERABAD

II Year B.Tech II Semester

ME2227

**METALLURGY & INSTRUMENTATION LAB**

Note: Any six of the following experiments from each section be conducted.

**Section A**

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

**Section B:**

1. Calibration of Pressure Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotometer for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

**REFERENCE BOOK :**

Metallography Laboratory Practice / George / KEHL

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HYDERABAD

II Year B.Tech II Semester

ME2228

**THERMAL ENGINEERING LAB**

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test
3. I.C. Engines Morse Test, Retardation, Motoring.
4. I.C. Engines Heat Balance Test.
5. I.C. Engines Economical speed Test.
6. I.C. Engines Optimum cooling water Temperature.
7. COP of a Refrigeration Unit.
8. Study of Boilers
9. Disassembly / Assembly of Engines.
10. Performance of A/C.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech I Semester

ME3121

**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (MEFA)**

(Common for all Branches)

**UNIT I :****Introduction to Managerial Economics**

Managerial economics : Definition, nature and scope – Demand analysis : Law of Demand, demand determinants – Elasticity of Demand : definition, types, measurement and significance – Demand Forecasting methods.

**UNIT II****Theory of Production**

Firm and industry – Production Function – Cobb Douglas Production Function – Laws of Returns – Internal and External economies of scale.

Cost Analysis : Cost concepts, fixed vs variable costs, explicit vs implicit costs, out-of-pocket costs vs imputed costs, opportunity cost, sunk costs and abandonment costs.

Break-even analysis : Concept of Break-even Point (BEP) – Break Even Chart – Determination of BEP in volume and value – Assumptions underlying and practical significance of BEP. (Simple Problems).

**UNIT III :****Introduction to Markets and Business Organisations.**

Market Structures – Types of Competition – Features of Perfect competition, Monopoly, Monopolistic Competition – Price-output determination.

Types of Business Organisation – Features, merits and demerits of Sole proprietorship, Partnership and Joint stock companies – Types of companies – Public Enterprises – Types and Features.

**UNIT IV****Introduction to Capital**

Capital and its significance – Types of capital – Estimation of Fixed and working capital requirements – Methods of raising capital.

Introduction to capital budgeting methods : Pay back method, Accounting Rate of Return (ARR) and Net Present Value (NPV) method (Simple Problems).

**UNIT V :****Introduction to Financial Accounting and Financial Analysis**

Double Entry Book keeping – Journal – Ledger – Trial Balance – Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.

**Ratio Analysis :** Computation of liquidity ratios (current ratio and quick ratio), activity ratios (inventory turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt-equity Ratio and Interest Coverage Ratio) and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS). Analysis and Interpretation

**BOOK FOR REFERENCE :**

1. Joel Dean, Managerial Economics, Prentice Hall of India, 2001.
2. James C. Van Horne, Financial Management Policy, PHI, 2001.
3. Varshney & Maheshwari, Managerial Economics, S. Chand and Co., 2000.
4. Y.K. Bhushan, Fundamentals of Business Organisation and Management, Sultan Chand, New Delhi.
5. Narayana Swamy, Financial Accounting, Prentice Hall of India, 2001.
6. A.R. Aryasri, Managerial Economics and Financial Analysis (MEFA) for JNTU (B.Tech), Tata McGraw-Hill, New Delhi.
7. R.K. Mishra et al, Readings in Accounting and Finance.
8. R.L. Gupta, Financial Accounting, Volume I, Sultan Chand, New Delhi, 2001.

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III Year B.Tech I Semester

ME3122

**HYDRAULIC MACHINERY & SYSTEMS**

**UNIT – I****IMPACT OF WATER JETS:**

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip-velocity triangles at inlet and outlet expressions for work done and efficiency – angular momentum principle – applications to radial flow turbines – Jet propulsion of ships.

**UNIT – II****HYDRAULIC TURBINES :**

Overshot and undershot water wheels – classification of Water turbines – Pelton Wheel – Work done and working proportions, Francis, Kaplan and propeller turbines – work done and working proportions – draft tubes – types – governing of turbines – surge tanks.

**PERFORMANCE OF TURBINES :**

Performance under unit head – unit quantities – performance under specific conditions – specific speed – performance characteristic curves – model testing of turbines – cavitation.

**UNIT – III****RECIPROCATING PUMPS :**

Main components and working of a reciprocating pump-types of reciprocating pumps-power required to drive the pump, coefficient of discharge and slip indicator diagram – effect of acceleration head in suction and delivery pipes – effect of friction – maximum vacuum pressure, work saved by air vessels – rate of flow into and from air vessels – pump duty.

**UNIT – IV****CENTRIFUGAL PUMPS – I :**

Types, Component parts and working-work done by the impeller-Manometric head – losses and efficiencies – effect of vane angle on manometric efficiency – effect of finite number of vanes of the impeller on head and efficiency – minimum starting speed – loss of head due to reduced or increased flow – diameters of impeller and pipes.

**CENTRIFUGICAL PUMPS – II :**

Specific speed – Model testing of pumps – Multistage Pumps – Pumps in parallel – performance of pumps – characteristics curves – NPSH – Cavitation, priming devices – pump troubles and remedies.

**UNIT – V:****HYDRAULIC DEVICES :**

Hydraulic accumulator, Hydraulic Intensifier – Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane – hydraulic couplings and torque converters – Air lift pump.

**HYDRAULIC SYSTEMS :**

Transmission of power through pipes : Condition for maximum power transmission – Gear and Vane pumps, Hydraulic valves, fluids and hydraulic piping.

**TEXT BOOKS :**

1. Hydraulic Machines / Benga & Sharma
2. Hydraulics and Hydraulic Machines / Modi & Seth.

**REFERENCE BOOKS :**

1. Elements of Hydraulic Machines and Fluidics / Jagdish Lal
2. Hydraulic Turbines / Nechleba M

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III Year B.Tech I Semester

ME3123

**PRODUCTION TECHNOLOGY**

**UNIT – I**

**CASTING** : Steps involved in making a casting – Advantage of casting and its applications. Types of Foundry – Foundry layout – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction.

**UNIT – II**

**Methods of melting** : Crucible melting and cupola operation – Defects in castings – Types of casting processes – Centrifugal casting, die-casting etc. Investment casting, shell moulding etc.

Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Solidification of casting – Concept – Solidification of pure metal – Nucleation and grain – growth, casting design considerations.

**UNIT – III**

History and development of welding, basic requirements – classification of welding process – Types of welds and welded joints – characteristics of groove and fillet welds – Design of welded joints.

**Welding Process** : Arc welding, gas welding, forge welding – Resistance welding, Thermit welding, spot welding.

**UNIT – IV**

Inert Gas Welding – TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding, Laser Welding, Soldering and Brazing, Heat affected zone in welding.

Welding defects – causes and remedies – destructive and non-destructive testing of welds.

Economics of Welding – Welding costs – standard time for arc welding, gas welding and oxy-fuel gas cutting – standard time and cost calculations.

**UNIT – V**

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, Rolling fundamentals – theory of rolling, types of rolling mills and products. Forces in rolling and power requirements.

Stamping, forming and other cold working processes : Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning – Types of presses and press tools. Forces and power requirement in the above operations.

**EXTRUSION OF METALS** : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion – Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion.

**FORGING PROCESSES** : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

**TEXT BOOKS :**

1. Manufacturing Technology / P.N. Rao
2. Production Technology Vol I / L Krishna Reddy / Allied Publishers

**REFERENCE BOOKS :**

1. Production Technology / H.M.T.
2. Production Technology / R.K. Jain
1. Metal Casting / TV Ramana Rao / New Age
2. Manufacturing Engineering and Technology / R.S. Parmar
3. Principles of Metal Castings / Hiene & Roenthal.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech I Semester

ME3124

**KINEMATICS OF MACHINES**

(Common with Mech. Engg – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

**MECHANISMS** : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

**MACHINES** : Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – Inversions of quadric cycle, chain – single and double slider crank chains.

**STRAIGHT LINE MOTION MECHANISMS** : Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

**UNIT – II**

**KINEMATICS** : Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

**Analysis of Mechanisms** : Analysis of slider crank chain for displacement , velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane motion of body** : Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

**UNIT – III**

**STEERING GEARS** : Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.

**HOOKE'S JOINT** : Single and double Hooke's joint – Universal coupling – application – problems.

**CAMS** : Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

**Analysis of motion of followers** : Roller follower – circular cam with straight, concave and convex flanks.

**UNIT – IV**

Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – form of teeth, cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference.

Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical – Bevel and worm gearing.

**UNIT – V**

**GEAR TRAINS** : Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear train. Methods of finding train value or velocity ratio – Epicyclic gear trains.

Selection of gear box-Differential gear for an automobile.

**TEXT BOOKS :**

1. Theory of Machines / Dr. Jagadish Lal, J.M. Shaw

**REFERENCE BOKS :**

1. Theory of Machines / Thomas Beven
2. Theory of Machines / Abdulla Sharif
3. Theory of Machines / P.L. Ballaney
4. Mechanism and Machine Theory / JS Rao and RV Dukkupati / New Age
5. The theory of Machines through Solved Problems / J S Rao / New Age.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech I Semester

ME3125

**DESIGN OF MACHINE MEMBERS – I**

(Common with Mechatronics Engg. – Production)

**NOTE :** Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

**UNIT – I**

**INTRODUCTION :** General considerations in the design of Engineering Materials and their properties – selection – Tolerances and fits – ISI codes.

**STRESSES IN MACHINE MEMBERS :** Simple stresses – Combined stresses – Torsional and bending stresses – impact stresses – stress strain relation – Various theories of failure – factors of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations – Static strength design based on fracture toughness.

**UNIT – II**

**STRENGTH OF MACHINE ELEMENTS :** Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line.

**UNIT – III****DESIGN OF FASTENERS :**

Riveted joints – welded joints – Bolted joints – Design of bolts with initial stresses – Design of joints under eccentric loading.

**UNIT – IV****KEYS, COTTERS AND KNUCKLE JOINTS :**

Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

**UNIT – V****SHAFTS AND SHAFT COUPLINGS :**

**SHAFTS :** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combine bending and axial loads – Shaft sizes – ISI code. Use of internal and external circlips, Gaskets and seals (stationary & rotary)

**SHAFT COUPLING :** Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Flange coupling (Modified).

**TEXT BOOKS :**

1. Mech. Engg. Design / J.E. Shigley
2. Machine Design / Pandya And Shah

**REFERENCE BOOKS :**

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
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III Year B.Tech I Semester

ME3126

**THERMAL ENGINEERING - II**

**UNIT – I**

**Steam Power Plant :** Schematic layout – Rankine cycle, Methods to improve cycle performance – Regeneration & reheating – Boilers – Classification – Working principles – with sketches including H.P.Boilers) – Mountings and Accessories – Need for and Working principles – Boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

**UNIT – II**

**Steam Nozzles :** Function of nozzle, applications types, flow through nozzles, thermodynamic analysis, assumptions, velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape, super saturated flow, its effects, degree of super saturation and degree of under cooling, Wilson line.

**Steam condensers :** Requirements of steam condensing plant – Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump-cooling water requirement.

**UNIT – III**

Energy transfer between fluid and rotor – Euler's equation

**Steam Turbines :** Classification – Impulse turbine, mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blading or diagram efficiency – condition for maximum efficiency. De-Laval turbine, its features.

Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

**Reaction Turbine :** Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

**UNIT – IV**

**Gas Turbines :** Simple gas turbine plant – Ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating – effect on power and economy – closed and semi closed cycles – merits and demerits, compressors, combustion chambers and turbines – requirements of combustion chambers and types.

**UNIT – V**

**Jet Propulsion :** Principle of Operation – Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines, classifications – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – other Jet Engines, Working Principle – Nozzle Design Criteria.

**Rockets :** Application – Working Principle – Classification – Propellant Type – Thrust and Effective Jet Exit Velocity, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

**REFERENCE BOOKS :**

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2. Gas Turbines / Cohen, Rogers and Saravana Muttou / Addison Wesley – Longman
3. Thermal Engineering / Rajput / Lakshmi Publications

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech I Semester

ME3127

**MECHANICS OF SOLIDS, MECHANICS OF FLUIDS  
& HYDRAULIC MACHINES LAB**

**Note:** Any six of the following experiments from each section be conducted.

**Section A**

1. Tension Test
2. Bending Test
3. Torsion Test
4. Hardness Test
5. Spring Test
6. a) Compression Test on Wood and Concrete  
b) Impact Test
7. Shear Test
8. Deflection Test on Simple Beams
9. Demonstration of the following sophisticated Equipments :  
a) Strain Gauges and Strain Measuring Equipment  
b) Microprocessor based UTM / Compression Testing Equipment.

**Section B:****FLUID MECHANICS :**

1. Calibration of Venturi meter.
2. Calibration of Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Determination of friction factor for a given pipe line.
6. Calibration of a contracted Rectangular Notch.
7. Calibration of a Triangular Notch.

8. Determination of coefficient "C" and exponent "n" for a circular weir.
9. Determination of coefficient of loss of head in a sudden contraction of a pipe line.
10. Verification of Bernoulli's equation.

**HYDRAULIC MACHINES :**

1. Determination of the efficiency and specific speed of Pelton wheel turbine.
2. Efficiency of Francis Turbine and performance curves.
3. Performance test on Reciprocating pump.
4. Calculate the efficiency of hydraulic ram.
5. Determination of Coefficient of impact of jet on different Vanes like flat, inclined vanes, curved vanes.
6. Performance test on centrifugal pump.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech I Semester

ME3128

**PRODUCTION TECHNOLOGY LAB**

**I. Metals Casting Lab :**

- |                      |                 |
|----------------------|-----------------|
| 1. Moulding          | - 2 Exercises   |
| 2. Melting & Casting | - Demonstration |
| 3. Pattern Marking   | - 1 Exercise    |

**II. Welding Lab :**

1. Arc Welding :
  - a) Effect of polarity on weld strength & Heat affected zone
  - b) Effect of current on weld strength and Heat affected zone
2. Spot Welding – Effect of current on weld strength.
3. Gas welding and Brazing exercises.

**III. Mechanical Press Working :**

- 1) Blanking & Piercing operation & Study of simple Compound and progressive press tools.
- 2) Hydraulic Press : Deep Drawing and Extrusion Operations.
- 3) Bending and other operations.

**IV. Processing of Plastics :**

- 1) Injection Moulding
- 2) Blow Moulding

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3221

**MANAGEMENT SCIENCE**

(Common for all Branches)

**UNIT I :****Introduction to Management :**

Concepts of Management and Organisation – Functions of Management – Evolution of Management Thought : Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Mayo's Hawthorne Experiments, Herzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs – Systematic Approach to Management – Principles of Organisation – Types of Organisation, Types of Organisation Structure : Line Organisation, Functional Organisation and Line and Staff Organisation, Matrix Organisation – Managerial objectives – Social Responsibilities.

**UNIT II :****Introduction to Operations Management.**

Types of Plant layout – Methods of Production : Job, Batch and Mass Production.

Work-study : Basic Procedure involved in Method study and Work Measurement.

Statistical Quality Control.

Materials Management-Objectives of Inventory Control – EOQ-ABC Analysis- Purchase procedure – Stores Management and Stores Records.

Marketing : Marketing vs Selling, Marketing Mix, Stages in Product Life Cycle, Channels of Distribution.

**UNIT III :****Introduction to Human Resource Management (HRM)**

The concept of HRM, Human Resource Development (HRD) and Personnel Management & Industrial Relations (PMIR) HRM vs PMIR, Basic functions of HR Manager : Manpower Planning, Recruitment, selection, training, development, placement, wage and salary administration promotion, transfer, separation, performance appraisal, grievance handling and welfare administration, Job Evaluation and Merit Rating.

**UNIT IV :****Introduction to Strategic Management.**

Corporate Planning Process : Mission, goals, objectives, policy, strategy, programmes – Elements of Corporate planning process – Environmental Scanning : External Environment Analysis, Internal Environment Analysis, SWOT Analysis – Stages in Strategy Formulation and Implementation.

**UNIT V :****Introduction to PERT / CPM**

Network analysis – project management – Programme Evaluation and Review Technique (PERT) vs Critical Path Method (CPM) – Identifying critical path – Probability of completing the project within given time under PERT, Project cost analysis, project crashing.

**BOOKS FOR REFERENCE:**

1. Koontz and O' Donnel, Principles of Management, McGraw-Hill, 2001
2. Phillip Kotler, Marketing Manangement, PHI, 2002.
3. Gary Dessler, Human Resource Management, Pearson Education Asia, 2002.
4. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
5. W. Glueck & L.R. Jauch, Business Policy and strategic Management, McGraw-Hill, 1998.
6. A.R.Aryasri, Management Science for JNTU (B.Tech), Tata McGraw-Hill, 2002.
7. O.P.Khanna, Industrial Engineering & Management, Dhanpat Rai, 1999.
8. Chandra Bose, Management and Administration, Prentice Hall, 2002.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3222

**METROLOGY****UNIT – I**

**Systems of limits and fits :** Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard Institution system – British standard system, International Standard system for plain ad screwed work.

Application of suitable limits and tolerances – for correct functioning and economic manufacture and control of size during manufacturing and inspection.

**UNIT – II**

**LINEAR MEASUREMENT :** Length standard, line and end standard, slip gauges – calibration of the slip gauges, Dial indicator, micrometers.

**MEASUREMENT OF ANGLES AND TAPERS :** Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

**LIMIT GAUGES :** Taylors principle – Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

**UNIT – III**

**OPTICAL MEASURING INSTRUMENTS :** Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.

**FLAT SURFACE MEASUREMENT :** Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat, auto collimator.

**UNIT – IV**

**SURFACE ROUGHNESS MEASUREMENT :** Differences between surface roughness and surface waviness – Numerical assessment of surface finish – CLA, R, R.M.S Values –  $R_z$  values,  $R_{10}$  value, Methods of measurement of surface finish – profilograph. Talysurf, ISI symbols for indication of surface finish.

**UNIT – V**

**MEASUREMENT THROUGH COMPARATORS :** Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

**GEAR MEASUREMENT :** Brief treatment of the subject.

**SCREW THREAD MEASUREMENT :** Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

Machine Tool Alignment Tests : Brief Treatment of the subject

**TEXT BOOKS :**

1. Production Technology / R.K.Jain and S.C.Gupta.
2. Engineering Metrology / R.K. Jain / Khanna Publishers

**REFERENCE BOOKS :**

1. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Precision Engineering in Manufacturing / RL Murthy / New Age
3. Manufacturing engineering and Technology / Kalpakjian / Addison Wesley.

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HYDERABAD**

III Year B.Tech II Semester

ME3223

**MACHINE TOOLS****UNIT – I**

Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects chip breakers. Mechanics of orthogonal cutting – Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

**UNIT – II :**

Engine lathe – Principle of working, specification of lathe – types of lathe – work holders tool holders – Box tools, Taper turning, thread turning – for Lathes and attachments.

Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout.

Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes – tool layout and cam design. Kinematic scheme of the lathes.

**UNIT – III :**

Shaping slotting and planing machines – Principles of working – Principal parts – specification classification, operations performed. Kinematic scheme of the shaping slotting and planing machines, machining time calculations.

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine. Deep hole drilling machine. Kinematics scheme of the drilling and boring machines

**UNIT – IV :**

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling cutters.

**UNIT – V:**

Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel Kinematic scheme of grinding machines.

Lapping, honing and broaching machines – comparison to grinding – lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations – Principles of design of Jigs and fixtures and uses. Typical examples of Jigs and fixtures.

**TEXT BOOKS :**

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Production Technology by H.M.T. (Hindustan Machine Tools)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3224

**DYNAMICS OF MACHINES**

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

**PRECESSION :** Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

static and dynamic force analysis of planar mechanisms.

**UNIT – II**

**FRICTION :** Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis : lubricated surfaces, boundary friction, film lubrication, clutches.

**BRAKES AND DYNAMOMETERS :** Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operations.

**UNIT – III**

**TURNING MOMENT DIAGRAM AND FLY WHEELS :** Turning moment – Inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – Fly wheels and their design.

**GOVERNERS :** Watt, Porter and Proell governors. Spring loaded governors – Hartnell and hartung with auxiliary springs. Sensitiveness, isochronism and hunting.

**UNIT – IV**

**BALANCING :** Balancing of rotating masses Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples – examination of "V" multi cylinder inline and radial engines for primary and secondary balancing, locomotive balancing – Hammer blow, Swaying couple, variation of tractive efforts.

**UNIT – V**

**VIBRATION** : Free Vibration of mass attached to vertical spring – oscillation of pendulums, centers of oscillation and suspension. Transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method. Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems. Simple problems on forced damped vibration. Vibration Isolation & Transmissibility

**TEXT BOOKS :**

1. Theory of Machines / Robert L Norton/ Mc. Graw Hill Publ.
2. Theory of Machines / Jagadish Lal & J.M.Shah / Metropolitan

**REFERENCE BOOKS :**

1. Mechanism and Machine Theory / JS Rao and RV Dukkupati / New Age
2. The Theory of Machines Through Solved Example / JS Rao / New Age
3. Theory of Machines / Shiegly / MGH
4. Theory of Machines / Thomas Bevan / CBS Publishers

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3225

**DESIGN OF MACHINE MEMBERS – II**

(Common with Mech. Engg. – Production)

**NOTE** : Design Data Book Permitted.

Design of all components should include design for strength and rigidity apart from engineering performance requirements.

**UNIT – I**

**BEARINGS** : Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static of ball & roller bearings.

**UNIT – II****ENGINE PARTS :**

Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts.

Pistons, Forces acting on piston – Construction Design and proportions of piston.

**UNIT – III**

**MECHANICAL SPRINGS** : Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Design of co-axial springs, Design of leaf springs.

**PULLEYS** : Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types – Ropes – pulleys for belt and rope drives.

**UNIT – IV**

**GEARS** : Spur gears & Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of centre distance, module and face width, check for plastic deformation.

**UNIT – V**

Design of Power Screws : Design of screw, design of nut, compound screw, differential screw, ball screw.

**MACHINE TOOL ELEMENTS** : Design of beds, slide ways, spindles - Materials selection, design for strength and rigidity of parts.

**REFERENCE BOOKS :**

1. Machine Design / T.V. Sundaraja Murthy & N. Shanmugam
2. Machine Design / Sarma and Agarwal
3. Machine Design / Sadhu Singh.
4. Data Books : (I) P.S.G. College of Technology (ii) Mahadevan
5. Mech. Engg. Design / JE Shigley
6. Machine Design / Pandya & Shah
7. Design of Machine Tools / S.K. Basu

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3226

**HEAT TRANSFER****UNIT – I**

**Introduction** : Modes and mechanisms of heat transfer – Basic laws of heat transfer – Simple general discussion about applications of heat transfer.

**Conduction Heat Transfer :**

Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and

Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions.

**UNIT – II**

One Dimensional Steady State Conduction Heat Transfer :

Homogeneous slabs, hollow cylinders and sphere – overall heat transfer coefficient – electrical analogy – Critical radius of insulation – variable Thermal conductivity – systems with heat sources or Heat generation – extended surfaces and fins.

**One Dimensional Transient Conduction Heat Transfer :**

Systems with negligible internal resistance – chart solutions of transient conduction systems.

**UNIT – III****Convective Heat Transfer :**

Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham  $\Pi$  – Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – use of empirical correlations for convective heat transfer – Forced convection : Flat plates and horizontal pipes. Free convection : Vertical plates and pipes.

Concepts about hydrodynamic and thermal boundary layers – forced convection : flat plate and horizontal pipe, free convections : vertical plate.

**UNIT – IV :****Heat Transfer With Phase Change :**

Heat transfer with boiling – pool boiling – Condensation plates heat transfer : film wise and drop wise condensation – film condensation on vertical and horizontal cylinders using empirical correlations.

**Radiation Heat Transfer :**

Emission characteristics and laws of black-body radiation – incident radiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzman – heat exchange between two black bodies – concepts of shape factor – emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

**UNIT V****Heat Exchangers :**

Classification of heat exchangers – overall and fouling resistance – problems using LMTD and NTU methods.

**TEXT BOOK :**

Fundamentals of Engg. Heat Transfer and mass / R.C.SACHDEVA / New Age International

Companion Date – Book / Allowed In Exams :

Heat and Mass transfer data book / C.P.Kothandaraman / New Age

**REFERENCE BOOKS**

1. Heat Transfer / OZSIK
2. Heat Transfer / HOLMAN
3. A Course in Heat and Mass Transfer / SC Arora and Domkandwar / Dhanpatrai
4. A text Book on Heat Transfer / Sukhatme / University Press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3227

**METROLOGY & MACHINETOOLS LAB**

**Note:** Any six of the following experiments from each section be conducted.

**Section A**

1. Measurement of lengths, heights, diameters by vernier calipers micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine tool alignment of test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application.
7. Angle and taper measurements by Bevel protractor, Sine bars, etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Bevel protractor, Sine bars, etc.
10. Surface roughness measurement by Taly Surf.

**Section B:**

1. Introduction of general purpose machines – Lathe, Drilling machine, Milling machine, Shaper, Planning machine, slotting machine, Cyl. Grinder, surface grinder. And tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on – lathe machine
4. Drilling and Tapping
5. Shaping and Planning
6. Slotting
7. Milling
8. Cylindrical / Surface Grinding
9. Grinding of Tool angles.
10. Electro Discharge Machining / Ultrasonic Machining.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

III Year B.Tech II Semester

ME3228

**HEAT TRANSFER LAB**

1. Thermal Conductivity of given metal rod.
2. Stefan Boltzman Apparatus.
3. Critical Heat flux apparatus.
4. Composite Wall – Overall heat transfer co-efficient.
5. Heat transfer through lagged pipe.
6. Heat transfer in forced convection apparatus.
7. Heat transfer in natural convection
8. Thermal conductivity of Insulation powder.
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Study of heat pipe and its demonstration.
12. Heat transfer in pin-fin
13. Heat transfer in drop and film wise condensation.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4121

**OPERATIONS RESEARCH**

(Common with Mech. Engg. – Mechatronics and Mech.Engg. – Production)

**UNIT – I**

Development – Definition – Characteristics and Phases – Scientific method – Types of models – General methods for solving operation Research models.

**ALLOCATION :** Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables technique – Duality Principle.

**UNIT – II**

**TRANSPORTATION PROBLEM** - Formulation – Optimal solution, unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Traveling Salesman problem.

**SEQUENCING :** Introduction – Optimal solution for processing 'n' jobs through two machines and 'n' jobs through three machines – Processing two jobs through 'm' machines .

**UNIT – III**

**REPLACEMENT :** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

**THEORY OF GAMES :** Introduction – Minimax (maximum) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points.

**UNIT – IV**

**WAITING LINES :** Introduction – Single Channel – Poisson arrivals, exponential service times, unrestricted queue, with infinite population and finite population models – single channel, Poisson arrivals, exponential services times with infinite population and restricted queue – Multichannel, Poisson arrivals, exponential service times with infinite population and unrestricted queue.

**UNIT – V**

**INVENTORY :** Introduction – Single item – Deterministic models-Purchase inventory models with one price break, and multiple price breaks, shortages are not allowed – Stochastic models, demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand, and no set up cost.

**DYNAMIC PROGRAMMING :**

Introduction – Bellman's Principle of optimality – Solution of problems with finite number of stages.

**TEXT BOOK :**

1. Operations Research / Taha.

**REFERENCE BOOKS :**

1. Operations Research : Methods and Problems / Maurice Casoni, Arthur Yaspan and Lawrence Friedman
2. Operations Research / SD Sharma / Kedarath Ramnath, Meerut.
3. Operations Research / Wagner.
4. Operations Research / VK Kapoor / Sultan Chand, New Delhi.

**UNIT – IV**

Group Technology and Flexible manufacturing system : Part families, parts classification and coding. Production flow analysis, machine cell design, F.M.S. Workstations, Material handling and storage system, Computer control system, planning the FMS, analysis methods for flexible manufacturing system, Application of Group Technology and FMS.

**UNIT – V**

Computer Integrated production planning systems, computer aided process planning (CAPP), Computer aided quality control. MRP I and MRP II - Introduction to Concurrent Engineering

**TEXT BOOKS :**

1. Automation, Production Systems and Computer Integrated Manufacturing : / Mikell P. Groover.
2. CAD / CAM Theory and Practice / Ibrahim Zeid
3. Computer Control of Manufacturing Systems / Yoram Koren
4. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age

**REFERENCE BOOKS :**

1. Geometric Modelling / Mickel P. Mortenson / PHI
2. Numerical Control and Computre Aided Manufacturing / T.K. Kundra, P.N.Rao, N.K.Tewari / TMH
3. Computer Aided Manufacturing : T.K. Kundra, P.N.Rao, N.K.Tewari / TMH
4. CNC Machines / BS Pabla and M. Adithan / New Age.

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4122

**CAD / CAM**

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

Fundamentals of CAD, CAM, Automation, the design process, application of Computers for design, benefits of CAD, Computer configuration for CAD application, Computer peripherals for CAD Design workstation, graphic terminal.

CAD software, definition of system software and application software CAD database and structure.

**UNIT – II**

**Geometric Modelling :** wireframe models, wire frame entities and their definitions Interpolation and approximation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, B-spline.

**Surface modelling :** Algebraic and geometri form, parametric space of surface, blending functions. Surface Representation, composite surface, Bezier surface. B-spline surface.

**Solid Modelling :** Solid models, entities, fundamentals of solid modelling, sweep representation, constructive solid geometry, boundary representation.

**UNIT – III**

**NC Control Production Systems :** Numerical control, elements of NC system, NC part programming : methods of NC part programming, manual part programming, computer assisted part programming, processor, post processor, computerized part program, SPPL (A Simple Programming Language)

CNC, DNC Process optimization and adaptive control.

2002 – 2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4123

**AUTOMOBILE ENGINEERING**

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

**Introduction :** Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

Emission from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Noise Pollution & control.

**UNIT – II**

**Fuel System :** S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pump – filters – carburettor – types – air filters – petrol injection.

**C.I. Engines :** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps.

**UNIT – III**

**Cooling System :** Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

**Ignition System :** Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

**UNIT – IV**

**Electrical System :** Charging circuit, generator, current – voltage regulator – starting system, bende drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

**Transmission System :** Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel –

gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epycyclic gear box , over drive torque converter.

Propeller shaf – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

#### UNIT – V

**Steering System :** Stering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

**Suspension System :** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

#### UNIT – V

**Steering System :** Stering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

**Suspension System :** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

**Breaking System :** Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brakefluid, Pneumatic and vacuum brakes.

#### TEXT BOOKS :

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Sing.
2. Automotive Mechanics / G.B.S. Narang

#### REFERENCE BOOKS :

1. Automotive Engineering / Nuten Steeds & Havret
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

IV Year B.Tech I Semester

ME4124

### POWER PLANT ENGINEERING

#### UNIT – I

Introduction to the Sources of Energy → Resources and Development of Power in India.

**STEAM POWER PLANT :** Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, ash handling systems.

**COMBUSTION PROCESS :** Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

#### UNIT – II

##### INTERNAL COMBUSTION ENGINE PLANT :

**DIESEL POWER PLANT :** Introduction field of use – Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

**GASTURBINE PLANT :** Introduction – classification – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines.

**DIRECT ENERGY CONVERSION :** Solar energy Fuel cells, Thermo electric and Thermo ionic, MHD generation.

#### UNIT – III

**HYDRO ELECTRIC POWER PLANT :** Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hygrographs – storage and pondage – classification of dams and spill ways.

**HYDRO PROJECTS AND PLANT :** Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

**POWER FROM NON-CONVENTIONAL SOURCES :** Utilization of Solar Wind and Tidal Energies.

**UNIT – IV**

**NUCLEAR POWER STATION :** Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

**TYPES OF REACTORS :** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

**UNIT – V**

**POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS :** Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve.

Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises.

Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of pollution control.

**TEXT BOOKS :**

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. A Course in Power Plant Engineering : / Arora and S. Domkundwar.

**REFERENCE BOOKS :**

1. Power Plant Engineering : / F.T. Morse.
2. Power station Engineering and Economy / Skrotaki and Vopat.
3. An Introduction to Power Plant Technology / G.D. Rai.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4125

**REFRIGERATION AND AIR CONDITIONING (Elective – I)**  
(Common with Mech. Engg. – Mechatronics)

**UNIT – I**

**Introduction to Refrigeration:** - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigerations – Types of Ideal cycle of refrigeration.

Air Refrigeration : Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts air systems – Actual air refrigeration system – Refrigeration needs of Air crafts – Application of Air Refrigeration, Justification – Types of systems – Problems.

**UNIT – II**

Vapour compression refrigeration – working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – Representation of cycle on T-S Ph and h.s charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts – Problems.

Refrigerants – Desirable properties – common refrigerants used – Nomenclature.

**System Components :**

Compressors – General classification – comparison – Advantages and Disadvantages.

Condensers – classification – Working

Evaporators – classification - Working

Expansion devices – Types – Working

**UNIT – III**

Vapour Absorption System – Calculation of max COP – description and working of NH<sub>3</sub> – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features.

Steam Jet Refrigeration System – Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

**UNIT – IV****Introduction to Air Conditioning :**

Psychometric Properties & Process – sensible and latent heat loads – characterization and SHF – Need for Ventilation, Infiltration – concepts of RSHF, ASHF, ESHF and ADP.

Concept of human comfort and effective temperature – comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

**UNIT – V**

Air Conditioning systems, classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers.

Heat Pump – Heat sources – different heat pump circuits – Application.

**TEXT BOOKS :**

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanparaj

**REFERENCE BOOK :**

Principles of Refrigerations / Dossat / Wiley Eastern.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4126

**JET PROPULSION AND ROCKET ENGINEERING**

(Elective – I)

**UNIT – I**

Elements of Gas Turbine theory – Thermo dynamic Cycles, open closed and semi-closed – Parameters of performances – Refinements to simple cycle

**Jet Propulsion :** Historical sketch – Reaction Principle – Essential features of propulsion devices – Thermal Jet Engines, Classification of – Energy flow, thrust, thrust power and propulsion efficiency – Need for Thermal jet engines and applications

**UNIT – II**

Turboprop and Turbojet – Thermo dynamic cycles, Plant layout, essential components, principles of operation- performance evaluation – Thrust Augmentation and Thrust reversal – Contrasting with Piston Engine Propeller plant.

**UNIT – III**

Ramjet – Thermo dynamic Cycle, plant lay-out, essential components – Principle of operation – performance evaluation – Comparison among atmospheric thermal jet engines – Serqujet and pulse jet, elementary treatment of.

**UNIT – IV**

**Rocket Engines :** Need for, applications – Basic principle of operation and parameters of performance – Classification, solid and liquid Propellant rocket engines, advantages, domains of application – Propellants – Comparison of propulsion systems.

**UNIT – V**

**Rocket technology :** Flight mechanics, Application Thrust Profiles, Acceleration – staging of Rockets, need for – Feed systems, injectors and expansion nozzles – Rocket heat transfer and ablative cooling – Testing & Instrumentation – Need for Cryogenics – Advanced Propulsion Systems, elementary treatment of Electrical Nuclear and Plasma Arc Propulsion.

**TEXT BOOKS :**

1. Fundamentals of I.C. Engines /Gill, Smith and Zierys
2. Rocket Propulsion / Sutton.
3. Thermodynamics of Propulsion / Hill & Paterson

**REFERENCE BOOK :**

Gas Turbines / Cohen, Rogers & Sarvana Muttou / Addison Wesley & Longman

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4127

**NON-CONVENTIONAL SOURCES OF ENERGY**

(Elective – I)

**UNIT – I**

**INTRODUCTION :** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power.

**PRINCIPLES OF SOLAR RADIATION :** Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on tilted surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT – II**

**SOLAR ENERGY COLLECTION :** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**SOLAR ENERGY STORAGE :** Different methods, sensible, latent heat and stratified storage, solar ponds.

Solar applications, solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion.

**UNIT – III**

**WIND ENERGY :** Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

**BIO-MASS – Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, economic aspects.**

**UNIT – IV**

**GEOTHERMAL ENERGY :** Resources, types of wells, methods of harnessing the energy, potential in India.

O T E C : Principles, utilization, setting of OTEC plants, thermodynamic cycles.

**TIDAL AND WAVE ENERGY** : Potential and conversion techniques, mini-hydel power plants, their economics.

#### UNIT – V

**DIRECT ENERGY CONVERSION** : Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect; magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects.

Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

#### TEXT BOOKS :

1. Non- conventional Energy Sources / G.D. Rai
2. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
3. Non-Conventional Energy Systems / Km Mittal / Wheeler
4. Renewable Energy Technologies / Ramesh & Kumar / Narosa

#### REFERENCE BOOKS :

1. Renewable Energy Sources / Twidell & Weir
2. Solar Energy / Sukhame
3. Solar Power Engineering / B.S. Magal Frank Kreith & J.F. Kreith
4. Principles of Solar Energy / Frank Krieth & John F Kreider

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

IV Year B.Tech I Semester

ME4128

### UNCONVENTIONAL MACHINING PROCESS

(Elective – II)

(Common with Mech. Engg. – Mechatronics and Mech.Engg. – Production)

#### UNIT – I

**INTRODUCTION** – Classification of modern machining processes – considerations in process selection.

Mechanical process – Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

Abrasive jet machining, Water jet machining and abrasive water jet machine : Basic principles, machines of metal removal, process variables, application and limitations.

#### UNIT – II

**ELECTRO – CHEMICAL PROCESSES** : Fundamentals of electro chemical machining, electro-chemical grinding, electro chemical honing and electro chemical honing and electro chemical grinding, electro chemical honing and electro chemical deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

#### UNIT - III

**THERMAL METAL REMOVAL PROCESSES** : General Principle and applications of Electric discharge machining, electric discharge grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection.

**UNIT – IV**

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes – application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

**UNIT – V**

Basic Principle, limitations and applications of hydrostatic extrusion, radial extrusion, liquid forging – explosive forming electro-hydraulic forming and electro – magnetic forming methods.

**REFERENCE BOOKS :**

1. Modern Machining Process / Pandey P.C. and Shah H.S./TMH
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.
3. Developments in High Speed Metal Forming / Davies and Austin / The Machinery Publishing Co.Ltd. 1985.
4. Manufacturing Technology / Adithan and Gupta / New Age
5. Manufacturing Engineering and Technology / Kalpakjian / Addison Welsv.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4129

**PRODUCTION PLANNING AND CONTROL  
(Elective – II)**

**UNIT – I**

Introduction : Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

**UNIT – II**

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.

**UNIT – III**

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P-Systems and Q-Systems – Introduction to MRP & ERP, LOB (Line of Balance), JIT inventory, and Japanese concepts.

**UNIT – IV**

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading – Scheduling Policies – Techniques, Standard scheduling methods, Line Balancing, Aggregate planning, Chase planning, Expediting, controlling aspects.

**UNIT – V**

Dispatching – Activities of dispatcher – Dispatching procedure – followup – definition – Reason for existence of functions – types of followup, applications of computer in production planning and control.

**TEXT BOOKS :**

1. Elements of Production Planning and Control / Samuel Eilon.
2. Modern Production / Operations Management / Baffa & Rakesh Sarin.
3. Operations Management / Joseph Monks.

**REFERENCE BOOKS :**

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Production Control A Quantitative Approach / John E. Biegel.
4. Production Control / Moore.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4130

**AUTOMATION IN MANUFACTURE**

(Elective – II)

(Common with Mech. Engg. Mechatronics)

**UNIT – I**

Introduction Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and tool changing and machine tool control transfer the automaton.

Automated flow lines : Methods of work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

**UNIT – II**

Analysis of Automated flow lines : General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of klautomated flow lines.

Assembly system and line balancing : Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**UNIT – III**

Automated material handling : Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

Automated storage systems, Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

**UNIT – IV**

Adaptive control systems : Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

**UNIT – V**

Business process Re-engineering : Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

**REFERÉNCES :**

1. Automation, Production systems and computer integrated Manufacturing by M.P. Grover.
2. Computer control of Manufacturing systems by Yoram Coreom.
3. CAD / CAM/ CIM by Radhakrishnan.
4. Automation by W. Buekinsham.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

**IV Year B.Tech I Semester**

**ME4131**

**CAD / CAM LAB**

(Common with Mech. Engg. – Production and Mech. Engg.)

1. **Drafting** : Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.
  2. **Part Modeling** : Generation of various 3D Models through Protrusion, revolve shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.
  3.
    - a. Determination of deflection and stresses in 2D and 3D trusses and beams.
    - b. Determination deflections component and principal and Von-mises stresses in plane stresses in plane stress, plane strain and Axisymmetric components.
    - c. Determination of stresses in 3D and shell structures (at least one example in each case)
    - d. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
    - e. Study state heat transfer Analysis of plane and Axisymmetric components.
  4.
    - a) Development of process sheets for various components based on tooling Machines.
    - b) Development of manufacturing diffects and tool management systems.
    - c) Study of various post processors used in NC Machines.
    - d) Development of NC code for free from and sculptured surfaces using CAM packages.
    - e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
    - f) Quality Control and inspection.
- Packages** : Use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech I Semester

ME4132

**PRODUCTION DRAWING PRACTICE**

1. Format of drawing sheet, title block, columns for materials, processes, part list etc. Conventional representation of materials and parts (screwed joints, welded joints, springs, gears, elements of electrical and Pneumatic circuits, machine tool elements). Methods of indicating, notes on drawing.
2. **Limits and Fits** : Basic definitions of terms, alpha numeric designation of limits / fits. Types of fits. Exercises involving section / interpretation of fits and estimation of limits (from tables).
3. **Production Drawing** : Conventional practices of indicating tolerances on size and geometrical form, surface finish surface treatments. Part drawings from assembled drawings. Specification and indication of above features on the drawings.
4. Detailed working drawings of Mechanical Units like Tailstock, Screw Lock connecting rod assembly with indications limits, surface finish, heat treatment etc. the production planning sheets for manufacture of Industrial components.

**TEXT BOOKS :**

1. Engg. Metrology Sri R.K.JAIN, Khanna Publishers, 8<sup>th</sup> Edition. 1985
2. Production Drawing Prof. K.L.Narayana & Prof.P.Kannaiah;
3. Production Drawing Prof.P.N.Reddy, Prof T.A.J. Reddy and Sri C. Srinivasa Rao
4. Tolerances and finishes obtainable from different processes. Study of L.S.2709 on limits and fits and other relevant standards of surface finish Geometrical tolerances etc.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech II Semester

ME4221

**MECHANICAL HANDLING EQUIPMENT**

(Elective – III)

(Common with Mech, Engg. – Production)

**UNIT – I**

Types of industrial transport – classification and characteristics of materials – classification and selection of materials handling.

**UNIT – II**

Conveying equipment – classification of conveyors – description and uses of belt – conveyors – apron conveyors – Roller conveyors – Water – screw conveyors – pneumatic and hydraulic conveyors.

**UNIT – III**

Industrial trucks – main types – purpose of hand trucks – tractors and trailers – self propelled trucks – fork trucks.

**UNIT – IV**

Auxiliary equipment – Hoppers and gates – uses, auxiliary equipment – feeders – chutes – uses.

**UNIT – V**

Hoisting appliances – types, description and uses of chain – ropes – types and description and purpose of crane hooks – Grab buckets, lifts – excavators.

**REFERENCE BOOKS :**

1. Conveyors and Related Equipment / A. Spivakousky and V.Dyancheus.
2. Materials Handling Equipment / N. Rudenko.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech II Semester

ME4222

**FINITE ELEMENT METHODS**

(Elective – III)

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. Strain – Displacement relations. Stress – strain relations.

One Dimensional problems : Finite element modeling coordinates and shape functions. Potential Energy approach : Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

**UNIT – II**

**Analysis of Beams :** Element stiffness matrix for two node, two degrees of freedom per node beam element.

**UNIT – III**

Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions.

Finite element modelling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements.

Two dimensional four noded isoparametric elements and numerical integration.

**UNIT – IV**

Steady state heat transfer analysis : one dimensional analysis of a fin and two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

Dynamic Analysis : Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

**UNIT – V**

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation, Techniques such as semi automatic and fully Automatic Mesh generation Techniques : use of softwares such as ANSYS, CAEFEM, NISA NASTRAN etc. Comparison of commercially available packages.

**REFERENCE BOOKS :**

1. Introduction to Finite Elements in Engineering / Chandruputla, Ashok and Belegundu / Prentice – Hall
2. An introduction to Finite Element Method / JN Reddy / Mc Graw Hill
3. The Finite Element Methods in Engineering / SS Rao / Pergamon.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech II Semester

ME4223

**MICROPROCESSORS**

(Elective – III)

(Common with Mech. Engg. – Mechatronics and Mech.Engg. – Production)

**UNIT – I****8085 ARCHITECTURE :**

Introduction to Micro Processors and Micro-computers, Features of 8085 :  
Functional block diagram, registers, addressing modes.

**8086 ARCHITECTURE :**

CPU Architecture, internal operations, addressing modes, instruction formats,  
instruction execution, timing diagrams of 8086.

**UNIT – II****ASSEMBLY LANGUAGE PROGRAMMING :**

Assembler instruction format, data transfer instructions, arithmetic  
instructions, arithmetic instructions, branch instructions, Simple programs  
using the instruction set of 8086.

**UNIT – III****MODULAR PROGRAMMING :**

Linking and relocation, stacks, procedures, interrupts and interrupt routines,  
macros, program design and program design examples.

**UNIT – IV****BYTE AND STRING MANIPULATION :**

String instructions, REP prefix, text editor example. Table translation. Number  
format conversions.

**I/O PROGRAMMING :**

Fundamental I/O considerations, Programmed I/O and interrupt I/O. I/O  
design example.

**UNIT – V****INTERFACING : (WITH 8086)**

8255 PPI, Key board and display Interface, A/D and D/A converters, RS232C,  
USART.

8259,8237, Stepper motor, Floppy Disk controller, Transducers and actuators.

**REFERENCE BOOKS :**

1. Microprocessor Architecture Programming and Applications /  
Goankar, R.
2. Microcomputer Systems The 8086/8088 Family / Liu and Gibson /PHI.
3. The 8086 book / Rector, Rassel.
4. Microprocessor and Interfacing / Hall, Douglas. V / TMH

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech II Semester

ME4224

**NEURAL NETWORKS AND FUZZY LOGIC CONTROL**  
(Elective – IV)  
(Common for ECE, EIE, E Cont. E & B.M.E.)

**1. INTRODUCTION AND DIFFERENT ARCHITECTURES OF NEURAL NETWORKS :**

Artificial Neuron – MLP – Backpropagation – Hopfield Networks – Kohonen self-organising maps – Adaptive Resonance.

**2. NEURAL NETWORKS TO FUZZY LOGIC :**

Schemes of Neuro-control-Identification & control of dynamical systems-Case study.

**3. INTRODUCTION TO FUZZY LOGIC :**

Fuzzy sets – Fuzzy Relations – Fuzzy conditional statements – Fuzzy rules – Fuzzy algorithm-functional diagram.

**4. FUZZY LOGIC CONTROL SYSTEMS :**

Fuzzy logic controller – Fuzzification interface – Knowledge base – Decision making logic – Defuzzification interface – Design of Fuzzy logic controller – Case study.

**5. NEURO-FUZZY CONTROL :**

Adaptive fuzzy systems – Optimization of membership function and rule base of fuzzy logic controller using Neural Networks – fuzzy neuron – Case study.

**REFERENCE BOOKS :**

1. Klir G.J., and T.A., Fuzzy sets, uncertainty and Information, Prentice Hall of India, New Delhi, 1994.
2. Simon Hayking, Neural Network, ISA, Research triangle Parke, 1995.
3. Kosko b., Neural Networks and Fuzzy systems : A Dynamical approach to machine Intelligence, Prentice Hall, USA, 1992.
4. Hertz j., Korgh A., and Palmer R.G. Introduction to the Theory of Neural Computation Addison – Wesley Publishing Co., California, 1991.
5. Nie & Linkers : Fuzzy Neural Control : Principles, Algorithms and Applications, PHI, 1998.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD**

IV Year B.Tech II Semester

ME4225

**ROBOTICS**  
(Elective – IV)

(Common with Mech. Engg. – Mechatronics and Mech.Engg. – Production)

**UNIT – I**

**Introduction :** Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

**UNIT – II**

**Components of the Industrial Robotics :** Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

**UNIT – III**

**Motion Analysis :** Homogeneous transformations as applicable to rotation and translation – problems.

**Manipulator Kinematics :** Specifications of matrices, D-H notation joint coordinates and world coordinates 0 Forward and inverse kinematics – problems.

**UNIT – IV**

Differential transformation and manipulators, Jacobians – problems. Dynamics : Lagrange – Euler and Newton – Euler formations – Problems.

**UNIT V**

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion.

**Robot actuators and Feed back components :**

Actuators : Pneumatic, Hydraulic actuators, electric & stepper motors.  
 Feedback components : position sensors – potentiometers, resolvers, encoders – Velocity sensors.

**REFERENCE BOOKS :**

1. Industrial Robotics / Mikell & P. Groveer & Mitchell Wesis / MGH
2. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Robot Dynamics and Controls / Spong and Vidyasagar / John Wiley
4. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
5. Introduction to Robotics / John J Craig / Addison Wesley.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
 HYDERABAD**

IV Year B.Tech II Semester

ME4226

**COMPUTER GRAPHICS (Elective – IV)**

(Common with Mech. Engg. – Mechatronics and Mech. Engg. – Production)

**UNIT – I**

**Geometry and line generation :** Points, Lines, Plances, Pixels and frame buffers, types of Bresenham's algorithm for circle generations, algorithm for display devices, DDA and Brasenham's Line Algorithms for eclipse eclipse generation character generation. Aliasing and Antialisaing.

**UNIT – II**

**Graphics Primitives :** Display Files, Display processors, Algoritm for polygon generation, polygon filling algorithms, NDC (Normalised device co-ordinates), Pattern filling, 2D Transformations : scaling, Rotation, translation, homogeneous co-ordinates, rotation about arbitrary point reflections, Zooming.

**UNIT – III**

Segment tables, operations on segments, data strutures for segmets and display files :

Windowing and clipping : Window, Viewport, Viewing transformation, Viewing transformation, clipping line and polygon clipping, generalized clipping, multiple windowing.

**UNIT – IV**

**3D Graphics :** 3D Primitives, 3D Transformations, Projections, Parallel, perspective, isometric, viewing transformation, Hidden surfaces and line removal, painters algorithm, Z buffers, Warnaks algorithm, shading algorithms, 3Dclipping.

**UNIT – V**

**Curves and surfaces :** Generation of curves and surfaces using Hermite, Beziereand B-spline, sweeping method of interpolation.

**Raster Graphics Architecture :** Simple Raster-display system, Display processors system, Standard graphics pipeline, multiprocessor Rasterization Architecture, Pipeline and parallel front end architecture.

**TEXT BOOKS :**

1. Procedure Elements for Computer Graphics Dvaid F Rogers – TMH.
2. Computer Graphics Principles and Practice / Foley,  
Vandam Feiner & Huges / Addison Wesley
3. Principles of Interactive Computer Graphics / Newman & Sprouu
4. Mathematical Elements for Computer Graphics / David F Rogers  
and Adams.

**SUBJECT CODE: ME 4227**

**PROJECT**