

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

MECHANICAL (MECHATRONICS)
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 sessionals 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 department 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. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
- 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 the consecutive regular and supplementary examinations of I year and from the regular examination of II year I 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 one supplementary examinations of II Year I Semester
 - c. One regular and one supplementary examinations of II Year II Semester
 - d. One regular III year I 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:

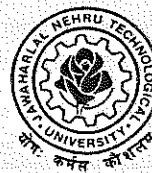
The minimum instruction for each semester / 1 year shall be 90/180 working days excluding examination days.

- 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 fulfills the academic requirements of 44 credits from the examinations following

- a. Two regular and one supplementary examinations of II Year I Semester

- b. One regular and one supplementary examinations of II Year II Semester

- c. One regular III year I 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:

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

I YEAR B.Tech.

Mechanical Engineering (MECHATRONICS)

NOTATION:

ME=Mechanical Engineering;

MP= Mechanical Engineering (Production)

MC= Mechanical Engineering(Mechatronics)

B.Tech-I(Mechanical Engineering-Mechatronics): Yearly Pattern
 [Common for B.Tech-I (Mechanical Engineering) &
 B.Tech-I (Mechanical Engineering-Production)]

COURSE STRUCTURE

CODE	SUBJECT	T	P	D	C
MC 1021	English	3	0	0	6
MC 1022	Mathematics-I	3+1*	0	0	6
MC 1023	Engineering Physics	2+1*	0	0	4
MC 1024	Engineering Chemistry	2	0	0	4
MC 1025	Engineering Mechanics	2+1*	0	0	6
MC 1026	Introduction to Computers	3	0	0	6
MC 1027	Engineering Graphics	0	0	6	8
MC 1028	Engineering Physics Lab	0	3/2*	0	2
MC1029	Fuels &Lubricants Lab	0	3/2	0	2
MC 1030	Computers Lab	0	6	0	8
MC 1031	Work Shop	0	3	0	4
Total	15+3*	12	6	56	

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

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)

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II YEAR B.Tech: Semester-I

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Comm o n With	Comm o n With	T	P	D	C
MC 2121	Mathematics-II	ME 2121	MP 2121	4	0	0	4
MC 2122	Data Structures through C	ME 2122	MP 2122	4	0	0	4
MC 2123	Mechanics of Solids	ME 2222	MP 2222	4	0	0	4
MC 2124	Electrical engineering	ME 2123	MP 2123	4	0	0	4
MC 2125	Thermodynamics & Fluid Mechanics	-----	MP 2125	4	0	0	4
MC 2126	Machine Drawing	ME 2126	MP 2126	0	0	6	4
MC 2127	Data Structures	ME 2127	MP 2127	0	3	0	2
MC 2128	Lab Mechanics of Solids & Electrical engineering lab	-----	-----	0	3	0	2
		Total		20	6	6	28

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech: Semester-II

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Comm o n With	Comm o n With	T	P	D	C
MC 2221	Probability & Statistics	ME2221	MP2221	4	0	0	4
MC 2222	Computer Graphics	ME4226	MP4226	4	0	0	4
MC 2223	Managerial economics & Financial Analysis	ME3121	MP3121	4	0	0	4
MC 2224	Electronic Devices & Circuits	-----	-----	4	0	0	4
MC 2225	Metallurgy & Material Science	ME2224	MP2223	4	0	0	4
MC 2226	Thermal Engineering & Heat Transfer	-----	-----	4	0	0	4
MC 2227	Electronic Devices & Circuits Lab	-----	-----	0	3	0	2
MC 2228	Metallurgy & Computers Graphics Lab	-----	-----	0	3	0	2
		Total		24	6	0	28

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech: Semester-I

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Comm on With	Comm on With	T	P	D	C
MC 3121	Management science	ME 3221	MP 3221	4	0	0	4
MC 3122	Finite Element Method	ME 4222	MP 4222	4	0	0	4
MC 3123	Digital Electronics	---	---	4	0	0	4
MC 3124	Linear & digital I.C Applications	---	MP 2123	4	0	0	4
MC 3125	Kinetics of Machines	ME 3124	MP 3124	4	0	0	4
MC 3126	Manufacturing Technology	---	---	4	0	0	4
MC 3127	Linear & Digital I.C Lab	---	---	0	3	0	2
JC 3128	Thermal Engineering & Heat Transfer Lab	----	----	0	3	0	2
				Total	24	6	0 28

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

III Year B.Tech: Semester-II

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Comm on With	Comm on With	T	P	D	C
MC 3221	Microprocessors	--	MP 3122	4	0	0	4
MC 3222	Instrumentation & Control Systems	ME 2225	MP 2224	4	0	0	4
MC 3223	Dynamics of Machines	ME 3224	MP 3222	4	0	0	4
MC 3224	Principles of Machine Design	-----	-----	4	0	0	4
MC 3225	Advanced Manufacturing	-----	-----	4	0	0	4
MC 3226	Automobile Engineering	ME 4123	MP 4123	4	0	0	4
MC 3227	Microprocessors Lab	-----	-----	0	3	0	2
MC 3228	Instrumentation & Control systems Lab	-----	-----	0	3	0	2
				Total	24	6	0 28

2002-2003

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech: Semester-I

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Commoo n With	Commoo n With	T	P	D	C
MC 4121	Operations Research	ME 4121	MP 4121	4	0	0	4
MC 4122	CAD/CAM	ME 4122	MP 4122	4	0	0	4
MC 4123	Robotics	ME 4225	MP 4225	4	0	0	4
MC 4124	Motion Control Design	----	----	4	0	0	4
ELECTIVE-I				4	0	0	4
MC 4125	Product Design & Assembly automation	-----	-----	-	-	-	-
MC 4126	Computer Organisation	-----	-----	-	-	-	-
MC 4127	Non Conventional Sources of Energy	ME 4127	MP 4127	-	-	-	-
ELECTIVE-II				4	0	0	4
MC 4128	CIM & FMS	-----	-----	-	-	-	-
MC 4129	Production Planning & control	ME 4129	ME 4124	-	-	-	-
MC 4130	Advanced Kinematics & Dynamics of Machines	---	---	-	-	-	-
MC 4131	CAD/CAM Lab	-----	-----	0	3	0	2
MC 4132	Motion control CNC and Robotics Lab	-----	-----	0	3	0	2
Total							
24 6 0 28							

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech: Semester-II

Mechanical Engineering (MECHATRONICS)

COURSE STRUCTURE

CODE	SUBJECT	Commoo n With	Commoo n With	T	P	D	C
ELECTIVE -III		-----	-----	4	0	0	4
MC 4221	Mechanical Handling Equipment	ME 4221	MP 4221	-	-	-	-
MC 4222	Cocurrent engineering	-----	-----	-	-	-	-
MC 4223	Industrial Electronics	-----	-----	-	-	-	-
ELECTIVE-IV				4	0	0	4
MC 4224	Neural Networks & Fuzzy Logic	ME 4224	MP 4224	-	-	-	-
MC 4225	Systems Simulation & Modelling	-----	-----	-	-	-	-
MC 4226	Entrepreneurship & Management	-----	-----	-	-	-	-
MC 4227	Project	-----	-----	-	-	-	8
Total							
8 - - 16							

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

I Year B.Tech.

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MC 1021

**ENGLISH
(Common for 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. Bhattacharjee (a profile from the Institution Builders in Masterminds, OL).

UNIT IV:

1. Environment, Unit 1: 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 Mason (OL).

- 2002-2003
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 nd edition by Andrea J. Rutherford, (Pearson Education Asia).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

I Year B.Tech.

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MC 1022

MATHEMATICS – I

(Common with Mech. 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
nd Company
gineering Mathematics
2. V. Ramana, Tata McGraw_Hill 2002
ngineering Mathematics – I
3. Sanakraiah, Vijaya Publications-2002
ngineering Mathematics – I - 2002
4. Nageswara Rao, Y. Narsimhulu, Prabhakara Rao

ERENCES :

1. gineering 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.

ENGINEERING PHYSICS

(common with Mech.Engg – Mechatronics)

Unit –I:

(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.

(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.

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

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(A) Thermal properties: Specific heat of solids – Einstein model, Phonons – Thermal conductivity – Thermal expansion – Thermoelectric effect-thermo-analyzes –thermo-gravimetry – Thermo-mechanical analysis.

(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

(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.

(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.

ENGINEERING CHEMISTRY

(common with Mech.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 – Roxn 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.

ENGINEERING MECHANICS
(Common with Mech.Engg. and 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, and Differential Screw-
jack.

Transmission of Power: Belt Drive : 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 Curvilinear 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 :Impulse momentum 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 / Fединанд . 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. Askhevkar
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.

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MC 1026

INTRODUCTION TO COMPUTERS

(common with Mech.Engg. and 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 CIRC / 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 operation systems, Number Systems, Binary, Hex, Octal, BCD Code, Character Codes, 3 methods of binary representation, of integers, floating point numbers.

UNIT – II: Computer Programming :

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 Jordon and Gauss Siedel's methods, algorithms.

UNIT – V: Numerical Methods – II :

Interpolation, Language interpretation, 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, 4th Edn/PHI.
2. Programming in ANSI C / E Balagureswamy.
3. Computer Oriented Numerical Methods / V Rajaraman.
4. Programming in C/D. Ravichandra / New Age.

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MC 1027

ENGINEERING GRAPHICS
(common with Mech. Engg. and 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

- Conic Sections including the Rectangular Hyperbola – General method only.
- Cycloid, Epicycloid and Hypocycloid
- 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 Point 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 method (General Method only)

TEXT BOOKS :

- Engineering Drawing Narayana and Kannaiah / Scitech publishers.
- Engineering Drawing N.D. Bhat / Charotar
- Engineering Drawing and Graphics Venugopal / New age.

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I Year B.Tech.

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MC 1028

ENGINEERING PHYSICS LAB

(Common with Mech.Engg. and 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 (Meldé'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.

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MC 1029

FUELS AND LUBRICANTS LAB

(Common with Mech.Engg. and 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 Calorific Value : Solid/Liquid/Gaseous Fuels
5. Greese Penetration Test.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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MC1030

COMPUTER PROGRAMMING LAB

(Common for EEE, ECE, EIE, EContE, ICE, CSE, IT, CSSE,
ETM, ECM, BME)

1. Write a C program that evaluates the following algebraic expressions after reading necessary values from the user:
 - a) $ax+b/ax-b$
 - b) $2.5 \log x + \cos 32^{\circ} + |x^2 - y^2| + \sqrt{2xy}$
 - c) $1/\alpha\sqrt{2\pi} e^{- (x-m)/\sqrt{2\sigma^2}}$
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) $1 + x^2/2! + x^4/4! + \dots$ upto ten terms
 - d) $x + x^3/3! + x^5/5! + \dots$ upto 7th 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/sec¹) and acceleration (m/sec²). Write C program to find the distance traveled at 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
2 2
3 3 3
4 4 4 4
5 5 5 5 5

1
2 2
3 3 3
4 4 4 4
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.

13. 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 covert all lower case characters into their upper case equivalents.
15. Implement the following data structures using Arrays (i) Stacks (ii) Linear Queues (iii) Circular queues (iv) Dequeue.
16. Implement polynomial addition and multiplication with linked list sparse matrix.
17. Implement binary search tree using linked list and perform the following operations. (i) Insertion (ii) Deletion (iii) Inorder Traversal (iv) Preorder Traversal (v) Post Order Traversal.

18. Singly linked list and doubly linked lists (i) Insertion (ii) Deletion (iii) Lookup
19. (i) Implement stack using singly linked list. (ii) Implement queue using singly linked list.
20. Implement the following sorting techniques (i) Bubble sort (ii) Insertion Sort (iii) Quick Sort (iv) Heap Sort.
21. Implement the following searching method. (i) Sequential Search (ii) Binary Search (iii) Fibonacci
22. (i) Conversion of Infix expression to Postfix notation. (ii) Simple expression evaluator, that can handle +,-,/ and *.
23. Implement the algorithms for the following iterative methods using C to find one root of the equation $f(x)=x \sin x + \cos x=0$.
 a) Bisection (b) False Position (c) Newton-Raphson
 d) Successive approximation.
24. Write programs for implementing Gauss-Jordan and Gauss-Seidal methods for solving simultaneous algebraic equations given below.
- $$9x_1+2x_2+4x_3 = 20$$
- $$x_1+10x_2+4x_3 = 6$$
- $$2x_1-4x_2+10x_3 = -15.$$
25. Write Computer programs to implement the Lagrange interpolation and Newton-Gregory forward interpolation.
26. Implement in 'C' the linear regression and polynomial regression algorithms.
27. Implement Trapezoidal and Simpson methods.
28. Practice of exercises (in text book 2 of theory) related to:
 a) Word 2000 Chapter 7, 8, 9. (b) Excel 2000 Chapter 12, 13. (c) Power point- 2000 Chapter 15, 16. (d) Access 2000 Chapter 18,19. (e) Outlook 2000 Chapter 21,22,23. (g) FrontPage 2000 Chapter 25

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MC 1031

W O R K S H O P
(Common with Mech.Engg and Mechatronics)

I. TRADES FOR EXERCISES :

(Minimum of THREE exercises in each Trade)

1. Carpentry & Pattern Making
2. Fitting
3. Tin-Smythy
4. Black Smithy
5. House-wiring
6. Foundry

II. Trades for Demonstration & Exposure

1. Plumbing
2. Welding
3. Machine Shop

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech. Semester - I 4 – 0 – 0 – 4

MC 2121

Mechanical Engineering (MECHATRONICS)

MATHEMATICS – II

4 Periods/Week (Common to all Branches)
4 Credits

Effective for the batches admitted in the year 2002 and onwards.

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 – Diagnolization of matrix. Calculation of powers of matrix – Modal and sprectral matrices. Real matrices – Symmetric, skew-symmetric, orthogonal. Linear Transformation – Orthogonal Transfromation. 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. 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. Narsimulu, Prabhakar Rao

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 Kreyszig John Wiley & Sons (ASIA) Pvt. Ltd. – 2001
3. Advanced Engineering Mathematics (Second edition)
Michael D. Greenberg, Prentice Hall, Upper Saddal River, New Jersey – 1998.
4. Sarveswara Rao Konery Engineering Mathematics
Orient Longman (Pvt.) Ltd. 2002
5. Engineering Mathematics – II
N.P. Bali, Laxmi Publications (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 2122

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 transversals, 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.

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II Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 2123

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 & Thick Cylinders

Thin seamless cylindrical shells – Derivation of the formula for hoop stress and longitudinal stress – Hoop strain and longitudinal strain. Wire wound thin cylinders. Thick cylinders – Lame's equation – Hoop stress and radial stress distribution – Compound cylinders – shrink fit stresses.

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. Columns and struts :

Derivation and use of Euler's formula and Rankine's formula.

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. Semester - I 4 – 0 – 0 – 4 MC 2124

ELECTRICAL ENGINEERING

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

UNIT – I

SI Unit's law, series, and parallel circuits, Kirchhoff's 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 O Speed control.

UNIT – IV

Construction and principle of operation of single phase transformer – emf equation O.C. & S.C. tests – efficiency and regulation – 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, 2nd edition / Prentice Hall Publishers
2. Fundamental of Electrical Engineering / Ashfaq Husain, 2nd 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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,
HYDERABAD**
II Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 2125
THERMODYNAMICS & FLUID MECHANICS**UNIT – I**

Introduction : Basic Concepts of System, Control Volume, Surroundings, Boundary, Universe, Types of systems, Macroscopic and Microscopic views, concept 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 functions.

ZEROETH LAW OF THERMODYNAMICS – concept of Equality of Temperature – Principles of thermometry – Reference points – Const. Volume Gas Thermometer - Scales of Temperature Ideal Gas Cal.

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 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, cannot cycle and its specialties, thermodynamic scale of Temperature, Clausius statement of Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Available Energy- Unavailable Energy, Availability and Irreversibility – Thermodynamic potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of thermodynamics.

UNIT – III

Thermodynamic Cycles : Otto, Diesel, Dual-Combustion cycles – Description and Power Cycle representation of p-V and

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T-s diagrams, Thermal Efficiency, Mean Effective Pressures on Airstandard basis – comparison of cycles.

Joule and Rankine cycles – Performance, Evaluation – combined cycles.

Refrigeration Cycles : Bell – Coleman cycle, Reversed Brayton Cycle, Vapour compression cycle – performance Evaluation.

UNIT – IV

Physical properties of fluids, Measurement of pressure. Introduction to fluid mechanics, statics, kinematics and dynamics.

FLUID KINEMATICS : Stream line, path line and streak lines and stream tube, Classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent. Rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – Stream and velocity potential functions – Flow net analysis.

UNIT – V

FLUID DYNAMICS : Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line. Momentum equation and its applications – Boundary layer along a thin flat plate – Separation of boundary layer – Drag and lift. Flow measurement by pitot tube venturi meter and orifice meter.

TEXT BOOKS

1. Thermodynamics & Heat Engines / Yadav – Venital Book De.Alkhabd
2. Engineering Thermodynamic / PKNag / Tata McGraw Hill
3. Heat Transfer/PK Nag
4. Fundamentals of Engineering Thermodynamics/E.Ratha Krishnan/Prentice-Hall India Ltd.
5. fundamentals of Engineering Thermodynamics / Michael J Moran / John Wiley & Sons

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6. Introduction to Thermodynamics /YVC Rao/New age International

7. fundamentals of Thermodynamics/Sonntag,Borgnakka/John weiley & sons

REFERENCE BOOKS :

1. Engineering Thermodynamic with applications / Burghardt. Hamps
2. Fluid Mechanics / Modi and Seth
3. Fluid Mechanics / A.K.Jain
4. Fluid Mechanics/Victor L Streeter/McGraw Hill

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

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) Riveted 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

II Year B.Tech. Semester - I 0 – 3 – 0 2 MC 2127

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. Singly linked list and doubly linked lists.
 - a) Insertion
 - b) Deletion
 - c) Loop up
5. a) Implement stack using singly linked list
 - a) Implement queue using singly linked list.
 - b) Implement the following sorting techniques.
 - c) Bubble sort
 - d) Insertion Sort
 - e) Quick Sort
 - f) A cap Sort.
6. Implement the following searching method
 - a) Sequential Search
 - b) Binary Search
 - c) Fibnacci Search
7. a) Conversion of Infix expression to post fix notation.
 - b) Simple expression evaluation, that can handle : +, -, / and *

II Year B.Tech. Semester - I 0 – 3 – 0 – 2 MC 2128

MACHANICS OF SOLIDS LAB & ELECTRICAL ENGINEERING LAB

MACHANICS OF SOLIDS LAB

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

1. Tension Test
2. Bending Test
3. Torsion Test
4. Hardness Test
5. Spring Test
 - 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) Microprocesor based UTM / Compression Testing Equipment.

ELECTRICAL ENGINEERING LAB

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

The following experiments are required to be conducted as 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
 - g) Armature Voltage control motor by
 - h) Field flux control method
6. Magnetization characteristics of D.C. Shunt generator and determination of critical field resistance.
7. Brake test on D.C. Compound motor. Determination of performance characteristics.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

II Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 2221

PROBABILITY AND STATISTICS

(Common to Computer Science, Civil and Mechanical Engineering)

Effective for the batches admitted in the year 2002 and onwards.

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, χ^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, 6th 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. Semester - II 4 – 0 – 0 – 4 MC 2222

COMPUTER GRAPHICS

UNIT – I

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

UNIT – II

Graphics Primitives : Display Files, Display processors, Algorithm 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 structures for segments 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, Bezier and 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 David F Rogers – TMH.
2. Computer Graphics Principles and Practice / Foley, Vandam Feiner & Hughes / Addison Wesley
3. Principles of Interactive Computer Graphics / Newman & Sproull
4. Mathematical Elements for Computer Graphics / David F Rogers and Adams.

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II Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 2223

**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, Prentice Hall of India, 12th Edition, 2002.
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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 2224

ELECTRONIC DEVICES AND CIRCUITS

UNIT – I

SEMICONDUCTOR DIODES AND RECTIFIERS

Semiconductors – P&N junction, junction diode V-I characteristics of Si and Ge diodes and its temperature dependence. Diffusion and Transition capacitance of a p-n junction diode, varactor diode. Breakdown of junctions on reverse bias – Zener and avalanche breakdowns, Zener diode and its V-I characteristics, application as regulator. Tunnel diode and V-I characteristics, applications. Diode as a rectifier-Half wave, full wave and bridge rectifiers. Basic filter circuits, Ripple factor. Problems on rectifier circuits.

UNIT – II

TRANSISTOR CHARACTERISTICS

BJT-PNP AND NPN junction transistor, BJT operation and characteristics in CB, CE and CC configurations. FET-JFET operation, JFET static characteristics. MOSFET – Enhancement and depletion modes. UJT – operation, characteristics and applications.

UNIT – III

TRANSISTOR AMPLIFIERS

Transistor biasing and thermal stabilization. BJT transistor modeling – Hybrid model and r_e model. Graphical determination of h parameter. BJT small signal analysis using h parameters – Single stage transistor amplifier circuits. Comparison of CB, CE and CC configurations, emitter follower amplifier, compound connections like cascade, cascode, darlington. R-C coupled amplifier-Low and high frequency response effect of cascading on frequency response of an amplifier. High frequency transistor model-Hybrid Π model, f_α and f_β cut off frequencies concept of gain and bandwidth product.

UNIT – IV
FET AMPLIFIERS

FET biasing. FET small signal analysis – FET small signal model, Analysis of single stage amplifier in CS, CD and CG configuration, Frequency response R-C coupled FET amplifier, FET applications and comparison of FET and BJT amplifiers.

UNIT – V
FEEDBACK AMPLIFIERS AND OSCILLATORS

Concept of feedback, classifications of feedback amplifiers, General characteristics of negative feedback amplifiers, effect of feedback on amplifier characteristics, Simple problems.

Positive feedback, conditions for oscillations, RC & LC type oscillators, crystal oscillators, frequency and amplitude stability of oscillations, Analysis of Hartley, Colpitts, R-C phase shift and Wein Bridge oscillations.

TEXT BOOKS :

1. Integrated Electronics by Millman & Halkias – Tata Mc Graw Hill.
2. Electronic devices & Circuit Theory by Robert, L. Boylestad, Louis Nashelsky – Prentice Hall Ltd.
3. Principles of Electronics by V.K. Mehta-S. Chand.
4. Electronic Devices and Circuits, by Y.N. BAPAT, - Tata Mc. Graw Hill.
5. Prepared by – Mrs. Mangala Joshi, Lecturer, MGIT Hyderabad.

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II Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 2225

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 Bravais 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-Fe₃C.

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 plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – III

HEAT TREATMENT OF ALLOYS : Effect of alloying elements on Fe-Fe₃C system, Annealing, normalizing, Hardening, TTT DIAGRAMS tampering, Hardenability surface hardening methods, Age hardening treatment.

2002-2003

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, ceramics, glasses, cermets, abrasive materials.

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. Avner.
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 Materials Science / Singh

2002-2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

II Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 2226

THERMAL ENGINEERING & HEAT TRANSFER (Common with and Mech. Engg. – Production)

UNIT – I :

I.C. ENGINES : General, Thermodynamic cycles, engine mechanism, mechanical cycles, Two and Four stroke cycles – Engine classification – Cycle analysis, Otto diesel and dual Combustion cycles Ideal. Air and actual cycles.

Fuel System : Fuels uses, Modes of fuel admission to engine cylinder, Induction and Injection, Chemically correct F/A ratio. Flammability limits in homogeneous mixtures.

UNIT – II :

S.I. ENGINES : Mixture requirements, simple carburetor, limitations, Need for auxiliary systems and their working.

C.I. ENGINES : Requirement of fuel admission, fuel pump and injector, Types of fuel injection systems, Working of fuel injection pump and injector – Nozzles and type.

Introduction to Cooling, Lubrication and super charging systems.

UNIT – III :

ENGINE TESTING : Parameters of performance, measurement of cylinder pressure, Fuel consumption, Air intake, Brake Power, determination of frictional losses. Indicated power, performance Test, Heat Balance.

Gas Turbines : Introduction, Thermodynamic cycles, schematic layout, Open, Closed and Semi-closed cycles – Parameters of performance – Methods of Improving Gas Turbine performance – Intercooling, Reheating and Regeneration – Fields of Application.

UNIT – IV :

Introduction : Modes of heat transfer, Mechanism of heat transfer, Basic laws of heat transfer.

CONDUCTION : Fourier heat conduction equation, general heat conduction equation, initial and boundary conditions, conduction through homogeneous slab, cylinder and sphere.

2002-2003

UNIT – V :

CONVECTION : Dimensional analysis, Rayleigh and Buckingham methods applied to heat transfer, Non-dimensional numbers in heat transfer.

Boundary layer concept, concept of stagnant film, Reference temperature for evaluation of fluid properties. Forced convection of laminar flow inside ducts and over bodies. Local and average heat transfer coefficients.

RADIATION : Emissions characteristics and laws of Black body radiation. Incident radiation, Total and Monochromatic quantities. Laws of black, Wien, Kirchoff, Lambert, Stephan and Boltzman. Heat exchange between two blank bodies, concept of shape factor, Emissivity. Heat exchange between grey bodies.

TEXT BOOKS :

I.C. Engines : Ganesan, Tata Mc Graw Hill

I.C. Engines : Mathur and Sharma, Dhanapatri and Sons

Fundamentals of Engg. Heat Transfer :

R.C. Sachdev

Heat Transfer : Ozisik

Fundamentals of Engg. Heat & mass transfer Frank P Incroperk, David P Dewit/John weily & sons

Heat transfer principles & Applications /Binay K dutta/Prentice Hall

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,
HYDERABAD

II Year B.Tech. Semester - II 0 – 3 – 0 – 2 MC 2227

ELECTRONIC DEVICES AND CIRCUITS LABS

1. PN junction diode characteristics
 - a) forward bias
 - b) reverse bias
2. Zener diode characteristics
3. Transistor CE characteristics (Input and Output)
4. Rectifier without filters (Full wave & Half wave)
5. Rectifier with filter (Full wave & Half wave)
6. FET characteristics
7. Study of CRO
8. Common emitter (CE) amplifier
9. Feed back amplifier
10. RC Phase shift Oscillator
11. RC coupled amplifier (Two stage)

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HYDERABAD**

II Year B.Tech. Semester - II 0 – 3 – 0 – 2 MC 2228

METALLURGY LAB & COMPUTER GRAPHICS LAB

METALLURGY LAB

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

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 – carbon 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. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

REFERENCE BOOK :

Metallography Laboratory Practice / George / KEHL

COMPUTER GRAPHICS LAB

(Common with Mech.Engg.- Production)

1. Executive the built in graphics libraries in Turbo "C".
2. Line generation algorithm.
 - a) DDA algorithm
 - b) Bresenham's algorithm.
3. Circle generation algorithm.
 - a) DDA algorithm
 - b) Bresenham's algorithm.

4. Algorithms for basic transformation techniques.
5. Line clipping using
 - a) Mid point subdivision algorithm
 - b) Cohen-Sutherland algorithm.
6. Polygon clipping using Sutherland - Hodgman algorithm
7. Polygon filling algorithm
8. Hidden surface removal algorithms
 - a) Z-buffer algorithm
 - b) P-algorithm
9. Implementing 3-Dimensional transformations for 3-D objects
10. Implement curve generation algorithm using Bazier Method.
11. Using B-Spline algorithms generate the curve.
12. Implement following shading methods on the surface of 3-D object.
 - a) Phong Shading
 - b) Gour and shading

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 3121

MANAGEMENT SCIENCE

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. Philip Kotler, Marketing Management, Prentice Hall of India – 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 strategy 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.

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HYDERABAD**

III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC3122

FINITE ELEMENT METHODS

(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 / Chandraputla, Ashok and Belegundu / Prentice – Hall
2. An introduction to Finite Element Method / JN Reddy / Me Graw Hill
3. The Finite Element Methods in Engineering / SS Rao / Pergamon.

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HYDERABAD**

III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 3123

DIGITAL ELECTRONICS

UNIT-I

Linear Wave shaping circuits. Diode clipping and clamping circuits. Transistorized astable, monostable and bistable circuits and applications Triggering techniques.

UNIT-II

Transistor as a switch, Schmitt trigger. Bootstrap and Miller Sweep circuits.

Linear current sweep circuits.

UNIT-III

Number Systems. Introduction to Boolean algebra. AND, OR, NOT, EX-OR and Universal Gates, Encoders, Decoders, Multiplexers, Demultiplexers, application circuits.

UNIT-IV

Binary, BCD adders. Half Adder, Full Adder, Half subtractor. Full subtractors

Bounce free circuits. Crystal Controlled clock generators, RS, D, JK, MS flip flops. Binary and Decade counters. Shift registers.

UNIT-V

LED, LCD Display Systems, Decoders, Driver Circuits, Design of typical application circuits. Dot matrix display.

TEXT BOOKS

1. Millman and Herbit, Pulse Digital and Switching Waveforms, McGraw Hill-1991.
2. Millman and Halkias. Integrated Electronics. McGraw Hill. 1991.
3. Mono, Digital Logic Design.
4. Sonde B.S.. Introduction to System Design Using ICs, Wiley Eastern, 1994

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HYDERABAD**

III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 3124

LINEAR & DIGITAL I.C. & APPLICATIONS

UNIT – I

OPERATIONAL AMPLIFIER : Design aspects of Monolithic Opamps, ideal characteristics, specifications, offset voltages & currents, frequency compensation techniques, measurement of op amp parameters, applications of op amps – inverting, non-inverting amplifiers, integrators function generators logarithmic amplifiers, instrumentation amplifiers, signal conditioning circuits, multivibrators, square wave generator, rectifiers, peak detectors - & voltage regulators.

UNIT – II

555 Timer, 556 function generator Ics & their applications. Three terminal regulators IC 1496 (Balanced modulator)

I.C. 565 phase locked loops & their typical applications. IC 1496 (Balanced modulator applications)

UNIT – III

ACTIVE FILTERS : LPF, HPF, BPF, BEF, ALL pass filters, and Higher order filters and their design. VCSV and IGMF configurations.

UNIT – IV

LOGIC FAMILIES : DTL, TTL, ECL, IIL, MOS Logic families, Parameters and their comparison, Tristate logic, interfacing of Logic Families. Flip-flops.

UNIT – V

Analog multiplexers, sample and hold circuits. D/A converters – resistive divider and ladder networks. A/D converters, counters – ramp type, dual slope, integration technique, successive approximation. Parallel comparison technique.

TEXT BOOKS :

1. Micro Electronics – Jacob Millman (ISE)
2. Op amps & linear integrated circuits – Ramakanth Gayakwad (PHI)
3. Integrated circuits – Botkar (Khanna)
4. Applications of linear integrated circuits – Clayton.

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HYDERABAD

III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 3125

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 – 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 – from 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 BOOKS :

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

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 3126

MANUFACTURING TECHNOLOGY

UNIT – I

Pattern and Pattern making – Types of patterns – materials used for pattern – pattern allowances.

Moulding Process : Various methods of Moulding – Different Moulding Sand Tests.

Cores : Types of cores – core making, Melting : Crucible melting and cupola melting.

Types of Casting Die Casting – Centrifugal casting, Machine Moulding, Casting defects.

UNIT – II

Metal Working Processes : Hot working-Cold working, Recovery, Re crystallization, Rolling : Theory of Rolling, Types of rolling mills and products Blanking, Piercing, Bending, Drawings – wire drawing, Tube drawing, Deep Drawing, Hot Spinning. Extrusion : Basic extrusion process, Types of extrusion – Forward extrusion, Backward extrusion, Impact extrusion, Tube extrusion, Hydrostatic extrusion.

UNIT – III

Forging L Forging operations and principals – Forging Tools Forging Hammers, Presses, Forging methods – Roll forging, Smith forging, Drop forging, Forging defects.

UNIT – IV

Forging : Forging operations and principals – Forging Tools Forging Hammers, Presses, Forging methods – Roll forging, Smith forging, Drop forging, Forging defects.

UNIT – V

Introduction to Metrology : Linear Measurement : Length standard, Slip guages, Dial indicators, micrometers.

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Measurement of Angle and Taper : Bevel protractor, Sine bar
Measurement of Flatness and Surface finish : Straight edges, Optical flats, Optical Collimator.

Limit guages : System of Limits and Fits, Go and NOGO guages, Plug, Ring and Snap guages.

Mechanical Comparators, Screw Thread Measurement : Measurement of effective diameter, angel, pitch, and thread guage.

BOOKS :

1. Principles of Foundry Technology by P.L. Jain.
2. Workshop Technology by Hazra Chowdary – Volume – I
3. Engineering Metrology by
4. Manufacturing Technology/PN Rao

Reference : Production Technology – by R.K. Jain
Engineering Metrology – by R.K. Jain

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

III Year B.Tech. Semester - I 0 – 3 – 0 – 2 MC 3127

LINEAR & DIGITAL I.C. & APPLICATIONS LAB

(Minimum ten experiments should be performed)

1. OP AMP Characteristics
2. OP AMP Applications
3. Linear Wave Shaping and Non-linear wave shaping
4. Astable multi vibrator using 555 timer
5. Transistor astable multi vibrator
6. a) Transistor bistable multi vibrator
 b) Transistor monostable multi vibrator
7. Boot strap Sweep Circuit
8. Study of Logic Gates
9. Flip-Flops
10. Counters and Shift Registers
11. Half Adder and Full Adder
12. Half Subtractor
13. Multiplexers and Demultiplexers
14. Encoders and Decoders.

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III Year B.Tech. Semester - I 0 – 3 – 0 – 2 MC 3128

THERMAL ENGINEERING AND HEAT TRANSFER LAB

(Common with Mech. Engg. – Mechatronics)

Thermal Engineering

1. Valve timing diagram of I.C. Engines
2. Performance Test of I.C. Engine
3. Morse Test
4. Heat Balance of I.C. Engine
5. Performance of Air Compression
6. C.O.P. of Refrigeration unit

Heat Transfer

1. Thermal conductivity of a given metal rod
2. Heat transfer in natural convection
3. Heat transfer in forced convection
4. Thermal conductivity of Insulation powder
5. Parallel and counter flow heat exchanger
6. Emissivity Apparatus.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3221

MICROPROCESSORS

(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

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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3222

INSTRUMENTATION AND CONTROL SYSTEMS

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

UNIT – I

Defination – 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.

Their' 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. Manometers, 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 activeultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

FLOW MEASUREMENT : Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer.

UNIT – IV

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

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 – VI

ELEMENTS OF CONTROL SYSTEMS :

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3223

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.

TURNING MOMENT 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.

UNIT – II

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

FRICITION : 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.

UNIT – III

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 in line 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. 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 Grawhill publications
2. Theory of Machines / Jagadish Lal & J.M.Shah / Metropolitan

REFERENCE BOOKS :

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

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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3224

PRINCIPLES OF MACHINE DESIGN

NOTE : Design data book not permitted in the examination.

UNIT – I

INTRODUCTION : General considerations in the design of Engineering materials and their properties – Selection – ISI Codes.

STRESSES IN MACHINE MEMBERS : Simple stresses combines stresses – Torsional and bending stresses – Stresses – Stress strain relations – various theories of failure – factors of safety – Design stress – preferred numbers.

UNIT – II

Design of Shafts, Keys and coppers, shafts under torsion and bending supports for shafts – journal and roller bearing – designing criteria, shaft, coupling design.

UNIT – III

DESIGN FOR FATIGUE : 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.

Numerical exercises : Design for rigidity and for strength.

UNIT – IV

PISTONS and PISTON RODS : Forces acting on piston construction and proportions of piston – Diameter of piston rod, steam and I.C.Engine pistons. Connecting Rod design.

DESIGN PULLEYS : Belts – Flat and V-types – Ropes – pulleys for best and rope drives.

UNIT – V

DESIGN OF GEARS – Spur 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 – Agma method – Lewis and Bickingham actions – check for wear.

TEXT BOOKS :

1. Machine Design by Sundararaja Murthy and Shanmugham.

REFERENCE :

1. Mech. Engg. Design by J.E. Shigley.
2. Machine Design by Pandya and Shah
3. Design of machine elements V.M. Faires.
4. Machine design by Sehaum.

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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3225

ADVANCED MANUFACTURING TECHNOLOGY

UNIT – I

Introduction to metal cutting theory, single point cutting tool geometry – Tool materials and their selection.

Classification of Lathe machines :

Centre Lathe – Construction details and various operations, cutting speed, feed, depth of cut.

UNIT - II

Constructional details and operation of shaper, planer, Drilling, Boring machines Tools used in Shaping, Planning, Slotting, Drilling and Boring machines.

UNIT – III

Milling Machines : Construction details and operation of Horizontal, Vertical, Universal milling machines, various milling operations, milling cutters, Indexing.

UNIT – IV

Grinding Machines : Cylindrical, surface and centreless grinding machines, constructional details and operation, specification of grinding wheels and their selection Jigs and Fixtures and Jig boring machines.

UNIT – V

Unconventional Machining Processes :

Elements of Processes, applications and limitations of – Ultrasonic Machining, Electrochemical machining, Electric discharge machining, Electron Beam machining and Laser Beam Machining.

BOOKS :

Workshop Technology – by Hazra Chowdary – Volume 2

Production Technology by R.K. Jain.

Pandey P.C. and Shah H.S. Modern machining process
Tata Mc.Graw Hill publishing
Company Ltd.

REFERENCES :

1. Bhattacharya A. New Technology, The Institution of Engineers, India, 1984.
2. Production Technology : HMT : HMT publication.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 3226

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 – igneto 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, bendix 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, epicyclic gear box, over drive torque converter.

Propeller shafty – 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.

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

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III Year B.Tech. Semester - II 0 – 3 – 0 – 2 MC 3227

MICRO PROCESSORS LAB
(8086 Assembly Language Program)

EXERCISES

1. 16-bit addition
2. Sorting the "n" numbers in ascending & descending order
3. Sum of squares of n numbers, sum of cubes of n numbers
4. Interfacing of A/D Converter
5. Stepper motor control using microprocessor
6. Interfacing key board / display controller
7. Microprocessor based Traffic controller

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III Year B.Tech. Semester - II 0 – 3 – 0 – 2 MC 3228

INSTRUMENTATION AND CONTROL SYSTEMS LAB
(Common with Mech. Engg. – Mechatronics, Mech. Engg. -
Production)

Note : Any Six of the following Experiments be conducted :

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.
12. Temperature Control System.
13. Speed Control System.
14. Position Control System.

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IV Year B.Tech. Semester - I 4 - 0 - 0 - 4 MC 4121

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 – variations i.e., non-square ($m \times n$) Matrix.

SEQUENCING : Introduction – Optimal solution for processing 'n' jobs through two machines and 'n' jobs through three machines – Processing two jobs through 'm' machines – travelling salesman problem i.e., shortest acyclic route, models.

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.

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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, Production is instantaneous or at a constant rate, shortage and allowed or not allowed and withdrawals from stock is continuous – 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 :

Operations Research / Taha.

REFERENCE BOOKS :

1. Operations Research : Methods and Problems / Maurice Casioni, Arhur Yaspan and Lawrence Friedman
2. Operations Research / Taha.
3. Operations Research / Wagner.
4. Operations Research / VK Kapoor / Sultan Chand, New Delhi.

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IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4122

CAD / CAM

(Common with Mech.Engg and Mechatronics)

UNIT – I

FUNDAMENTALS OF CAD, 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.

Geometric Modelling : 3-D wireframe modeling, wire frame entities and their definitions Interpolation and approximation of curves, concept of parametric and non-parametric representation of curves. Curve fitting techniques, definitions of cubic spline and Bezier, B-spline.

UNIT – II

Surface modelling : Algebraic and geometric form, parametric space of surface, blending functions. Reparametrisation of a surface patch, subdividing, cylindrical surface, ruled surface, surface of revolution spherical surface, composite surface, Bezier surface. B-spline surface, regenerative surface and pathological conditions.

Solid Modelling : Definition of cell composition and spatial occupancy enumeration, sweep representation, constructive solid geometry, boundary representations.

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.

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. 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 Compute 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.
5. Auto Cad Technologies / Jickoo

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IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4123

ROBOTICS

(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 / Spond and Vidyasagar / John Wiley
4. Robot Analysis and Intelligence / Asada and Sbow time / Wiley Inter-Science
5. Introduction to Robotics / John J Craig / Addison Wesley.

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IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4124

MOTION CONTROL DESIGN

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

UNIT – I

INTRODUCTION TO MOTION CONTROL :

Concept of Motion Control : Drive Mechanisms – Feeding and index Mechanisms, orientation, escapement, sorting device and conveyor system.

UNIT – II

INDUSTRIAL HYDRAULICS:

Merits of Fluid power and its utility for increase in productivity, symbolic representation of hydraulic element – Hydraulic control valves – Hydraulic accessories – various pumps used in hydraulic system – Hydraulic fluids – Hydraulic circuits and servo control systems.

UNIT – III

INDUSTRIAL PNEUMATICS :

Symbolic representations of Pneumatic elements – Compressor and air installation – Pneumatic circuits using Pneumatic cylinders and other elements – Applications to fluidics – Biselectors.

UNIT – IV

ACTUATORS AND MOTION CONTROL :

Characteristics of Mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations. Control parameters and system objectives. Popular Control System Configurations – Motion Control aspects in Design.

Motion Control Algorithms : Significance of feed forward control loops, Short falls. Fundamental concepts of adaptive and fuzzy control.

UNIT – V

HYDRO PNEUMATICS AND ELECTRO HYDRAULICS :

Application of Analogue and Digital Computers for control of Mechanical Equipment. Microprocessor control programmable logic controllers.

REFERENCE BOOKS :

Designing of Intelligent Machines, Open University, London 1995.

Introduction to Mechatronics and Measurement Systems.

TEXT BOOKS :

Principles of Machine Tools – Sen & Bhattacharya
Manuals on Mechatronics – CITD, Hyderabad.

Mechatronics – W. Bolten, Addison Wesley Longmont Ltd. 1999.

Control Sensors and Actuators – C.W.Desukva Prentice Hall, 1989.

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IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4125

PRODUCT DESIGN AND ASSEMBLY AUTOMATION

UNIT-I

AUTOMATIC FEEDING AND ORIENTING DEVICES : Vibrator feeders : Mechanics of vibratory conveying, estimating the mean conveying velocity, load sensitivity, solutions to load sensitivity, spiral elevators, balanced feeders, orientation of typical oriental system, effect of active orienting devices on feed rate, analysis of orienting systems, performance of an orienting device, natural resting aspects, of parts for automatic handing, analysis of a typical orienting system, out-of-bowl tooling. Mechanical feeders. Reciprocating -tube hopper feeder; magazines:

UNIT-II

INTRODUCTION : Historical development of the assembly process, choice of assembly method, social effects of automation.

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

UNIT-III

PRODUCT DESIGN FOR HIGHSPEED AUTOMATIC ASSEMBLY AND ROBOT ASSEMBLY : Introduction, design of parts for: high speed, feeding and orienting, example, additional feeding difficulties, high speed automatic insertion, example, analysis of an assembly, general rules for product design for automation, design of parts for feeding and orienting, summary of design rules for high speed automatic assembly, product for robot assembly.

UNIT-IV:

DESIGN OF MANUAL ASSEMBLY: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology,

assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time, avoiding jams during assembly, reducing disk assembly problems, effects of holding down, manual assembly data base and design data sheets, application of the DFA methodology and general design guidelines.

UNIT-V:

PERFORMANCE AND ECONOMICS OF ASSEMBLY SYSTEMS :

Indexing machines, free transfer machines, basis for economic comparisons of automation equipment, comparison of indexing and free - transfer machines' economics of robot assembly.

FEASIBILITY STUDY FOR ASSEMBLY AUTOMATION :

Machine design factors to reduce machine downtime due to defective parts, Visibility study.

TEXTBOOK:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.

REFERENCE BOOKS:

1. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekker, N.Y. 1990.
2. A Delbainbre "Computer Aided Assembly London, 1992.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4126

COMPUTER ORGANISATION
(Common for ECE, EIE, E Cont. E, CSE, CSIT)

UNIT - I

Von Neumann Machine, Computer components, functions, bus interconnection, PCI, ALU integer arithmetic, addition, subtraction, multiplication and division, floating point arithmetic.

UNIT - II :

Machine Instruction set, types of operands, types of operations, addressing modes, instruction formats, processor organization, register organization, instruction cycle, instruction pipelining, Pentium Processor, Power PC Processor, RISC.

UNIT - III:

8085 microprocessor organization, Assembly language programming of 8085, processor control unit operation, micro-operations, hardwired control, micro program control, horizontal and vertical micro instructions, micro instruction sequencing and execution, nano programming, Applications of Micro programming.

UNIT - IV :

Internal memory, semiconductor main memory, cache memory, DRAM organization, associate memory organization, Magnetic disk, CD-ROM, Magnetic tape, memory management, memory hierarchy, partitioning, paging, virtual memory, demand paging scheme, segmentation.

UNIT - V :

Input / Output, external devices, I/O modules, I/O addressing, programmed I/O, Interrupt driven I/O, priority, arbitration, DMA, I/O channel, I/O processor

TEXT BOOKS :

1. Computer Organization and Architecture by Williams Stallings
4th Edition, PHI
2. Computer Architecture and Organization by Hayes, Mc. Graw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4127

NON-CONVENTIONAL SOURCES OF ENERGY

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 titled 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 characters.

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

GEO THERMAL ENERGY : Resources, types of wells, methods of harnessing the energy, potential in India.

OTEC 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 / Sukhamo
3. Solar Power Engineering / B.S. Magal Frank Kreith & J.F. Kreith
4. Principles of solar energy / Frank Kreith & John F Kreider

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4128

CIM &FMS

UNIT-I

FUNDAMENTALS OF MANUFACTURING AUTOMATION: Production operation and automation strategies-types of production,functions of manufacturing,cost of manufacturing,lead time and work-in-progress.

UNIT-II

HIGH VOLUME PRODUCTION SYSTEMS : Automated flow lines, methods of work transport, automated flow lines-General terminology and analysis of transfer lines,partial automation, simulation models of flow lines. Assembly systems and line balancing.The assembly process assembly systems, manual assembly,types of automated assembly lines. Automated assembly systems Design for automated assembly, types of automated assembly systems.

UNIT-III

AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEMS:

The material handling function, types of material handling systems, analysis of a material handle system, automated guided vehicle systems. Automated storage and retrieval systems. Interfacing handling and storage with manufacturing.

UNIT-IV

GROUP TECHNOLOGY AND PROCESS PLANNING :- Introduction -part families,part classification and coding systems, group technology machine cells, advantages of group technology, the planning function, retrieval type process planning

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system, generative process planning systems feature recognition in CAPP, benefits of CAPP.

C.I.M. : Flexible manufacturing cells and systems. Fundamentals of Computer Communication, Computer networks for manufacturing MAP/TOP. Future automated factory, future trends in manufacturing systems, CIM elements and Management.

UNIT-V:

EMERGING TECHNOLOGIES: Computer Vision, Lasers in Manufacturing, Concurrent Engineering, Multimedia Communications, Virtual Manufacturing Systems. Business process Re-engineering Introduction to BPE, logistics ERP, Software configuration of BPE, Techniques of Rapid Proto typing.

REFERENCES:

1. Automnatiom, Production systems and computer integrated Manufacturing M.P.Grover.
2. Computer control of Manufacturing systems byYoramaa'd'Corecim.
3. CAD/CAM/CIMtlyRadhakrishnan.
4. Automation by W.Buekmsham

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD'**

IV Year B.Tech. Semester - I 4 – 0 – 0 – 4 MC 4129

PRODUCTION PLANNING AND CONTROL

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. Semester - I 4 – 0 – 0 – 4 MC 4130

ADVANCED KINEMATICS AND DYNAMICS OF MACHINES

UNIT-I:

Geometry of motion-Grublers Criterion for plain and spatial mechanisms- Grashoff's law for planar and spatial mechanisms, Kutn Batch criterion for planar and apatial mechanisms

Velocity and acceleration analysis and use of computers in the analysis. Velocity and accelerations analysis of complex mechanisms. Auxiliary point method, Goodman's analysis. Use of computers in the analysis.

UNIT-II:

Coupler curves, Robert's Chebychev spacing method. Cognate linkages. Path curvature- Polodes- Euler savery equation -Bobiller and Hartman's Construction- Equivalent mechanisms.

UNIT- III:

Space mechanisms and mobility equations: Positional problems. Vector analysis of velocity and accelerations, Theorem of angular velocities and accelerations -computer aided analysis.

UNIT-IV:

Static force analysis of plane and spatial mechanisms. Inertia forces and torque's. Dynamic force analysis, application of computer animation and simulation of motion studies.

Dynamic Motion Analysis: Quinn's energy distribution method, the equivalent mass and force method. The rate of change of energy method, dynamic motion simulation.

UNIT-V:

Synthesis of linkages: Two position synthesis. Properties of rotopole, Chebychev spacing. Optimization of the transmission angles. The overlay method; Three-position synthesis; point position reduction; synthesis of dwell mechanisms; synthesis using complex numbers and matrices, Freudenstain"equation. Computer aided kinematic synthesis.

TEXTBOOKS:

1. Shigley : J.E. Kinematic Analysis of mechanism, McGraw '11.
2. Hirschcom : J.K.. KincB~cs and Dynamics of Plane Mechanisms Mc.Graw Hill.
3. Holewenko, A.R. Dynamics of machinery, John Wiley & Sons.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**
IV Year B.Tech. Semester - I 0 – 3 – 0 – 2 MC 4131
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.

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- b) Development of manufacturing effects and tool management systems.
- c) Study of various post processors used in NC Machines.
- d) Development of NC code for free form 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,

REFERENCES

Engg Drawing With Auto CAD/T Jaya Poovan/Vikas publishers

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IV Year B.Tech. Semester - I 0 – 3 – 0 – 2 MC 4132

MOTION CONTROL DESIGN LAB & CNC MACHINES AND ROBOTICS LABORATORY

MOTION CONTROL DESIGN LAB

Study of the following equipment :

- a. Study of different types of drives
- b. Relief Valve
- c. Flow Control Valves
- d. Directional Control Valves
- 2. Circuits for reciprocating motion of a single acting and double acting pneumatic cylinders.
- 3. Circuits for rotary & reciprocating motion of hydraulic cylinder.
- 4. Circuits for speed control of a (a) double acting pneumatic cylinder. (b) Double acting hydraulic Cylinder.
- 5. Circuits for semi automatic and automatic operation of a double acting cylinder.
- 6. Circuits for sequencing motion of two pneumatic cylinder (a) by cascading (b) by using a sequence valve (c) by sing a microprocessor
- 7. Circuits for deceleration motion of hydraulic cylinder.
- 8. Circuits for Measurement of pressure of air/oil in fluid power system.
- 9. Circuits for Measurement of flow rate in a fluid power system.
Position control systems using electron circuits.

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CNC MACHINES AND ROBOTICS LABORATORY

The following experiment will be conducted in this laboratory :

1. Study and operation of CNC lathe
2. Study and operation CNC milling machine
3. Study and operation of drilling machines.
4. Preparation of testing of typical part programs on CNC Trainer.
5. Preparation of typical part programs on CNC milling machine.
6. Exercises using CAM software.
7. Training on Desktop Tutors.
8. Training on Modular Educational System.
9. Communication with in flexible manufacturing cell : Cell Computer to Machine, Cell Computer to Robot, Machine to Machine and inter-linking.
10. Part program generation through G and M Codes for turning, contouring, pocketing, drilling, boaring, Reaming and Milling.
11. Development of tool path simulation by setting tool offsets for multi-operations (Combinations of above operations)
12. Study of Cutter Compensations and surface finish measurements through various guages.
13. Study of various cutting tools used in above CNC Machines such as twist drills, End mills, Ball nose Cutters and Other Standard Tooling.
14. Machining of various Components by generation of CNC code by (CAM Packages)
15. Interfacing the CNC Codes to the CNC Lathe and mill through Rs. 232.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD (A.P)

IV Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 4221

MECHANICAL HANDLING EQUIPMENT

(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. Semester - II 4 – 0 – 0 – 4 MC 4222

CONCURRENT ENGINEERING (ELECTIVE – IV)

UNIT – I

Introduction : Development of Concurrent Engineering. The mean and activity concepts and principles. Examples.

UNIT – II :

Concurrent Engineering Tools and Technologies : Changes in to Technologies, Tasks, Talents and times into well managed resources product developments.

UNIT – III :

Research in Engineering design and manufacturing : Theory applications using the concurrent Engineering concepts and Principles. Simultaneous design and all related processes of a product.

UNIT – IV :

The mission and vision of C.E. : Computer optimized manufacturing (COM). The next generation of computer integrated manufacturing (CIM). Global competitiveness and development of high quality product.

UNIT – V:

Managing the concurrent Engineering : Contemporary Issues a modern Tools and methods. Use of Computers and decision making.

REFERENCES :

1. Concurrent Engineering : Tools and Technologies for Mechanic Systems Design – Edward, J. Haug.
2. Research in Engineering Design : Theory, applications, and concurrent engineering : Vol. 7, No. 1, 1995.
3. Managing Concurrent Engineering. – Jon Turino.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 4223

INDUSTRIAL ELECTRONICS

UNIT – I

DC AMPLIFIERS :

DC amplifiers, drift compensation techniques, differential amplifier.

UNIT – II

REGULATED POWER SUPPLIES :

Series and shunt type, protection Techniques, Switching mode voltage regulator, servo voltage stabilizer, monolithic voltage regulators (fixed and variable)

UNIT – III

SCR AND THYRISTOR :

Principles of operation and characteristics of SCR. Triggering of SCR, Diac and Triac, Commutation. Thyristor – characteristics – phase controlled half and full wave rectification.

UNIT – IV

APPLICATIONS OF SCR IN POWER CONTROL :

Static circuit breaker, overload protection, inverters, converters and chopper circuits. Other applications of SCR, industrial applications of Triac and Diac. (Single phase applications only).

UNIT – V

INDUSTRIAL APPLICATIONS :

Timing circuits, welding control, Electronic DC motor control, induction and Dielectric heating. Ultrasonic generators and applications.

REFERENCES :

1. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs (ISE)
2. Industrial Electronics – GK. Mital (Khanna Publications)
3. Thyristors and applications – M. Rammurthy.
4. Integrated Electronics – Milliman & Halikiase. (ISE)
5. Engineering Electronics – Ryder.

IV Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 4224

NEURAL NETWORKS AND FUZZY LOGIC CONTROL
(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-contro-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. Kosco 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.

IV Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 4225

SYSTEM SIMULATION AND MODELING

UNIT I

Systems Models; Concepts, continuous and Discrete systems, systems modeling, types of models, subsystems, corporate model, system study.

System simulation : Techniques, comparison of simulation and analytical methods, types of simulation, distributed log models, cowed models,

UNIT II

Continuous system simulation : Numerical solution of differential equation, analog computer hybrid computers, continuous system simulation languages CSMI", system dynamic growth models, logistic curves.

UNIT III

Probability concepts in simulation : Monte Carlo techniques, stochastic variables, and probability functions, random number generation algorithms.

UNIT IV

Queuing theory : Arrival pattern distribution, service times, queuing problems.

Discrete systems simulation : Events generation of arrival patterns, simulation – programming tasks, analysis of simulation output.

UNIT V

GPSS AND SIMSCRIPT : General description of GPSS and SIMSCRIPT, programming in GPSS and SIMSCRIPT. Simulation Programming Techniques : Data structures, implement of activities, events and queues, even scanning, simulation algorithms in GPSS and SIMSCRIPT.

REFERENCES :

Geoffrey Gordan : Systems Simulation, Prentice Hall Publications 1978.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech. Semester - II 4 – 0 – 0 – 4 MC 4226

ENTREPRENEURSHIP & MANAGEMENT

UNIT – I

Indian Industrial Environment – Competence, Opportunities and Challenges. Entrepreneurship and Economic growth. Small Scale Industry in India. Objectives. Linkage among small medium and heavy industries – Types and forms of enterprises.

UNIT – II

Identification and characteristics of entrepreneurs. Conception and evaluation of ideas and their sources. Choice of Technology – Collaborative interaction for Technology development.

UNIT – III

Project formulation, Analysis of market demand. Financial and profitability analysis and Technical analysis Project financing in India.

UNIT – IV

Project Management during construction phase, project organization, project planning and control using CPM. PERT techniques. Human aspects of project management. Assessment of tax burden.

UNIT – V

Behavioural aspects of entrepreneurs : Personality – determinants, attributes and models. Leadership concepts and models. Values and attitudes. Motivation aspects. Change behaviour . Time Management : Various approaches of time management, their strengths and weaknesses. The urgency addiction and time management matrix.

TEXT BOOKS :

1. Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House. 1997.
2. Prasanna Chandra, Project –Planning, Analysis. Selection, Implementationand Review, Tata McGraw-Hill Publishing Company Lts. 1995.
3. Stephen R. Covey and Roger Merrill A. First Taings First. Simon and Schuster.

REFERENCE :

1. Sudha G.S.Organizational Behaviour National Publishing House, 1996.
