

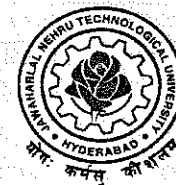
**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**II**

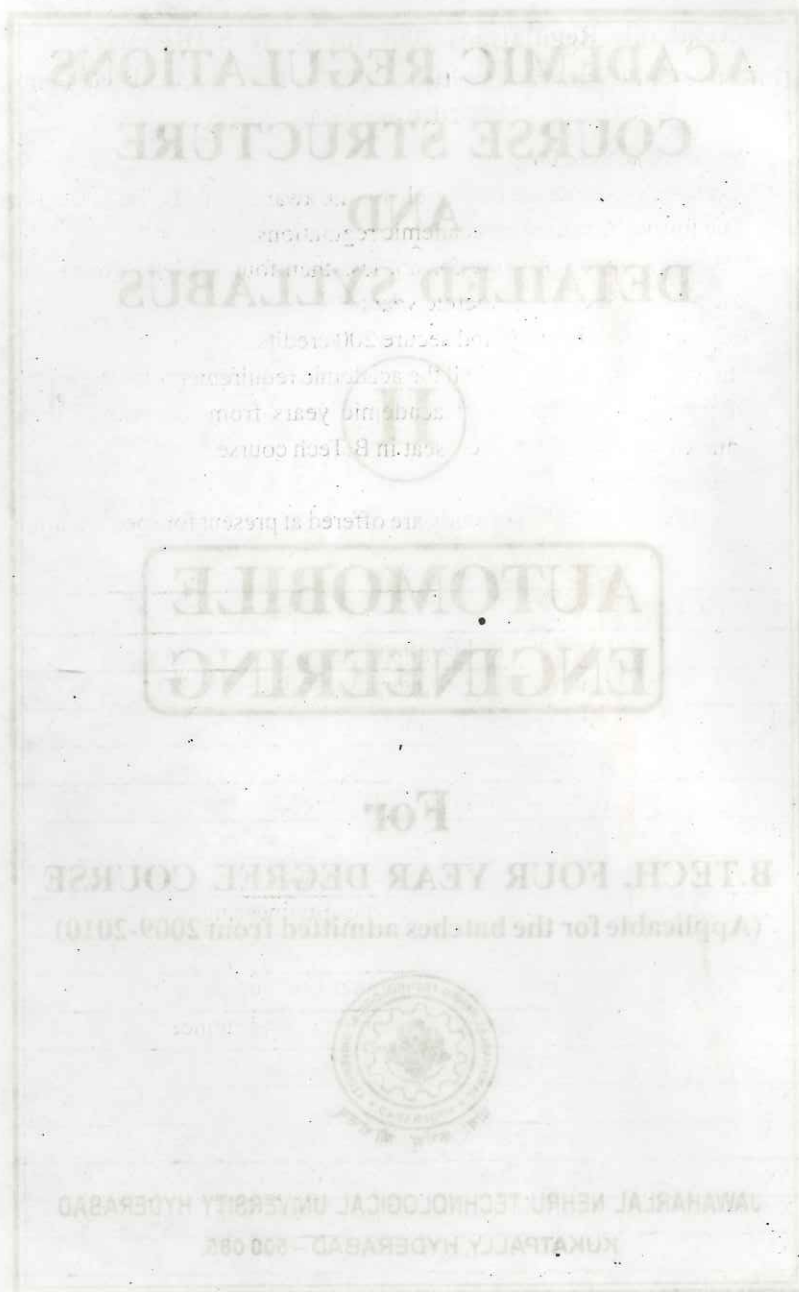
**AUTOMOBILE  
ENGINEERING**

**For**

**B.TECH. FOUR YEAR DEGREE COURSE**  
(Applicable for the batches admitted from 2009-2010)



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



### Academic Regulations 2009 for B. Tech (Regular)

(Effective for the students admitted into I year from the Academic Year 2009-2010 onwards)

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

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

- i. Pursued a course of study for not less than four academic years and not more than eight academic years.
  - ii. Register for 200 credits and secure 200 credits
2. Students, who fail to fulfil 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 B.Tech course.

#### 3. Courses of study

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

Branch Code	Branch
I ✓	Aeronautical Engineering.
II ✓	Automobile Engineering.
III ✓	Bio-Medical Engineering.
IV ✓	Biotechnology.
V ✓	Chemical Engineering.
VI ✓	Civil Engineering.
VII ✓	Computer Science and Engineering.
VIII ✓	Electrical and Electronics Engineering.
IX ✓	Electronics and Communication Engineering.
X ✓	Electronics and Computer Engineering.
XI ✓	Electronics and Instrumentation Engineering.
XII ✓	Electronics and Telematics Engineering.
XIII ✓	Information Technology.
XIV ✓	Instrumentation and Control Engineering.
XV ✓	Mechanical Engineering (Mechatronics).
XVI ✓	Mechanical Engineering (Production).
XVII ✓	Mechanical Engineering.
XVIII ✓	Metallurgy and Material Technology.



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

#### 4. Credits

	I Year		Semester	
	Periods / Weeks	Credits	Periods / Weeks	Credits
Theory	03	06	03	03
Practical	02	04	--	--
Drawing	03	04	03 06	02 04
Mini Project	02T/03D	04	--	02
Comprehensive Viva Voce	--	--	--	02
Seminar	--	--	6	02
Project	--	--	15	10

#### 5. Distribution and Weightage of Marks

- 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, Industry oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks respectively.
- For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.
- For theory subjects, during the semester there shall be 2 mid term examinations. Each mid term examination consists of one objective paper, one subjective paper and one assignment. The objective paper is for 10 marks and subjective paper is for 10 marks, with a duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set for 20 bits of – multiple choice questions, fill-in the blanks, matching type questions – for the 10 marks. Subjective paper of each semester shall contain 4 full questions (one from each unit) of which, the student has to answer 2 questions, each carrying 5 marks.

First mid term examination shall be conducted for 1-4 units of syllabus and second mid term examination shall be conducted for 5-8 units. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid. The total marks secured by the student in each mid term examination are evaluated for 25 marks, and the better of the two mid term examinations shall be taken as the final marks secured by each candidate.

However, for first year, there shall be 3 mid term examinations (each for 25 marks), along with 3 assignments in a similar pattern as above [1<sup>st</sup> mid shall be from 1-2 units, 2<sup>nd</sup> mid from 3-5 units and 3<sup>rd</sup> mid shall be from 6-8 units], and the average marks of the best two examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered as final marks for the internals / sessionals.

- For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Out of the 25 marks for internal, day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the concerned laboratory teacher. The end examination shall be conducted with external examiner and laboratory teacher. The external examiner shall be appointed from the cluster of colleges as decided by the University examination branch.
- For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests. However in the I year class, there shall be three tests and the average of best two will be taken into consideration.
- There shall be an industry-oriented mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated with the project work in IV year II Semester. The industry oriented mini project shall be submitted in report

form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

- vii. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.
- viii. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-voce.
- ix. Out of a total of 200 marks for the project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by the same committee appointed for industry oriented mini project. In addition the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from each other. 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.
- x. Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College 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 institutions as per the University norms and shall be produced to the Committees of the University as and when the same is asked for.

## 6. Attendance Requirements:

- i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ii. **Shortage of Attendance below 65% in aggregate shall in NO case be condoned.**
- iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
- iv. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year, as applicable. They may seek re-admission for that semester / I year when offered next.
- 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.
- vi. 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 be promoted from II to III year only if he fulfils the academic requirement of 37 credits from one regular and one supplementary examinations of I year, and one regular examination of II year



I semester irrespective of whether the candidate takes the examination or not.

- iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total 62 credits from the following examinations, whether the candidate takes the examinations or not.
  - 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 examination of III year I semester.
- iv. A student shall register and put up minimum attendance in all 200 credits and earn the 200 credits. Marks obtained in all 200 credits shall be considered for the calculation of percentage of marks.
- v. Students who fail to earn 200 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

#### 8. 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.
- When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas the academic regulations hold good with the regulations he was first admitted.

#### 9. Award of Class:

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

Class Awarded	% of marks to be secured	Class Awarded
First Class with Distinction	70% and above	From the aggregate marks secured for the best 200 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)

#### 10. Minimum Instruction Days :

The minimum instruction days for each semester / I year shall be 90/ 180 clear instruction days.

11. There shall be no branch transfers after the completion of admission process.
12. There shall be no place transfer within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

#### 13. General:

- i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- ii. The academic regulation should be read as a whole for the purpose of any interpretation.
- iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- iv. 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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**Academic Regulations for B. Tech. (Lateral Entry Scheme)**

(Effective for the students getting admitted into

II year from the Academic Year 2009-2010 and onwards)

1. The Students have to acquire 150 credits from II to IV year of B.Tech. Program (Regular) for the award of the degree.  
Register for 150 credits and secure 150 credits.
2. Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
3. The same attendance regulations are to be adopted as that of B. Tech. (Regular).
4. **Promotion Rule :**  
A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 37 credits from the examinations.
  - 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 examination of III year I semester.
5. **Award of Class:**

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

Class Awarded	% of marks to be secured	Class Awarded
First Class with Distinction	70% and above	From the aggregate marks secured for 150 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. (Lateral Entry Scheme)

**MALPRACTICES RULES**  
**DISCIPLINARY ACTION FOR/IMPROPER CONDUCT IN**  
**EXAMINATIONS**

	Nature of Malpractices/ Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in the subject only
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and



	(theory or practical) in which the candidate is appearing.	shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester / year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of

	the any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The

		continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.



10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses I to 11 shall be reported to the University for further action to award suitable punishment.	

#### Malpractices identified by squad or special invigilators

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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

### B.TECH.AUTOMOBILE ENGINEERING

#### I YEAR COURSE STRUCTURE

Code	Subject	L	T/P/D	C
51001	English	2	-	4
51002	Mathematics - I	3	1	6
51003	Engineering Mechanics	3	1	6
51004	Engineering Physics	2	1	4
51005	Engineering Chemistry	2	-	4
51006	Computer Programming & Data Structures	3	-	6
51007	Engineering Drawing	1	3	4
51668	Computer Programming Lab.	-	3	4
51669	Engineering Physics & Engineering Chemistry Lab	-	3	4
51670	English Language Communication Skills Lab.	-	3	4
51671	Engineering Workshop / IT Workshop	-	3	4
	<b>Total</b>	<b>17</b>	<b>18</b>	<b>50</b>

#### II YEAR I SEMESTER

#### COURSE STRUCTURE

Code	Subject	L	T/P/D	C
53014	Probability and Statistics	3	1	3
53015	Electrical and Electronics Engineering	4	1	4
53016	Mechanics of Solids	3	1	3
53017	Thermodynamics	4	1	4
53018	Metallurgy and Materials Science	4	1	4
53049	Automobile Engineering	3	-	3
53634	Electrical and Electronics Engineering Lab	0	3	2
53635	Metallurgy & Mechanics of Solids Lab	0	3	2
	<b>Total</b>	<b>18</b>	<b>14</b>	<b>25</b>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

**B.TECH.AUTOMOBILE ENGINEERING**

**II YEAR II SEMESTER COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
54013	Production Technology	4	1	4
54014	Kinematics of Machinery	3	1	3
54052	Applied Thermodynamics -I	3	1	3
54017	Machine Drawing	0	6	4
54004	Environmental Studies	3	0	3
54053	Automotive Engines	4	0	4
54634	Production Technology Lab	0	3	2
54635	Automotive Engines Lab	0	3	2
	<b>Total</b>	<b>17</b>	<b>15</b>	<b>25</b>

**III YEAR I SEMESTER COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
55015	Managerial Economics and Financial Analysis	4	0	4
55078	Mechanics of Fluids and Hydraulic Machinery	4	1	4
55017	Dynamics of Machinery	4	1	4
55079	Design of Machine Elements	3	1	3
55020	Applied Thermodynamics -II	3	1	3
55080	Vehicle Dynamics	3	1	3
55636	Mechanics of Fluids & Hydraulic Machines Lab	0	3	2
55637	Thermal Engineering Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

**B.TECH.AUTOMOBILE ENGINEERING**

**III YEAR II SEMESTER COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
56016	Industrial Management	4	0	4
56020	Heat Transfer	4	1	4
56052	Auto Air Conditioning	3	1	3
56053	Numerical Methods	3	1	3
	<b>Open Elective</b>	3	1	3
56021	Engineering Optimization			
56014	Nonotechnology			
56084	Robotics			
56085	Automotive Electrical and Autotronics	4	1	4
56641	Heat Transfer Lab	0	3	2
56642	Advanced English Communication Skills Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>

**IV YEAR I SEMESTER COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
57022	Operations Research	4	1	4
57139	Metrology & Surface Engineering	3	1	3
57024	CAD/CAM	4	1	4
57025	Instrumentation and Control Systems	4	0	4
	<b>Elective-I</b>	3	1	3
57140	Automotive Chassis and Suspension			
57141	Automotive Pollution and Control			
57028	Mechatronics			
57027	Mechanical Vibrations			
	<b>Elective-II</b>	3	1	3
57075	Micro Processors and Micro Controllers			
57090	Computational Fluid Dynamics			
57009	Finite Element Methods			
57142	Vehicle Body Engineering and Safety			
57635	Machine Tools & Metrology Lab	0	3	2
57636	Automotive Engines Lab-II & CAD/CAM Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

**B.TECH.AUTOMOBILE ENGINEERING**

**IV YEAR II SEMESTER**

**COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
58105	Alternate Fuels for Automobiles	3	1	3
	<b>Elective-III</b>	3	1	3
58106	Vehicle Transport Management			
58107	Product Design and Assembly			
58018	Automation Maintenance and Safety			
58017	Engineering Reliability Engineering			
	<b>Elective-IV</b>	3	0	3
58071	Principles of Entrepreneurship			
58067	Automation in Manufacturing			
58020	Renewable Energy Sources			
58019	Plant layout and Material Handling			
58669	Industry Oriented mini project	0	0	2
58670	Seminar	0	6	2
58671	Project Work	0	15	10
58672	Comprehensive Viva	0	0	2
	<b>Total</b>	<b>9</b>	<b>23</b>	<b>25</b>

**Note:** All End Examinations (Theory and Practical) are of three hours duration.

T - Tutorial

P - Practical/Drawing

L - Theory

C - Credits

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

I Year B.Tech. AME.

L T/P/D C

2 -/-/ 4

**(51001) ENGLISH**

**1. INTRODUCTION:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure by the students. Hence, it is suggested that they read it on their own with topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. *However, the stress in this syllabus is on skill development and practice of language skills.*

**2. OBJECTIVES:**

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects with greater facility through the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

**3. SYLLABUS: Listening Skills:****Objectives**

To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.

To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions.

*Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills: Objectives**

1. To make students aware of the role of speaking in English and its contribution to their success.
  2. To enable students to express themselves fluently and appropriately in social and professional contexts.
- Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: *Learning English : A Communicative Approach*.)
  - Just A Minute(JAM) Sessions.

**Reading Skills: Objectives**

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

**NOTE:** *The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as magazines/newspaper articles.*

**Writing Skills : Objectives**

To develop an awareness in the students about writing as an exact and formal skill.

To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Editing a passage

**4. TEXTBOOKS PRESCRIBED:**

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into **Eight Units**, are prescribed:

**For Detailed study**

1. First Text book entitled "Enjoying Everyday English", Published by Sangam Books, Hyderabad

**For Non-detailed study**

Second text book "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**A. STUDY MATERIAL:****Unit -I**

1. Chapter entitled *Heaven's Gate* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *Haragovind Khorana* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**Unit -II**

1. Chapter entitled *Sir CV Raman: A Pathbreaker in the Saga of Indian Science* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *Sam Petroda* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**Unit -III**

1. Chapter entitled *The Connoisseur* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *Mother Teresa* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**Unit -IV**

1. Chapter entitled *The Cuddalore Experience* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *Dr Amartya Kumar Sen* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**Unit -V**

1. Chapter entitled *Bubbling Well Road* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *I Have a Dream* by Martin Luther King from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

**Unit -VI**

1. Chapter entitled *Odds Against Us* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled *Ask Not What Your Country can do for you* by John F Kennedy from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

- \* Exercises from the lessons not prescribed shall also be used for classroom tasks.

**Unit - VII****Exercises on**

- |                            |                       |
|----------------------------|-----------------------|
| Reading and Writing Skills | Reading Comprehension |
| Situational dialogues      | Letter writing        |
| Essay writing              |                       |

**Unit - VIII****Practice Exercises on Remedial Grammar covering**

- Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions,
- Tense and aspect

**Vocabulary development covering**

- Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

**REFERENCES:**

1. **Innovate with English: A Course in English for Engineering Students**, edited by T Samson, Foundation Books
2. **English Grammar Practice**, Raj N Bakshi, Orient Longman.
3. **Effective English**, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
4. **Handbook of English Grammar & Usage**, Mark Lester and Larry Beason, Tata Mc Graw -Hill.
5. **Spoken English**, R.K. Bansal & JB Harrison, Orient Longman.
6. **Technical Communication**, Meenakshi Raman, Oxford University Press
7. **Objective English** Edgar Thorpe & Showick Thorpe, Pearson Education
8. **Grammar Games**, Renuvolcuri Mario, Cambridge University Press.
9. **Murphy's English Grammar with CD**, Murphy, Cambridge University Press.



10. Everyday Dialogues in English, Robert J. Dixon, Prentice Hall India Pvt Ltd.,
11. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
12. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
13. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw -Hill.
14. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan, Frank Bros & CO
15. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
16. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
17. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. AME. L T/P/D C

3 1/- 6

## (51002) MATHEMATICS - I

## UNIT - I Sequences - Series

Basic definitions of Sequences and series - Convergences and divergence - Ratio test - Comparison test - Integral test - Cauchy's root test - Raabe's test - Absolute and conditional convergence

## UNIT - II Functions of Single Variable

Rolle's Theorem - Lagrange's Mean Value Theorem - Cauchy's mean value Theorem - Generalized Mean Value theorem (all theorems without proof) Functions of several variables - Functional dependence - Jacobian - Maxima and Minima of functions of two variables with constraints and without constraints

## UNIT - III Application of Single variables

Radius, Centre and Circle of Curvature - Evolutes and Envelopes Curve tracing - Cartesian, polar and Parametric curves.

## UNIT - IV Integration &amp; its applications

Riemann Sums ; Integral Representation for lengths, Areas, Volumes and Surface areas in Cartesian and polar coordinates multiple integrals - double and triple integrals - change of order of integration - change of variable

## UNIT - V Differential equations of first order and their applications

Overview of differential equations- exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and geometrical applications.

## UNIT - VI Higher Order Linear differential equations and their applications

Linear differential equations of second and higher order with constant coefficients, RHS term of the type  $f(X) = e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , and  $x^n$ ,  $e^{ax} V(x)$ ,  $x^n V(x)$ , method of variation of parameters. Applications bending of beams, Electrical circuits, simple harmonic motion.

## UNIT - VII Laplace transform and its applications to Ordinary differential equations

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations.

### UNIT – VIII Vector Calculus

Vector Calculus: Gradient- Divergence- Curl and their related properties Potential function - Laplacian and second order operators. Line integral – work done — Surface integrals - Flux of a vector valued function.

Vector integrals theorems: Green's -Stoke's and Gauss's Divergence Theorems (Statement & their Verification)

### TEXT BOOKS:

1. Engineering Mathematics – I by P.B. Bhaskara Rao, S.K.V.S. Rama Chary, M. Bhujanga Rao.
2. Engineering Mathematics – I by C. Shankaralah, VGS Booklinks.

### REFERENCES:

1. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
2. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
3. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.
4. Higher Engineering Mathematics – B.S. Grewal, Khanna Publications.
5. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.
6. A text Book of KREYSZIG'S Engineering Mathematics, Vol-1 Dr. A. Ramakrishna Prasad. WILEY publications

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### (51003) ENGINEERING MECHANICS

#### UNIT – I

Introduction to Engineering. 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.

#### UNIT – II

**Equilibrium of Systems of Forces :** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

#### UNIT – III

**Centroid :** Centroids of simple figures (from basic principles ) – Centroids of Composite Figures

**Centre of Gravity :** Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

#### UNIT – IV

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

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

#### UNIT – V

Analysis of perfect frames ( Analytical Method) – Types of Frames – Assumptions for forces in members of a perfect frame, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

**UNIT – VI**

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

**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.

**UNIT – VII**

**Work – Energy Method :** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**UNIT – VIII**

**Principle of virtual work:** Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums

**TEXT BOOKS :**

1. Engineering. Mechanics / Timoshenko & Young.
2. Engineering. Mechanics / S.S. Bhavikatti & J.G. Rajasekharappa

**REFERENCES :**

1. Engineering Mechanics / Ferdinand L. Singer / Harper – Collins.
2. Engineering. Mechanics / Irving. H. Shames Prentice – Hall.
3. Engineering. Mechanics Umesh Regl / Tayal.
4. Engineering. Mechanics / R.V. Kulkarni & R.D. Askhekar
5. Engineering. Mechanics/Khurmi/S.Chand.
6. Engineering. Mechanics / KL Kumar / Tata McGraw Hill.

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**(51004) ENGINEERING PHYSICS****UNIT-I**

**1. Bonding in Solids:** Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy.

**2. Crystallography and Crystal Structures:** Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond and hcp Structures, Structures of NaCl, ZnS, CsCl.

**UNIT-II**

**3. X-ray Diffraction:** Basic Principles, Bragg's Law, Laue Method, Powder Method, Applications of X-ray Diffraction.

**4. Defects in Crystals:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects; Qualitative treatment of line (Edge and Screw Dislocations) Defects, Burger's Vector, Surface Defects and Volume Defects.

**UNIT-III**

**5. Elements of Statistical Mechanics:** Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Photon gas, Wein's Law, Rayleigh-Jeans law, Planck's Law of Black Body Radiation, Concept of Electron Gas, Fermi Energy, Density of States.

**6. Principles of Quantum Mechanics:** Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, G. P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function - Particle in One Dimensional Potential Box.

**UNIT-IV**

**7. Band Theory of Solids:** Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors,

Semi Conductors & Insulators, Concept of Effective Mass of an Electron and Hole.

#### UNIT-V

**8. Semiconductor Physics:** Fermi Level in Intrinsic and Extrinsic Semiconductors, Intrinsic Semiconductors and Carrier Concentration, Extrinsic Semiconductors and Carrier Concentration, Equation of Continuity, Direct & Indirect Band Gap Semiconductors, Hall Effect.

**9. Physics of Semiconductor Devices:** Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, I-V Characteristics of PN Junction, PN Diode as a Rectifier (Forward and Reverse Bias), Diode Equation, LED, LCD and Photo Diodes.

#### UNIT-VI

**10. Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo-electricity, Pyro-electricity and Ferro- electricity.

**11. Magnetic Properties:** Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials, Ferrites and their Applications, Concept of Perfect Diamagnetism, Meissner Effect, Magnetic Levitation, Applications of Superconductors.

#### UNIT-VII

**12. Lasers:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Carbon Dioxide Laser, Semiconductor Diode Laser, Applications of Lasers.

**13. Fiber Optics:** Principle of Optical Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers and Refractive Index Profiles, Attenuation in Optical Fibers, Application of Optical Fibers.

#### UNIT-VIII

**14. Acoustics of Buildings & Acoustic Quieting:** Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time (Qualitative Treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting The Architectural Acoustics and their Remedies. Acoustic Quieting: Aspects of Acoustic Quieting, Methods of Quieting, Quieting for Specific Observers, Mufflers, Sound-proofing.

**15. Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization (XRD & TEM) and Applications.

#### TEXT BOOKS:

1. Applied Physics – P.K.Palanisamy (SciTech Publications (India) Pvt. Ltd., Fifth Print 2008).
2. Applied Physics – S.O. Pillai & Sivakami (New Age International (P) Ltd., Second Edition 2008).
3. Applied Physics – T. Bhima Shankaram & G. Prasad (B.S. Publications, Third Edition 2008).

#### REFERENCES:

1. Solid State Physics – M. Armugam (Anuradha Publications).
2. Modern Physics – R. Murugesan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
3. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar – S. Chand & Co. (for acoustics).
4. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co. Ltd
5. Nanotechnology – M. Ratner & D. Ratner (Pearson Ed.).
6. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
7. Solid State Physics – A.J. Dekker (Macmillan).
8. Applied Physics – Mani Naidu Pearson Education



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. AME.**

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2	-/-/-	4

**(51005) ENGINEERING CHEMISTRY****UNIT I:**

**Electrochemistry and Batteries:** Concept of Electro Chemistry, Conductance-Electrolyte in solution, Conductance-Specific, Equivalent and molar conductance, Ionic mobilities, Kohlrausch's Law, Application of conductance, EMF: Galvanic Cells, types of Electrodes, Reference Electrode (SCE, Quinhydrone electrode), Ion Selective Electrodes (Glass Electrode) Nernst equation, Concentration Cells, Galvanic series, Potentiometric titrations, Numerical problems.

**Batteries:** Primary and secondary cells, (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries, fuel cells – Hydrogen – Oxygen fuel cells, Advantages of fuel cells.

**UNIT II:**

**Corrosion and its corrosion control:** Introduction, causes and different types of corrosion and effects of corrosion, theories of corrosion – Chemical, Electrochemical corrosion, corrosion reactions, factors affecting corrosion – Nature of metal – galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment-effect of temperature, effect of pH, Humidity, effect of oxidant. Corrosion control methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – methods of application on metals- hot dipping, galvanizing, tinning, cladding, electroplating - Organic surface coatings – paints constituents and functions.

**UNIT III:**

**Polymers:** Types of Polymerization, Mechanism (Chain growth & Step growth). Plastics: Thermoplastic resins & Thermo set resins. Compounding & fabrication of plastics, preparation, properties, engineering applications of: polyethylene, PVC, PS, Teflon, Bakelite, Nylon. Conducting Polymers: Poly acetylene, polyaniline, conduction, doping, applications. Liquid Crystal polymers: Characteristics and uses Rubber – Natural rubber, vulcanization. Elastomers – Buna-s,

Butyl rubber, Thiokol rubbers, Fibers – polyester, fiber reinforced plastics (FRP), applications

**UNIT IV:**

**Water:** Introduction, Hardness: Causes, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water, numerical problems. Boiler troubles – Scale & sludge formation, caustic embrittlement, corrosion, priming & foaming Softening of water (Internal & external treatment-Lime soda, Zeolite, Ion exchange process and Numerical problems) Reverse osmosis, electro dialysis.

**UNIT V:**

**Surface Chemistry:** Solid surfaces, types of adsorption, Langmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption, classification of colloids, Electrical & optical properties micelles, applications of colloids in industry. Nano materials: Introduction, preparation and applications of nano materials

**UNIT VI:**

**Energy sources:** fuels, classification – conventional fuels (solid, liquid, gaseous) Solid fuels – coal – analysis – proximate and ultimate analysis and their significance Liquid fuels – primary – petroleum – refining of petroleum-cracking knocking synthetic petrol – Bergius and Fischer Tropsech's process; Gaseous fuels – natural gas, analysis of flue gas by Orsat's method Combustion – problems, Calorific value of fuel – HCV, LCV, determination of calorific value by Junker's gas calorie meter.

**UNIT VII:**

**Phase rule:** Definitions – phase, component, degree of freedom, phase rule equation. Phase diagrams – one component system: water system. Two component system lead-silver system, heat treatment based on iron-carbon phase diagram, hardening, annealing.

**UNIT VIII:**

**Materials Chemistry:** Cement: composition of Portland cement, manufacture of port land Cement, setting & hardening of cement (reactions). Lubricants: Criteria of a good lubricant, mechanism,

properties of lubricants: Cloud point, pour point, flash & fire point, Viscosity, Refractoriness: Classification, Characteristics of a good refractory. Insulators & conductors: Classification of insulators characteristics of thermal & electrical insulators and applications of Superconductors (Nb-Sn alloy,  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ ), applications.

#### TEXT BOOKS:

1. Text Books of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).
2. Text of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co, New Delhi (2006)

#### REFERENCE BOOKS

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi (2004).
3. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).
4. Chemistry of Engineering Materials by CV Agarwal, C.P. Murthy, A. Naidu, BS Publications.
5. Chemistry of Engineering Materials by R.P. Mani and K.N. Mishra, CENGAGE learning.
6. Applied Chemistry – A text for Engineering & Technology – Springer (2005).
7. Text Book of Engineering Chemistry – Shashi Chawla, Dhanpatrai publishing Company, New Delhi (2008).
8. Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008).

### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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#### (51006) COMPUTER PROGRAMMING AND DATA STRUCTURES

##### UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programmes, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

##### UNIT - II

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

##### UNIT - III

Designing Structured Programmes, Functions, basics, user defined functions, inter function communication,

Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programmes

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C programme examples.

##### UNIT - IV

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Strings – Concepts, C Strings, String Input / Output functions, arrays of



strings, string manipulation functions, string / data conversion, C programme examples.

#### UNIT - V

Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

#### UNIT - VI

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C programme examples.

#### UNIT - VII

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods.

#### UNIT - VIII

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations.

#### TEXT BOOKS :

- 1) C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition Cengage Learning.
- 2) Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson education.

#### REFERENCES:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Educaion.
5. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
6. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
7. C Programming & Data Structures, E. Balagurusamy, TMH.
8. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
9. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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**(51007) ENGINEERING DRAWING****UNIT – I**

**INTRODUCTION TO ENGINEERING DRAWING :** Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions :

- Conic Sections including the Rectangular Hyperbola – General method only.
- Cycloid, Epicycloid and Hypocycloid
- Involute.
- Scales: Different types of Scales, Plain scales comparative scales, scales of chords.

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

**PROJECTION:** Principles of Orthographic Projections – Conventions – First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

**UNIT – III**

**PROJECTIONS OF PLANES & SOLIDS:** Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views.

**UNIT – IV**

**SECTIONS AND SECTIONAL VIEWS:-** Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**DEVELOPMENT AND INTERPENETRATION OF SOLIDS:** Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids

**UNIT – V**

**INTERSECTION OF SOLIDS:-** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT - VI**

**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.

**UNIT –VII**

**TRANSFORMATION OF PROJECTIONS:** Conversion of Isometric Views to Orthographic Views – Conventions.

**UNIT – VIII**

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

**TEXT BOOK :**

- Engineering Drawing, N.D. Bhat / Charotar
- Engineering Drawing and Graphics, Venugopal / New age.
- Engineering Drawing – Basant Agrawal, TMH

**REFERENCES :**

- Engineering drawing – P.J. Shah.S.Chand.
- Engineering Drawing, Narayana and Kanniah/Scitech publishers.
- Engineering Drawing- Johle/Tata Macgraw Hill.
- Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.
- Engineering Drawing – Grower.
- Engineering Graphics for Degree – K.C. John.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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## (51668) COMPUTER PROGRAMMING LAB

## Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To introduce the student to simple linear data structures such as lists, stacks, queues.

## Recommended Systems/Software Requirements:

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

## Week 1.

- Write a C program to find the sum of individual digits of a positive integer.
- A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

## Week 2.

- Write a C program to calculate the following Sum:  

$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
- Write a C program to find the roots of a quadratic equation.

## Week 3

- Write C programs that use both recursive and non-recursive functions.
  - To find the factorial of a given integer.
  - To find the GCD (greatest common divisor) of two given integers.
  - To solve Towers of Hanoi problem.

## Week 4

- The total distance travelled by vehicle in 't' seconds is given by

distance =  $ut + \frac{1}{2}at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance travelled 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'.

- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

## Week 5

- Write a C program to find both the largest and smallest number in a list of integers.
- Write a C program that uses functions to perform the following:
  - Addition of Two Matrices
  - Multiplication of Two Matrices

## Week 6

- Write a C program that uses functions to perform the following operations:
  - To insert a sub-string in to a given main string from a given position.
  - To delete n Characters from a given position in a given string.
- Write a C program to determine if the given string is a palindrome or not

## Week 7

- Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
- Write a C program to count the lines, words and characters in a given text.

## Week 8

- Write a C program to generate Pascal's triangle.
- Write a C program to construct a pyramid of numbers.

## Week 9

Write a C program to read in two numbers, x and n, and then

compute the sum of this geometric progression:

$$1+x+x^2+x^3+\dots+x^n$$

For example: if n is 3 and x is 5, then the program computes  $1+5+25+125$ .

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if  $n < 0$ , then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

#### Week 10

- 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- Write a C program to convert a Roman numeral to its decimal equivalent.

#### Week 11

Write a C program that uses functions to perform the following operations:

- Reading a complex number
- Writing a complex number
- Addition of two complex numbers
- Multiplication of two complex numbers

(Note: represent complex number using a structure.)

#### Week 12

- Write a C program which copies one file to another.
  - Write a C program to reverse the first n characters in a file.
- (Note: The file name and n are specified on the command line.)

#### Week 13

- Write a C programme to display the contents of a file.
- Write a C programme to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

#### Week 14

Write a C program that uses functions to perform the following operations on singly linked list:

- Creation
- Insertion
- Deletion
- Traversal

#### Week 15

Write C programs that implement stack (its operations) using

- Arrays
- Pointers

#### Week 16

Write C programs that implement Queue (its operations) using

- Arrays
- Pointers

#### Week 17

Write a C program that uses Stack operations to perform the following:

- Converting infix expression into postfix expression
- Evaluating the postfix expression

#### Week 18

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- Bubble sort
- Selection sort

#### Week 19

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :

- Linear search
- Binary search

#### Week 20

Write C program that implements the following sorting method to sort a given list of integers in ascending order:

- Quick sort

#### Week 21

Write C program that implement the following sorting method to sort a given list of integers in ascending order:

- Merge sort



**Week 22**

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

**Week 23**

Write C programs to implement the linear regression and polynomial regression algorithms.

**Week 24**

Write C programs to implement Trapezoidal and Simpson methods.

**Text Books**

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications
2. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
3. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
4. Practical C Programming, Steve Oualline, O'Reilly, SPD. TMH publications.
5. Computer Basics and C Programming, V. Rajaraman, PHI Publications.
6. Data structures and Program Design in C, R.Kruse, C.L.Tondo, B.P.Leung, M.Shashi, Pearson Education.

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(51669) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

**ENGINEERING PHYSICS LAB**

(Any twelve experiments compulsory)

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Study the characteristics of p-i-n and avalanche photodiode detectors.
10. Bending losses of fibres.
11. Evaluation of numerical aperture of given fibre.
12. Energy gap of a material of p-n junction.
13. Thermo electric effect – Seebeck effect and Peltier effect.
14. Torsional pendulum.
15. Single slit diffraction using laser.

**ENGINEERING CHEMISTRY LAB**

List of Experiments (Any 12 of the following):

**Titrimetry:**

- a. Estimation of hardness of water by EDTA method. (or)
- Estimation of calcium in limestone by Permanganometry.

**Mineral Analysis:**

2. Determination of percentage of copper in brass
3. Estimation of manganese dioxide in pyrolusite.

**Instrumental Methods:**

4. Colorimetry:

Determination of ferrous iron in cement by colorimetric method.

(Or) Estimation of Copper by Colorimetric method.

**5. Conductometry:**

Conductometric titration of strong acid Vs strong base.

(or) Conductometric titration of mixture of acids Vs strong base.

**6. Potentiometry:**

Titration of strong acid Vs strong base by potentiometry.

(or) Titration of weak acid Vs strong base by potentiometry.

**Physical Properties:**

7. Determination of viscosity of sample oil by redwood/oswald's viscometer

8. Determination Surface Tension of lubricants.

**Identification and Preparations:**

Identification of functional groups present in organic compounds.

Preparation of organic compounds Aspirin (or) Benzimidazole

**Kinetics:**

11. To determine the rate constant of hydrolysis of methyl acetate catalysed by an acid and also the energy of activation. (or) To study the kinetics of reaction between  $K_2S_2O_8$  and KI.

12. Demonstration Experiments ( Any One of the following ) :

- Determination of dissociation constant of weak acid-by PH metry
- Preparation of Thiokol rubber
- Adsorption on Charcoal
- Heat of reaction

**TEXT BOOKS:**

- Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
- Inorganic quantitative analysis, Vogel.

**REFERENCE BOOKS:**

- Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel.
- A text book on experiments and calculation Engg. S.S. Dara.
- Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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**(51670) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

**Objectives:**

- To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To train them to use language effectively to face interviews, group discussions, public speaking.
- To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

**SYLLABUS:**

The following course content is prescribed for the **English Language Laboratory** sessions:

- Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
- Introduction to Stress and Intonation.
- Situational Dialogues / Role Play.
- Oral Presentations- Prepared and Extempore.
- 'Just A Minute' Sessions (JAM).
- Describing Objects / Situations / People.
- Information Transfer
- Debate
- Telephoning Skills.
- Giving Directions.

**Minimum Requirement:**

**The English Language Lab shall have two parts:**



**The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

**The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement (Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library.
- Clarity Pronunciation Power – Part I.
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Oxford Advanced Learner's Compass, 7<sup>th</sup> Edition.
- Learning to Speak English - 4 CDs
- Vocabulary in Use, Michael McCarthy, Felicity O'Den, Cambridge.
- Murphy's English Grammar, Cambridge with CD.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

**Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):**

1. **A Handbook for English Language Laboratories** – Prof. E. Suresh Kumar, P. Sreehari, Foundation Books.
2. **Effective Communication & Public Speaking** by S. K. Mandal, Jaico Publishing House.

3. **English Conversation Practice** by Grant Taylor, Tata McGraw Hill.
4. **Speaking English effectively** by Krishna Mohan, N. P. Singh, Mac Millan Publishers.
5. **Communicate or Collapse: A Handbook of Effective Public Speaking, Group Discussions and Interviews**, by Pushpa Lata & Kumar, Prentice-Hall of India.
6. **Learn Correct English, Grammar, Usage and Composition** by Shiv. K. Kumar & Hemalatha Nagarajan, Pearson Longman
7. **Spoken English** by R. K. Bansal & J. B. Harrison, Orient Longman.
8. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr. G. Natanam & Prof. S. A. Sankaranarayanan, Anuradha Publications, Chennai.
9. **Effective Technical Communication**, M. Ashraf Rizvi, Tata McGraw-Hill.
10. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
11. **A text book of English Phonetics for Indian Students** by T. Balasubramanian, Mac Millan
12. **Spoken English: A foundation Course, Parts 1 & 2**, Kamlesh Sadanand and Susheela Punitha, Orient Longman

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

**English Language Laboratory Practical Paper:**

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by an external examiner/ or the teacher concerned with the help of another member of the staff of the same department of the same institution.

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## (51671) ENGINEERING WORKSHOP / IT WORKSHOP

## 1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.
9. IT Workshop-I : Computer hard ware , identification of parts , Disassembly, Assembly of computer to working condition, Simple diagnostic exercises.
10. IT workshop-II : Installation of Operating system windows and Linux , simple diagnostic exercises.

## 2. TRADES FOR DEMONSTRATION &amp; EXPOSURE:

1. Plumbing
2. Machine Shop
3. Metal Cutting (Water Plasma)

## TEXT BOOK:

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual by Venkat Reddy

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## (53014) PROBABILITY AND STATISTICS

## UNIT-I : Probability

*Sample space and events – Probability – The axioms of probability – Some*

Elementary theorems - Conditional probability – Baye's theorem, Random variables – Discrete and continuous.

## UNIT-II: Distributions

Binomial , Poisson & normal distributions related properties . Sampling distributions –Sampling distribution of means ( $\sigma$  known and Unknown)

## UNIT-III: Testing of Hypothesis I

Tests of hypothesis point estimations – interval estimations Bayesian estimation. Large samples, Null hypothesis – Alternate hypothesis type I, & type II errors – critical region confidential interval for mean testing of single variance. Difference between the mean.

## UNIT-IV : Testing of Hypothesis II

Confidential interval for the proportions. Tests of hypothesis for the proportions single and difference between the proportions.

## UNIT-V: Small samples

Confidence interval for the t- distribution – Tests of hypothesis – t- distributions, F- distributions  $\chi^2$  distribution. Test of Hypothesis.

## UNIT-VI

## Correlation &amp; Regression

Coefficient of correlation – Regression Coefficient – The lines of regression – The rank correlation

## UNIT-VII

## Queuing Theory

Arrival Theorem - Pure Birth process and Death Process M/M/1 Model.

## UNIT-VIII

## Stochastic processes



Introduction to Stochastic Processes – Markov process classification of states – Examples of Markov Chains, Stochastic Matrix, limiting probabilities.

#### TEXT BOOKS:

1. Probability & Statistics by D.K. Murugesan & P.Guru Swamy, Anuradha Publications.
2. Probability & Statistics for Engineers by G.S.S.Bhisma Rao, Scitech Publications.

#### REFERENCES:

1. Probability & Statistics by T.K.V.Iyengar & B.Krishna Gandhi & Others, S.Chand.
2. Probability & Statistics by William Mendenhall & Others, Cengage Publications.
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
4. Higher Engineering Mathematics by Jain & S.K.R. Iyengar, Narasa Publications.
5. A first course in Probability & Statistics by B.L.S. Prakasa Rao, World Scientific.
6. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.

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#### (53015) ELECTRICAL AND ELECTRONICS ENGINEERING

##### UNIT - I

**ELECTRICAL CIRCUITS:** Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

##### UNIT - II

**DC MACHINES :** Principle of operation of DC Generator – emf equation – types – DC motor types – torque equation – applications – three point starter.

##### UNIT - III

**TRANSFORMERS :** Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation

##### UNIT - IV

**AC MACHINES :** Principle of operation of alternators – regulation by synchronous impedance method – Principle of operation of induction motor – slip – torque characteristics – applications.

##### UNIT - V

**INSTRUMENTS :** Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

##### UNIT - VI

**DIODE AND ITS CHARACTERISTICS :** P-n junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (Simple Problems)

**UNIT - VII**

**TRANSISTORS** : PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications

**UNIT - VIII**

**CATHODE RAY OSCILLOSCOPE** : Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

**TEXT BOOKS:**

1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin/Pearson.
2. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Co.

**REFERENCES:**

1. Introduction to Electrical Engineering - M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering by Kothari and Nagarath, TMH Publications, 2nd Edition.

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**(53016) MECHANICS OF SOLIDS****UNIT - I**

**SIMPLE STRESSES & STRAINS** : Elasticity and plasticity - Types of stresses & strains-Hooke's law - stress - strain diagram for mild steel - Working stress - Factor of safety - Lateral strain, Poisson's ratio & volumetric strain - Elastic moduli & the relationship between them - Bars of varying section - composite bars - Temperature stresses. Strain energy - Resilience - Gradual, sudden, impact and shock loadings.

**UNIT - II**

**SHEAR FORCE AND BENDING MOMENT** : Definition of beam - Types of beams - Concept of shear force and bending moment - S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads - Point of contra flexure - Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT - III**

**FLEXURAL STRESSES** : Theory of simple bending - Assumptions - Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis - Determination bending stresses - section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections - Design of simple beam sections.

**UNIT - IV**

**SHEAR STRESSES** : Derivation of formula - Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

**UNIT - V**

**ANALYSIS OF PIN-JOINTED PLANE FRAMES** : Determination of Forces in members of plane, pinjointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever & simply-supported trusses-by method of joints, method of sections & tension coefficient methods.



**UNIT – VI**

**DEFLECTION OF BEAMS** : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, – U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

**UNIT – VII**

**THIN CYLINDERS** : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

**UNIT – VIII**

Thick cylinders – Lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.

**TEXT BOOKS :**

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

**REFERENCES :**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timshenko

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**(53017) THERMODYNAMICS****UNIT – I**

**Introduction: Basic Concepts** : System, Control Volume, Surrounding, Boundaries, Universe, Types of

Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium,

State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of

Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

**UNIT II**

Zeroth Law of Thermodynamics – Concept of quality of Temperature – Principles of Thermometry –

Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM

I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process –

applied to a flow system – Steady Flow Energy Equation.

**UNIT – III**

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

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries,

PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of

Temperature, Clausius inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability

and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations –

Elementary Treatment of the Third Law of Thermodynamics.

**UNIT IV**

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple

point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation

Property tables, Mollier charts – Various Thermodynamic processes and energy Transfer – Steam

Calorimetry.

**UNIT - V**

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes,

properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion

Processes – Flow processes – Deviations from perfect Gas Model – Vander Waals Equation of State –

Compressibility charts – variable specific Heats – Gas Tables.

**UNIT – VI**

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's

Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial

pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of

Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature,

Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity,

Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's

Equation – Psychrometric chart.

**UNIT - VII**

**Power Cycles** : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle,

Lenoir Cycle – Description and representation on P-V and T-S diagram,

Thermal Efficiency, Mean

Effective Pressures on Air standard basis – comparison of Cycles.

**UNIT VIII**

**Refrigeration Cycles** : Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-

Coleman cycle, Vapour compression cycle-performance Evaluation.

**TEXT BOOKS :**

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH

**REFERENCES :**

1. An introduction to Thermodynamics - YVC Rao / University press
2. Solution Manual to Introduction to Thermodynamics, YVC Rao / University Press
3. Engineering Thermodynamics – Jones & Dugan
4. Thermodynamics – Robert Balmer, Jaico Pub.
5. Thermodynamics – J.P.Holman, McGrawHill
6. Engineering Thermodynamics – K. Ramakrishna, Anuradha Publishers.
7. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen, John Wiley & sons (ASIA) Pte Ltd



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**(53018) METALLURGY AND MATERIAL SCIENCE****UNIT - I**

**Structure of Metals** : Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

**UNIT - II**

**Constitution of Alloys** : Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

**UNIT - III**

**Equilibrium of Diagrams** : 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-An, Cu-Sn and Fe-Fe<sub>3</sub>C.

**UNIT - IV**

**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 - V**

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

**UNIT - VI**

**Non-ferrous Metals and Alloys** : Structure and properties of copper

and its alloys, Aluminium and its alloys, Titanium and its alloys.

**UNIT - VII**

**Ceramic materials** : Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials – definition, properties and applications of the above.

**UNIT - VIII**

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

**TEXT BOOKS :**

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Essential of Materials science and engineering/ Donald R. Askeland/Thomson.

**REFERENCES :**

1. Material Science and Metallurgy/kodgire.
2. Science of Engineering Materials / Agarwal
3. Materials Science and engineering / William and collister.
4. Elements of Material science / V. Raghavan
5. An introduction to materials science / W.g.vinas & HL Mancini
6. Material science & material / C.D.Yesudian & harris Samuel
7. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.
8. Engineering materials and metallurgy/R.K.Rajput/ S.Chand.



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III Year B.Tech. AME. I-Sem

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## (53049) AUTOMOBILE ENGINEERING

## 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, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft..

## UNIT – II

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

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

## UNIT – III

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

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

## Unit – IV

Emission from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels and gaseous fuels, electrical-their merits and demerits.

## UNIT – V

**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.

## UNIT – VI

**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 shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

## UNIT – VII

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

## UNIT – VIII

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

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

## TEXT BOOKS :

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Sing.
2. Automobile Engineering / William Crouse

## REFERENCES :

1. Automotive Engineering / Newton Steeds & Garrett
2. Automotive Mechanics / G.B.S. Narang
3. Automotive Mechanics / Heitner
4. Automotive Engines / Srinivasan
5. Automobile Engineering – K.K. Ramalingam / Scitech Publications (India) PVT. LTD.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

II Year B.Tech. AME. I-Sem

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**(53634) ELECTRICAL AND ELECTRONICS ENGINEERING LAB****SECTION A: ELECTRICAL ENGINEERING:**

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

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method. In addition to the above four experiments, any one of the experiments from the following list is required to be conducted:
5. Speed control of D.C. Shunt motor by
  - a) Armature Voltage control
  - b) Field flux control method
6. Brake test on D.C Shunt Motor

**SECTION B: ELECTRONICS ENGINEERING :**

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

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**(53635) METALLURGY AND MECHANICS OF SOLIDS LAB****(A) METALLURGY LAB :**

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

**(B) MECHNICS OF SOLIDS LAB :**

1. Direct tension test
2. Bending test on
  - a) Simple supported
  - b) Cantilever beam
3. Torsion test
4. Hardness test
  - a) Brinells hardness test
  - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

NOTE : Any 10 experiments from the above are to be conducted taking atleast 4 from each section.



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## (54013) PRODUCTION TECHNOLOGY

## UNIT - I

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

## UNIT - II

Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys.

Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die, 3) Investment.

**Methods of Melting** : Crucible melting and cupola operation, steel making processes, special.

## UNIT - III

**A) Welding** : Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water ) welding.

**B) Cutting of Metals**: Oxy – Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals.

## UNIT - IV

Inert Gas welding, TIG & MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive nondestructive testing of welds.

## UNIT - V

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

## UNIT - VI

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

## UNIT-VII

**EXTRUSION OF METALS** : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion.

**Forging processes**: Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects.

## UNIT - VIII

Processing of Plastics: Types of Plastics, Properties, applications and their Processing methods & Equipment (blow & injection molding)

## TEXT BOOKS :

1. Manufacturing Processes for Engineering Materials - Seroppe Kalpakjian and Steven R Schmid, Pearson Pub.
2. Manufacturing Technology - P.N. Rao, TMH
3. Production Technology - Sarma P C, S. Chand Pub.

## REFERENCES :

1. Production Technology / R.K. Jain
2. Process and materials of manufacturing – Lindberg/PE
3. Principles of Metal Castings / Roenthal.
4. Welding Process / Paramar /
6. Production Engineering – Suresh Dalela & Ravi Shankar / Galgotia Publications Pvt. Ltd.
7. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.



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**(54014) KINEMATICS OF MACHINERY****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.

**UNIT - II**

**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 - III**

**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, cancloids 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 - IV**

**STEERING Mechanisms** : 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.

**UNIT - V**

**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 - VI**

Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

**UNIT - VII**

**Belt Rope and Chain Drives** : Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

**UNIT - VIII**

**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 by Thomas Bevan, CBS
2. Theory of Machines - R.K. Bansal
3. Theory of Machines R.S. Khurmi & J.K. Gupta

**REFERENCES :**

1. Theory of machines – Rattan .S.S., TMH, 2009 Edition
2. Theory of machines – PL. Ballaney / khanna publishers.
3. Theory of Machines Sadhu Singh Pearsons Edn
4. Mechanism and Machine Theory / JS Rao and RV Dukkupati / New Age
5. Theory of Machines / Shigley / Oxford

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

II Year B.Tech. AME. II-Sem

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**(54052) APPLIED THERMODYNAMICS - I****UNIT - I : Actual Cycles and their Analysis:**

Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency, Loss due to Rubbing Friction, Actual and Fuel-Air Cycles Of CI Engines.

**UNIT-II : I.C. ENGINES :**

Classification - Working principles, Valve and Port Timing Diagrams, Air - Standard, air-fuel and actual cycles - Engine systems - Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

**UNIT - III : Combustion in S.I. Engines :**

Normal Combustion and abnormal combustion - Importance of flame speed and effect of engine variables - Type of Abnormal combustion, pre-ignition and knocking (explanation of ) - Fuel requirements and fuel rating, anti knock additives - combustion chamber - requirements, types.

**UNIT IV : Combustion in C.I. Engines :**

Four stages of combustion - Delay period and its importance - Effect of engine variables - Diesel Knock- Need for air movement, suction, compression and combustion induced turbulence - open and divided combustion chambers and nozzles used - fuel requirements and fuel rating.

**UNIT - V : Testing and Performance :**

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

**UNIT - VI : COMPRESSORS:**

Classification -positive displacement and roto dynamic machinery - Power producing and power absorbing machines, fan, blower and compressor - positive displacement and dynamic types - reciprocating and rotary types.

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

**UNIT VII : Rotary (Positive displacement type) :**

Roots Blower, vane sealed compressor, Lysholm compressor - mechanical details and principle of working - efficiency considerations.

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

**UNIT-VIII : Axial Flow Compressors :**

Mechanical details and principle of operation - velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations - Polytropic efficiency.

**TEXT BOOKS:**

1. I.C. Engines - V. GANESAN, TMH
2. IC Engines - Ramalingam, Scietech publishers

**REFERENCES:**

1. IC Engines - Mathur & Sharma - Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines - Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot, Allahabad
5. I.C. Engines / Heywood /McGrawHill.
6. Thermal Engineering - R.S. Khurmi & J.K.Gupta - S.Chand
7. Thermal engineering data book-B.Srinivasulu Reddy/JK International Pub.
9. Thermal Engineering / Rajput / Lakshmi Publications.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. AME. II-Sem**

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0	-1/-6	4

**(54017) MACHINE DRAWING****Machine Drawing Conventions :**

Need for drawing conventions – introduction to IS conventions

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

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

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

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

**II. Assembly Drawings:**

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

- Engine parts – stuffing boxes, cross heads, Eccentrics, Petro Engine connecting rod, piston assembly.
- Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.

- Valves : 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 BOOKS :**

- Machine Drawing – Ajeet Singh, TMH Publications
- Machine Drawing – K.L. Narayana, P. Kanniah & K. Venkata Reddy / New Age/ Publishers
- Machine Drawing – N.D. Bhatt.

**REFERENCES :**

- Machine Drawing – P.S. Gill.
- Machine Drawing – Luzzader
- Machine Drawing - Rajput



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II Year B.Tech. AME A.M.E. I-Sem

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**(54004) ENVIRONMENTAL STUDIES**

**UNIT-I : ECOSYSTEMS:** Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Homeostasis / Cybernetics, Food chain concentration, Biomagnification, ecosystems value, services and carrying capacity.

**UNIT-II: NATURAL RESOURCES:** Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources – case studies. Land resources: land as a resource, land degradation, man induced landslides and land use / land cover mapping.

**UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-Situ and Ex-situ conservation. Food and fodder resources, Timber and non-timber forest products.

**UNIT-IV: ENVIRONMENTAL POLLUTION AND CONTROL:** Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards, Waste water treatment methods: effluent treatment plants (ETP), Sewage treatment plants

(STP), common and combined effluent treatment plants (CETP). Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents. Noise Pollution: Sources, Industrial Noise- Occupational Health hazards, standards, Methods of control of Noise. Thermal Pollution, Thermal Comforts, Heat Island effect, Radiation effects. Nuclear Pollution: Nuclear power plants, nuclear radiation, disasters and impacts, genetical disorders. Solid waste: types, Collection processing and disposal of industrial and municipal solid wastes composition and characteristics of e-Waste and its management.

**UNIT-V: GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS** : Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

**UNIT-VI: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN:** Definition of Impact: classification of impacts, Positive and Negative, Reversible and irreversible, light, moderate and severe, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society. Prediction of impacts and impact assessment methodologies. Environmental Impact Statement (EIS). Environmental Management Plan (EMP): Technological Solutions, preventive methods, Control technologies, treatment technologies: green-belt-development, rain water harvesting, Remote sensing and GIS methods.

**UNIT-VII: ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS**

National Environmental Policy, Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management

and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules.

#### UNIT: VIII — TOWARDS SUSTAINABLE FUTURE

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

#### SUGGESTED TEXT BOOKS:

1. Environmental studies, From crisis to cure by R.Rajagopalan, 2005
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007
3. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

#### REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. AME. II Semester

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#### (54053) AUTOMOTIVE ENGINES

##### Unit-I

**Introduction:** Historical development of Automobiles, Different Types of Automotive Power plants, principles of I.C engine operation and classification of engines, supercharging and turbo charging.

##### Unit-II

**Two stroke and four stroke engines:** different types of scavenging systems for 2stroke engines, scavenging efficiency. Relative merits and demerits in comparison to four stroke engines. Valve and Port timing diagrams, special types of I.C engines like Sterling, Wankle rotary, variable compression ratio engines and Variable valve timing engines.

##### Unit-III

**Automobile Engine Components:** Classification, Function, Materials, Constructional details and Manufacturing process of engine components. Cylinder head, cylinder block, cylinder liner, piston, piston ring, connecting rod, crankshaft, camshaft, Bearings, Gudgeon pin, Valve & Valve gear, valve mechanisms, Inlet and Exhaust manifolds, crankcase, flywheel, oil sump and crank case.

##### Unit-IV

**Carburetion:** Mixture requirements in SI Engines, fundamental of carburetion flow characteristics of carburetion, methods of mixture correction, calculation of throat and jet sizes of a carburetor, Types of carburetors, simple, S.U. carburetor, zenith carburetor etc. Means of compensation during starting, idling and acceleration. Carburetor adjustments, field and lab tests. Fuel feed pumps, Petrol Injection: Disadvantages of carburetion.

##### Unit-V

Advantages of petrol injection, need to have a close control over air fuel ratio in SI Engines for emission reduction, cylinder port and manifold injection systems, timed and continuous injection systems, multipoint fuel injection systems, Gasoline direct injection.



**Unit VI**

**Fuel injection in CI Engines:** Fuel filters, transfer pumps, injection pumps. Injection nozzles, their functions. Diesel fuel pumps: principle. Delivery characteristics of fuel pumps, characteristic injection lag effect of injection, pressure waves in fuel lines, rotary distributor pumps.

**Unit – VII**

**Governors:** Maximum and minimum speed governors. Mechanical and pneumatic governors. Fuel spray characteristics: Types of injection nozzles and their characteristics, Multihole, pintle and Pintaux nozzles. Unit injectors.

**Unit – VIII**

**Lubrication Systems:** Functions of the lubrication system, classification of lubricating oils, lubricating systems -wet sump lubrication - dry sump lubrication, oil filters, oil pumps, crankcase ventilation, oil additives. Air and water cooling systems, thermo syphon and forced water cooling systems.

**Text Books:**

1. K Newton and Steeds -The Motor Vehicle, SAE Publications
2. ML Mathur & RPSharma -A course in Internal combustion Engines - Dhanpat Rai
3. V Ganesan , I.C Engines.

**References Books:**

1. Bosch Gasoline Engines management – Bosch Publications
2. Bosch Diesel Engine management – Bosch Publication
3. B.P. Obert I C Engines & Air Pollution – Harper & Row Publications
5. Heinz Heistler, Internal Combustion Engines, SAE Publications
6. Richard Stone, Introduction to Internal Combustion Engines, MacMillan UK

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II Year B.Tech. AME. II-Sem

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**(54634) PRODUCTION TECHNOLOGY LAB**

Minimum of 12 Exercises need to be performed

**I. METAL CASTING LAB :**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability - 1
3. Moulding Melting and Casting - 1 Exercise

**II WELDING LAB :**

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises  
(Water Plasma Device)

**III MECHANICAL PRESS WORKING :**

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press : Deep drawing and extrusion operation.
3. Bending and other operations

**IV PROCESSING OF PLASTICS**

1. Injection Moulding
2. Blow Moulding

**REFERENCE BOOK:**

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. AME. II Semester

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## (54635) AUTOMOTIVE ENGINES LAB

## PART-A

1. Study of Hand power and measuring tools -sketching, materials used and their uses.
2. Writing technical specifications and descriptions of all types of automobile engines (petrol and diesel) -materials, functions with sketches.
3. i) Dismantling, Inspection for wear and tear, crack, material breakdown of different engines components. Servicing of engines by paraffin and degreasing methods, decarbonising procedure, Dismantling, Inspection and Assembly of different parts of two wheelers, 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines using the concepts of torque and assembly diagrams.  
ii) Measurement of dimensions of different components of the above engines and compare the same with standard specifications. Assembling the engines with using special tools, necessary adjustments of the engine components. Valve spring testing, connecting rod alignment, piston ring testing procedure for dismantling and assembling.

## PART-B

1. Testing of I.C. Engines-Basic measurements -speed, fuel, flow, air consumption, measurement of BHP using different types of dynamometers, their working principles. Determination of IHP, BHP, Mech. efficiency, break thermal efficiency, indicated thermal efficiency, volumetric efficiency SFC. etc; Drawing head balance sheet for petrol and diesel engines.
2. Test on multi cylinder engines, morse test.
3. Valve and port timing diagrams-determination of compression ratio.
4. Tests on Fuel and Lubricants.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. AME I Semester

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## (55015) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Unit I Introduction to Managerial Economics:** Definition, Nature and Scope of Managerial Economics-Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

**Unit II Elasticity of Demand:** Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

**Unit III Theory of Production and Cost Analysis:** Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

**Cost Analysis:** Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

**Unit IV Introduction to Markets & Pricing Policies: Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

**Objectives and Policies of Pricing- Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

**Unit V Business & New Economic Environment:** Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

**Unit VI Capital and Capital Budgeting:** Capital and its significance,

Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

**Unit VII Introduction to Financial Accounting:** Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Unit VIII Financial Analysis through ratios:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Profit Ratio, P/E Ratio and EPS).

#### TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

#### REFERENCES:

1. Raghunatha Reddy & Narasimhachary: Managerial Economics & Financial Analysis, Scitech, 2009.
2. V.Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
5. Subhash Sharma & M P Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2008.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2009.

8. Dwivedi: Managerial Economics, Vikas, 2009.
9. M.Kasi Reddy, S.Saraswathi: Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert: Techniques of Financial Analysis, Jaico, 2007.

**Prerequisites:** Nil

**Objective:** To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

**Codes/Tables:** Present Value Tables need to be permitted into the examinations Hall.

**Question Paper Pattern:** 5 Questions to be answered out of 8 questions. Out of eight questions 4 questions will be theory questions and 4 questions should be problems.

Each question should not have more than 3 bits.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

III Year B.Tech. AME I Semester	L	T/P/D	C
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**(55078) FLUID MECHANICS AND HYDRAULIC MACHINES****UNIT I**

**Fluid statics:** Dimensions and units: physical properties of fluids-specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

**UNIT II**

**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 dimensional flow.

**Fluid dynamics :** Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

**UNIT III**

**Closed conduit flow:** Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter (Ref.4)

**UNIT IV**

**Basics of turbo machinery:** Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

**UNIT V**

**Hydroelectric power stations:** Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

**UNIT VI**

**Hydraulic Turbines :** Classification of turbines, impulse and reaction

turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tube theory- functions and efficiency.

**UNIT VII**

**Performance of hydraulic turbines:** Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

**UNIT VIII**

**Centrifugal pumps :** Classification, working, work done – manometric head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

**Reciprocating pumps :** Working, Discharge, slip, indicator diagrams.

**TEXT BOOKS:**

1. Hydraulics, fluid mechanics and Hydraulic machinery by MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

**REFERENCES:**

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgalah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W Dally, William E. Riley, John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements).



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**(55017) DYNAMICS OF MACHINERY****UNIT – I PRECESSION:**

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

**UNIT – II STATIC AND DYNAMIC FORCE ANALYSIS OF PLANAR MECHANISMS:**

Introduction – Free Body Diagrams – Conditions for equilibrium – Two, three and four force Members – Inertia forces and D' Alembert's principle – planar rotation about a fixed center.

**UNIT – III SYNTHESIS OF LINKAGES:**

Three position synthesis – Four Position Synthesis – Precision positions – structural error – Chebychev's spacing, Freudentein's Equation, Problems.

**UNIT – IV CLUTCHES:**

Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

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

**UNIT – V****TURNING MOMENT DIAGRAM AND FLY WHEELS:**

Turning moment – Inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – Fly wheels and their design.

**UNIT-VI GOVERNERS:**

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

**UNIT – VII****BALANCING:**

Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods - Unbalanced forces and couples – Balancing of "V", multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing.

**UNIT – VIII****VIBRATION:**

Free Vibration of mass attached to vertical spring – Simple problems on forced damped vibration Vibration Isolation & Transmissibility- Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

**TEXT BOOKS :**

1. Theory of Machines by T. Beven, Pearson Education
2. Theory of Machines by SS Ratan, Mc Graw Hill

**REFERENCES :**

1. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
2. Kinematics and Dynamics of Machinery by R.L.Norton, Mc Graw - Hill
3. Mechanism and Machine Theory / JS Rao and RV Dukkupati / New Age
4. Theory of Machines and Mechanisms by Uicker, Pennock and Shigley, Oxford

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**(55079) DESIGN OF MACHINE ELEMENTS****UNIT – I**

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

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

**UNIT – II**

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

**UNIT – III**

**Riveted and welded joints** – Design of joints with initial stresses Bolted joints – Design of bolts with pre-stresses – both of uniform strength.

**UNIT – IV****SHAFTS, KEYS AND COTTERS:**

**SHAFTS:** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combines bending and axial loads – Shaft sizes – BIS code. Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter.

**UNIT – V****MECHANICAL SPRINGS:**

Stresses and deflections of helical springs – Extension and DMM – I compression springs – Springs for fatigue loading – natural frequency

of helical springs – Energy storage capacity – helical torsion springs – Co-axial springs, leaf springs.

**UNIT – VI**

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

**UNIT – VII****ENGINE PARTS:**

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

**UNIT – VIII**

**PISTONS, FORCES ACTING ON PISTON** – Construction Design and proportions of piston., Cylinder liners.

**TEXT BOOKS :**

1. Mechanical Engineering Design by Bahl and Goel, Standard Publications
2. Machine Design by R.L.Norton, Mc Graw Hill

**REFERENCES :**

1. Machine Design by Timothy H, Wenzell PE, Cengage
2. Machine Design by V.Bandari, Tmh Publishers
3. Machine design / Schaum Series.
4. Machine design – Pandya & Shah.
5. Machine Design, S MD Jalaludin, Anuradha Publishers



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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## (55020) APPLIED THERMODYNAMICS - II

## UNIT - I

**Basic Concepts:** Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean

Temperature of Heat addition, Methods to improve cycle performance - Regeneration & reheating, Combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis

## UNIT II

**Boilers:** Classification - Working principles - with sketches including H.P. Boilers - Mountings and Accessories - Working principles, Boiler horse power, equivalent evaporation, efficiency and heat balance - Draught, classification - Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney - artificial draught, induced and forced.

## UNIT - III

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

## UNIT - IV

**Steam Turbines:** Classification - Impulse turbine; Mechanical details - Velocity diagram - effect of friction - power developed, axial thrust, blade or diagram efficiency - condition for maximum efficiency. De-Laval Turbine - its features. Methods to reduce rotor speed - Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow - combined velocity diagram for a velocity compounded impulse turbine.

## UNIT V

**Reaction Turbine:** Mechanical details - principle of operation, thermodynamic analysis of a stage, degree of reaction - velocity

diagram - Parson's reaction turbine - condition for maximum efficiency.

## UNIT VI

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

## UNIT - VII

**Gas Turbines:** Simple gas turbine plant - Ideal cycle, essential components - parameters of performance - actual cycle - regeneration, inter cooling and reheating - Closed and Semi-closed cycles - merits and demerits, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

## UNIT - VIII

**Jet Propulsion:** Principle of Operation - Classification of jet propulsive engines - Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency - Turbo jet engines - Needs and Demands met by Turbo jet - Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation - Methods.

**Rockets:** Application - Working Principle - Classification - Propellant Type - Thrust, Propulsive Efficiency - Specific Impulse - Solid and Liquid propellant Rocket Engines.

## TEXT BOOKS:

1. Thermal Engineering / R.K. Rajput / Lakshmi Publications
2. Gas Turbines - V.Ganesan / TMH

## REFERENCES:

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2. Gas Turbines and Propulsive Systems - P.Khajuria & S.P.Dubey - /Dhanpatrai
3. Gas Turbines / Cohen, Rogers and Saravana Muttou / Addison Wesley - Longman
4. Thermal Engineering-R.S Khurmi/JS Gupta/S.Chand.
5. Thermal Engineering-P.L.Bellaney/ Khanna publishers.
6. Thermal Engineering-M.L.Mathur & Mehta/Jain bros.



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## (55080) VEHICLE DYNAMICS

## Unit-I

**Undamped free vibration:** Single degree of freedom Systems, introduction, undamped free vibration -Natural frequency' of free vibration, Rayleigh's method, stiffness of spring elements, effects of spring mass, Energy method, Newton's method and D' Alembert's principle- problems.

## Unit-II

**Damped free vibration:** Single degree of freedom systems, different types of damping, concept of critical damping and its importance, response study of viscous damped systems for cases of under damping and over damping, logarithmic decrement.

## Unit-III

**Forced vibration:** Single degree of freedom systems, steady state solution with viscous damping due to harmonic force solution by complex algebra, concept of response, reciprocating and rotating unbalance, vibration isolation Transmissibility ratio, energy dissipated by damping equivalent.

viscous damping. Structural damping, sharpness or resonance. base excitation.

## Unit-IV

**Vibration measuring instruments** -Accelerometers and vibrometers. whirling of shafts with and without air damping, discussion of speeds above and below critical speeds.

## Unit-V

**Systems with two degree of freedom:** Introduction, principle modes and normal modes" co-ordinate coupling, generalised and principle co-ordinate, free vibrations in terms of natural conditions. Lagranges equation, semi-definite systems, forced oscillations. harmonic excitation.

## Unit-VI

**Vehicle vibrations:** Vehicle vibration with single degree of freedom free vibration, forced vibration, vibration due to road roughness, vibration due to engine unbalance, transmissibility of engine mounting vibration with two degree of freedom, free vibration, compensated suspension systems forced vibration, vibration due to road roughness.

## Unit-VII

**Different types of tyres – Materials used:** Tyre construction, physics of tyre traction on dry and wet surface, tyre traction on dry and wet surface, tyre forces and moments, SAE recommended terminologies of tyre road interaction.

## Unit-VIII

**Numerical methods for multi degree of freedom systems:** Introduction, influence coefficients, Maxwell's reciprocal theorem, Dunkerley's equation, orthogonality principle, method of matrix iteration- method of determination of all the natural frequencies using sweeping matrix and orthogonality principle, Holzer's method for systems with free, fixed free and fixed ends.

## TEXTBOOKS:

1. Mechanical Vibration -By G.K.Grover, Nernchand & Brothers
2. Vibration Theory & Applications -By William I Thomson, Prentice Hall

## REFERENCES:

1. Theory & Problems of Mechanical Vibration -By William W. Seto, McGrawHill
2. Problems in Automobile Mechanics-By N.K.Giri, Khanna Pub.
3. Mechanics of Pneumatic Tyre -By S.K.Clark, Prentice Hall
4. Mechanical Vibration Analysis -By P Srinivasan, TMH
5. Mechanical Vibration -By Church. Wife International

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. AME I Semester	L	T/P/D	C
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**(55636) MECHANICS OF FLUIDS AND  
HYDRAULIC MACHINES LAB.**

1. Calibration of Venturimeter & Orifice meter
  2. Determination of Coefficient of discharge for a small orifice by a constant head method.
  3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
  4. Calibration of contracted Rectangular Notch and /or Triangular Notch
  5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
  6. Verification of Bernoulli's equation.
  7. Performance test on single stage centrifugal pump
  8. Performance test on reciprocating pump
  9. Impact of jet on vanes
  10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
  11. Performance and specific speed test on Francis Turbine
  12. Performance and specific speed test on Kaplan Turbine
  13. Performance test on multi stage pump
  14. Suitability test on centrifugal pump
  15. Drag and Lift Coefficients of an Aerofoil model.
- Any ten of the above experiments are to be covered.

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**(55637) THERMAL ENGINEERING LAB**

**Perform any 10 out of the 12 exercises**

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test(\*4 -Stroke Diesel Engines )
3. I.C. Engines Performance Test on 2-Stroke Petrol
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Petrol Engine
5. Evaluate of engine friction by conducting motoring /retardation test on 4 stroke diesel Engine.
6. Heat balance on IC Engines.
7. Determination of A/F Ratio and Volumetric Efficiency on IC Engines.
8. Determine of Economical speed test for fixed load on 4-stroke Engine.
9. Determine optimum cooling water temperature on IC Engine
10. Dis-assembly / Assembly of Engines.
11. Performance test on Reciprocating Air-compressor unit.
12. Study of Boilers.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. AME II Semester	L	T/P/D	C
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## (56016) INDUSTRIAL MANAGEMENT

**Unit I: Introduction to Management:** Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

**Unit II: Designing Organisational Structures:** Departmentation and Decentralisation, Types of Organisation structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

**Unit III: Operations Management:** Principles and 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:  $\bar{X}$  chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

**Unit IV: A) Materials Management:** Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records - Supply Chain Management

**B) Marketing:** Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution.

**Unit V: Human Resources Management (HRM):** Evolution of HRM, Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

**Unit VI: Project Management (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing, (simple problems)

**Unit VII: Strategic Management:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

**Unit VIII: Contemporary Management Practices:** Basic concepts of Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering 5S Model, Deming's PDCA, Kaizen, Poka-Yoke, Muda, Benchmarking, Balanced Score Card.

## TEXT BOOKS:

1. Aryasri: *Management Science*, TMH, New Delhi, 2009

## REFERENCE BOOKS:

1. Stoner, Management, Pearson, 2009
2. Kotler Philip & Keller Kevin Lane: *Marketing Management* PHI, 2009.
3. Koontz, Weihrich, & Aryasri: *Principles of Management*, TMH, 2009.
4. Thomas N. Duening & John M. Ivancevich *Management, Principles and Guidelines*, Cengage, 2009.
5. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2009.
6. Memoria & S.V.Ganker, *Personnel Management*, Himalaya, 2009
7. Schermerhorn: *Management*, Wiley, 2009.
8. Parnell: *Strategic Management*, Biztantra, 2009.
9. L.S.Srinath: *PERT/CPM*, Affiliated East-West Press, 2009.
10. William J. Stevenson & Ceyhan Ozturk: *Introduction to Management Science*, TMH, 2007.

**Pre-requisites:** Managerial Economics

**Objective:** To familiarize with the process of management and to provide basic insights into select contemporary management practices.

**Codes/Tables:** Normal Distribution Function Table need to be permitted into the examination Hall.

**Question Paper Pattern:** 5 Questions to be answered out of 8 questions. The question paper should contain atleast 2 practical problems, one each from units -III & VI

Each question should not have more than 3 bits.

*Unit VIII will have only short questions, not essay questions.*

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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## (56020) HEAT TRANSFER

### UNIT - I

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

**Conduction Heat Transfer:** Fourier's rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

### UNIT - II

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

**One Dimensional Steady State Conduction Heat Transfer:** Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation

**One Dimensional Steady State Conduction Heat Transfer:** Variable Thermal conductivity – systems with heat sources or Heat generation. Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature.

### UNIT III

**One Dimensional Transient Conduction Heat Transfer:** Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems- Concept of Functional Body

### UNIT - IV

**Convective Heat Transfer:** Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations.

**Forced convection: External Flows:** Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

**Internal Flows:** Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical



relations for Horizontal Pipe Flow and annulus flow.

#### UNIT - V

**Free Convection :** Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and pipes.

#### UNIT VI

**Heat Transfer with Phase Change: Boiling:** – Pool boiling – Regimes Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

**Condensation:** Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

#### UNIT VII

**Heat Exchangers:** Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

#### UNIT VIII

**Radiation Heat Transfer:** Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

#### TEXT BOOKS :

1. Heat Transfer – P.K.Nag / TMH
2. Heat Transfer / HOLMAN/TMH

#### REFERENCE BOOKS:

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.SACHDEVA / New Age International
2. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
3. Heat and Mass Transfer – Cengel- McGraw Hill.
4. Heat and Mass Transfer – R.K. Rajput – S.Chand & Company Ltd.
5. Essential Heat Transfer - Christopher A Long / Pearson Education
6. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons
7. Heat and Mass Transfer-Kondandaraman
8. Fundamentals of Heat Transfer & Mass Transfer- Incropera & Dewitt / John Wiley Pub.

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#### (56082) AUTO AIR CONDITIONING

#### UNIT - I

Fundamentals of Refrigeration, vapour compressors refrigeration - working principle, cycle COP - refrigeration cycle in T-s and P-h coordinates, Effect of sub cooling & super heating and cycle analysis and problems using P-h charts.

#### UNIT - II

Introduction to Air Conditioning – Psychrometric properties and processes, sensible and latent heat loads, characterization and SHF load for ventilation and filtration, concepts of RSHF& SHF ESHF and ADP, concepts of human comfort and effective temperature.

#### UNIT - III

Components of Air conditioners: Air-conditioning Components: Compressor-Evaporator-Condenser- Expansion valve-Receiver Drier- Filters-Mufflers -special features-compressor protection Anti freezing relay.

#### UNIT - IV

Vehicle cooling, load estimation, capacity requirements of Air Conditioning System, refrigerants used in Automobiles – properties.

#### UNIT - V

Operation of an Air-conditioning System: Type of Air conditioners. Heaters-Vehicle ventilation-combination heater and air conditioner- manually controlled air conditioner and heater system- automatically controlled air conditioner and heater systems.

#### UNIT - VI

Air Heating equipment, Ducts, Registers and Grills, blowers, filters

#### UNIT - VII

Trouble Shooting and Services: Servicing of heating Systems, Causes of air conditioner Failure, leak testing guide, Discharging the system- Evacuating the system-charging the System-trouble shooting air conditioner heater Systems.

**UNIT - VIII**

Servicing of Air Conditioners- Heating Systems: Air conditioner maintenance and service. Compressor trouble shooting and service, clutch service- shaft seal leakage compressor. Seal removal checking oil level-oil addition, repairs on compressors.

**TEXT BOOK:**

1. Automotive Air-conditioning- By William H.Grouse & Donald L.Anglin, MH

**REFERENCES :**

1. Automotive Air-conditioning- By Leslie F.Gomgs. McGrawHil1
2. Automotive Air-conditioning- By Boyce H.Dwiggins. Reston Pub.
3. Refrigeration & Air Conditioning by Manohar Prasad
4. Refrigeration & Air Conditioning by CP Arora

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**(56083) NUMERICAL METHODS****UNIT-I: Roots of Non linear equations:**

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

**UNIT-II: Solution of linear equations:**

Existence of solution – Gauss Elimination method – Gauss elimination with Pivoting. Gauss Jordan Method- Ill conditioned systems – Jacobi iterative method – Gauss Seidel Method – Convergence of Iterative methods.

**UNIT-III:**

**Interpolation:** Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences – Symbolic relations and separation of symbols- Difference Equations – Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unevenly spaced points-Lagrange's Interpolation formula. - Cubic spline.

**UNIT-IV:**

**Least squares method:** Linear, Non linear and curvilinear curve fitting – Multiple linear regression

**UNIT – V:**

**Numerical differentiation and integration:** Numerical differentiation and integration Trapezoidal rule, simpson's 1/3 rule and 3/8<sup>th</sup> rule.

**UNIT – VI :**

**Numerical solution of Initial Value Problems in Ordinary Differential Equations:** Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams- Bashforth Method.

**UNIT-VII:**

**Boundary values & Eigen value problems:** Shooting method, Finite



difference method and solving eigen values problems, power method.

#### UNIT-VIII:

**Solution of partial differential equations:** Classification of partial differential equation – Finite difference methods for: Elliptic equations – Laplace equations – Leibmann's iterative method – Parabola equations – Solution of heat equation ( One dimensional).

#### TEXT BOOKS:

1. Numerical Methods by E. Balaguruswamy by Tata – Mc Graw Hill.
2. An Introduction to Numerical Analysis by S.S.Sastry – PHI Learning
3. Numerical Methods by Jain, Iyengar & Jain.

#### REFERENCES:

1. Numerical Methods by S. Armugam & Others Scitech.
2. Introduction to Numerical Analysis by K.E. Aitkinson, Wiley Publications.
3. Numerical Analysis by Scarborough, Oxford IVH.
4. Elements of Numerical Analysis by Radha S.Gupta McMillan.
5. Higher Engineering Mathematics by B S. Grewal, Khanna Publications.

### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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#### (56021) ENGINEERING OPTIMIZATION (OPEN ELECTIVE)

##### UNIT – I Introduction:

**Optimal Problem formulation:** Design variables-Constraints- Objective function-Variable bounds. Engineering Optimization problems: Classification & Some examples (just theory & discussion) : Truss structure, Ammonia structure, Transit schedule and Car suspension

##### UNIT – II Single variable non-linear optimization problems:

Local minimum Global minimum & Inflection point. Necessary & Sufficient conditions theorems, some problems based on this. Numerical methods: Exhaustive Search methods- Fibonacci method, Golden section method & comparison. Interpolation methods: Quadratic.

##### UNIT – III Multivariable unconstrained non-linear optimization problems:

Numerical methods part a: Direct Search methods: Univariate method, Pattern Search methods: Powell, Hook-Jeeve's, Rosen Brock's search and Simplex methods.

##### UNIT – IV Multivariable unconstrained non-linear optimization problems:

Numerical methods part b: Gradient methods: Gradient of a function-Importance- Gradient direction search based methods: Steepest descent/ascent method, Conjugate gradient method and variable metric method.

##### UNIT – V Multivariable constrained non-linear optimization problems Classical optimization techniques:

Constraints –equations-Lagrangian method- inequalities-Kuhn-Tucker necessary and sufficient conditions-Quadratic problem-Statement-Wolfe's and Beale's methods.

##### UNIT – VI

a) **Geometric Programming:** Posynomials – arithmetic – geometric

Inequality – unconstrained G.P- constrained G.P(d" type only)

- b) Integer Programming- Introduction – formulation – Gomory cutting plane algorithm – branch and bound method

#### UNIT – VII Sensitivity Analysis:

Linear programming – Formulation – Simplex method and Artificial variable techniques-Big-M & two-phase methods- Change in the cost coefficients, coefficients & constants of the constraints, addition of variables.

#### UNIT – VIII

- a) Simulation-Definition-Steps involved- Types of simulation Models- Advantages and disadvantages- Simple problems on queuing & inventory.
- b) Non-traditional optimization algorithms: Genetic algorithms: working principles differences and similarities between Gas and traditional methods. Simulated annealing.

#### Text Books

1. Engineering Optimization: Theory & Practice-S.S.Rao-New Age International Publications- Thir Edition-2003
2. Optimization for Engineering Design- Kalyanmoy Deb-Prentice-Hall of India Pvt.Ltd, NewDelhi-2005.
3. Operations Research- S.D.Sharma- Kedar Nath & Ran Nath Co., New Delhi

#### Reference Text books

1. Optimization Theory & Practice: Beveridge & Schechter. McGraw-Hill International Student edition.
2. Optimization in Operations Research Ronald L.Rardin. Pearson Education, Low Price Edition.
3. Optimization Theory & Practice: Mohan C.Joshi & KM Moudgalya. Narosa Publishing House, Chennai
4. Operations Research: A.P.Verma. S.K.Kataria & Sons, New Delhi-110006.

### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. AME II Semester	L	T/P/D	C
	3	1/-/-	3

#### (56014) NANO TECHNOLOGY

##### (OPEN ELECTIVE)

#### Unit-I: Introduction to nanotechnology:

Importance of nanoscale, Nanostructure types, electronic, magnetic, optical Properties of Nanomaterials, top-down and bottom- up approach to nanostructures.

#### Unit-II: Quantum Mechanical phenomenon in nanostructures:

Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

#### Unit-III Carbon Nano Structures:

Carbon nanotubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

#### Unit-IV Fabrication of Nanomaterials:

Physical Methods: Inert gas condensation, Arc discharge, RFplasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

#### Unit-V Nano scale characterization techniques:

Scanning probe techniques (AFM, MFM, STM, SEM, TEM), XRD

#### Unit-VI Nanodevices and Nanomedicine:

Lab on chip for bioanalysis, Core/shell Nanoparticles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

#### Unit-VII Nano and molecular electronics:

Resonant-Tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

#### Unit-VIII nanolithography and nanomanipulation:

e-beam lithography and SEM based nanolithography and



nanomanipulation, Ion beam lithography, oxidation and metallization. Mask and its application. Deep UV lithography, X-ray based lithography.

#### TEXT BOOKS:

1. Charles.p.pode, Introduction to nanotechnology, springer publications
2. Springer Handbook of Nanotechnology - Bharat Bhusan
3. Phani kumar, principles of nanotechnology, scitech publications

#### REFERENCES BOOKS:

1. David Ferry "Transport in Nano structures" Cambridge University press 2000
2. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
3. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
4. Encyclopedia of Nanotechnology- Hari Singh Nalwa
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. S. Dutta "Electron Transport in Mesoscopic systems" Cambridge University press
7. H. Grabert and M. Devoret "Single charge Tunneling" Plenum press 1992

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(56084) ROBOTICS

(OPEN ELECTIVE)

#### UNIT – I

**Introduction:** Automation and Robotics, – An over view of Robotics – classification by coordinate system and control systems. **Components of the Industrial Robotics:** Degrees of freedom – End effectors: Mechanical gripper – Magnetic – Vacuum cup and other types of grippers – General consideration on gripper selection and design.

#### UNIT – II

**Motion Analysis:** Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

#### UNIT – III

**Manipulator Kinematics:** D-H notations - Joint coordinates and world coordinates - Forward and inverse kinematics – problems.

#### UNIT – IV

**Differential Kinematics :** Differential Kinematics of planar and spherical manipulators - Jacobians – problems.

#### UNIT – IV

**Robot Dynamics:** Lagrange – Euler formulations – Newton-Euler formulations – Problems on planar two link manipulators.

#### UNIT VI

**Trajectory planning:** Joint space scheme – cubic polynomial fit – Avoidance of obstacles – **Types of motion:** Slew motion - joint interpolated motion – straight line motion – problems.

#### UNIT VII

**Robot actuators and Feed back components:** Actuators: Pneumatic and Hydraulic actuators. **Electric Actuators:** DC servo motors - stepper motors. **Feedback components:** position sensors – potentiometers, resolvers and encoders – Velocity sensors – Tactile sensors.

**UNIT VIII**

**Robot Application in Manufacturing:** Material handling - Assembly and Inspection.

**TEXT BOOKS :**

1. Industrial Robotics / Groover M P / Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

**REFERENCES :**

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

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**(56085) AUTOMOTIVE ELECTRICAL AND AUTOTRONICS****Unit-I**

**Storage Battery:** Principles of lead acid cells and their characteristics. construction and working of lead acid battery. types of batteries, testing of batteries, effect of temperature on capacity and voltage, battery capacity, voltage, efficiency, charging of batteries, sulphation and desulphation, maintenance and servicing. Fault diagnosis. New developments in electrical storage.

**Unit-II**

**Ignition System:** Conventional Ignition system and study of its components. Types of ignition systems, spark advance and retarding mechanisms. Types of spark plugs, ignition timing, maintenance, servicing and fault diagnosis. Electronic ignition systems, programmed ignition, distributorless ignition.

**Unit-III**

**Starter motor:** Construction and working of series and shunt automotive starter motor, types of device arrangement, solenoid switches, starter motor troubles and repairs.

**Electronic controls of carburetion:** component of fuel injection systems, multipoint injection. Bosch L-variation electronic control diesel fuel injection.

**Unit - IV**

**Charging system:** Principle of generation of direct current. Principle, construction and working of alternator generating systems. Maintenance, servicing and trouble shooting. Bosch com- pact alternator.

**Unit-V**

**Wiring for auto electrical Systems:** Earth return and insulated return systems, six volt and twelve volt systems, fusing of circuits, low and high voltage automotive cables, wiring diagram for typical automotive wiring systems, maintenance and servicing.



**Unit-VI**

**Dash board units and electrical accessories:** Principle of automobile illumination, head lamp construction and wiring, horn, wind screen wiper signalling devices, fog lamps, auxiliary lighting, temperature gauge, oil pressure gauge, fuel gauge, speedometer, odometer.

**Unit - VII**

**Number system codes and data representation:** Binary numbers, number base conversion, decimal, octal and hexa-decimal numbers, BCD codes, memory representation of positive and negative integers, conversion real numbers, floating point notations and representations of floating point numbers, binary arithmetics, addition and subtraction of binary numbers, ones and two's complement method.

**Unit - VIII**

**Logic gates, arithmetic circuits and introduction to microprocessors:** Study of basic and universal logic gates, study of X-OR and X-NOR gates, flip flop, S-R, S-J flip flop and counters and shift resistance, half adders and subtractors.

**TEXTBOOKS:**

1. Automotive Electrical auxiliary systems -By N. R. Khatawale
2. Digital Logic and Computer Design by Mano, Prentice Hall of India

**REFERENCES:-**

1. Automotive Electrical systems -By Young and Griffith, Butterworth
2. Basic automotive electrical systems -By C.P.Nakra, Dhanpat Rai.
3. Automotive mechanics -By William H. Grouse, TMH
4. Modern Electrical Equipments -By A. W. Judge,
5. Automotive Electrical Equipment -By P.L. Kohli, TMH

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**(56641) HEAT TRANSFER LAB****(Performance any 12 experiments)**

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissive apparatus.
11. Stefan Boltzman Apparatus.
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Study of Two – Phase flow.

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		0	-3/- 2

**(56642) ADVANCED ENGLISH COMMUNICATION SKILLS LAB****1. Introduction**

The introduction of the English Language Lab is considered essential at 3<sup>rd</sup> year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

**2. Objectives:** This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

**3. Syllabus:** The following course content is prescribed for the Advanced Communication Skills Lab:

- **Functional English** - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- **Vocabulary Building** – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- **Reading Comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, Critical reading.
- **Writing Skills** – structure and presentation of different types of writing – *Resume writing / e-correspondence/Technical report writing/Portfolio writing* – planning for writing – *research abilities/data collection/organizing data/tools/analysis* – improving one's writing.
- **Group Discussion** – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars and written presentations through posters/projects/reports/PPTs/e-mails/assignments etc.
- **Interview Skills** – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.

**4. Minimum Requirement:**

**The English Language Lab shall have two parts:**

- i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
- ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement ( Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*



- iii) P – IV Processor
  - a) Speed – 2.8 GHZ                      b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- iv) Headphones of High quality
- 5. **Suggested Software:** The software consisting of the prescribed topics elaborated above should be procured and used.

**Suggested Software:**

- **Clarity Pronunciation Power** – part II
- **Oxford Advanced Learner's Compass**, 7<sup>th</sup> Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed,**
  - **Positive Thinking,**
  - **Interviewing Skills,**
  - **Telephone Skills,**
  - **Time Management**
  - **Team Building,**
  - **Decision making**
- **English in Mind**, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge
- 6. **Books Recommended:**
  1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
  2. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D. Pearson Education 2011.
  3. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

4. **English Vocabulary in Use** series, Cambridge University Press 2008.
5. **Management Shapers Series** by Universities Press(India) Pvt Ltd., Himaynagar, Hyderabad 2008.
6. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
9. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
10. **English for Technical Communication for Engineering Students**, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.
11. **Books on TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/ Cambridge University Press.
12. **International English for Call Centres** by Barry Tomalin and Subhashini Thomas, Macmillan Publishers, 2009.

**DISTRIBUTION AND WEIGHTAGE OF MARKS:**

**Advanced Communication Skills Lab Practicals:**

1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 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 with the help of another member of the staff of the same department of the same institution.

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**(57022) OPERATIONS RESEARCH****UNIT – I**

**Introduction:** Development – Definition– Characteristics and Phases – Types of operation Research models – applications. **Allocation :** Linear Programming - Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method. Big-M method – Duality Principle.

**UNIT – II**

**Transportation Problem :** Formulation – Optimal solution - unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

**UNIT – III**

**Sequencing:** Introduction – Flow –Shop sequencing –  $n$  jobs through two machines –  $n$  jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

**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.

**UNIT – IV**

**Theory Of Games:** Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – dominance principle –  $m \times 2$  &  $2 \times n$  games -graphical method.

**UNIT – V**

**Waiting Lines:** Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

**UNIT – VI**

**Inventory :** Introduction – Single item – Deterministic models –

Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost- Single period model.

**UNIT – VII**

**Dynamic Programming:** Introduction – Terminology- Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

**UNIT – VIII**

**Simulation:** Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Brief Introduction of Simulation Languages.

**TEXT BOOKS:**

1. Operations Research /J.K.Sharma 4e. /MacMilan
2. Operations Research / R.Pannerselvam 2e.,PHI Publications

**REFERENCES:**

1. Operations Research /A.M.Natarajan, P.Balasubramani, A. Tamilarasi/ Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, Arthur Yaspan & Lawrence Friedman
3. Introduction to O.R /Taha 8e/PHI
4. Operations Research / Wagner/ PHI Publications.
5. Operations Research / S.D.Sharma-Kedarnath
6. O.R/Wayne L.Winston/Thomson Brooks/cole
7. Introduction to O.R/Hiller & Libermann (TMH).



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## (57139) METROLOGY AND SURFACE ENGINEERING

## UNIT – I

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

## UNIT – II

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

**Measurement Of Angles And Tapers:** Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

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

## UNIT – III

**Optical Measuring Instruments:** Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.

**Flat Surface Measurement:** Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat and auto collimator.

## UNIT – IV

**Surface Roughness Measurement:** Differences between surface roughness and surface waviness-Numerical assessment of surface finish – CLA, R, R.M.S Values – Rz values, Rz value, Methods of measurement of surface finish-profilograph. Talysurf, ISI symbols for indication of surface finish.

**Measurement Through Comparators:** Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

## UNIT-V

**Screw Thread Measurement:** Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread

and thread pitch, profile thread gauges.

**Gear Measurement:** Gear measuring instruments, Gear tooth profile measurement. Measurement of diameter, pitch pressure angle and tooth thickness.

**Coordinate Measuring Machines:** Types of CMM, Role of CMM, and Applications of CMM.

## UNIT -VI

**Machine Tool Alignment Tests:** Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.

## UNIT- VII

**Surface Engineering:** Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Principles of corrosion and remedial measures, Laser applications for surface modifications.

## UNIT – VIII

**Surface Treatments:** Mechanical surface treatment and coating, casehardening and surface coating, thermal spraying, Vapour deposition, Ion implantation, Diffusion coating, Electro plating, Electroless plating and Electro forming, Ceramic, Organic and Diamond coating

## TEXT BOOKS:

1. Manufacturing Engineering and Technology, Serop Kalpakjian and Steven R. Schmid, Ed. 4, Pearson Publications, 2001
2. Metrology and Measurement, Anand Bewoor, Vinay A. Kulakarni, TMH, 2009
3. Principles of Engineering Metrology, R. Rahendra, JAICO Publications, 2008

## REFERENCES:

1. Fundamentals of Dimensional Metrology, 4e, Connie Dotson, Thomson, 2003
2. Surface Engineering with Lasers/ Dehossion J.T.
3. Surface Engineering for corrosion and wear resistance / JR Davis/ Woodhead Publishers.
4. Precision Engineering and Manufacturing/ R.L Murty/ Newage Publications, 2009

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**(57024) CAD / CAM****UNIT – I**

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

**UNIT – II**

**Computer Graphics:** Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

**UNIT – III**

**Geometric modeling:** Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

**UNIT – IV**

**Drafting and Modeling systems:** Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

**UNIT – V**

**Numerical control:** NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, **CNC Part Programming** : fundamentals, manual part programming methods, Computer Aided Part Programming.

**UNIT – VI**

**Group Tech:** Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

**UNIT – VII**

**Computer aided Quality Control:** Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection

methods-optical, noncontact inspection methods-nonoptical, computer aided testing, integration of CAQC with CAD/CAM.

**UNIT – VIII**

**Computer integrated manufacturing systems:** Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

**TEXT BOOKS:**

1. CAD / CAM A Zimmers & P.Groover/PE/PHI
2. CAD / CAM Theory and Practice / Ibrahim Zeld / TMH

**REFERENCES:**

1. Automation , Production systems & Computer integrated Manufacturing/ Groover/P.E
2. Computer Aided Design and Manufacturing –Lalit Narayan ,etal - PHI
3. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
4. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
5. CAD/CAM: Concepts and Applications/Alavala/ PHI
6. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.



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#### (57025) INSTRUMENTATION AND CONTROL SYSTEMS

**UNIT – I : Definition** – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

**UNIT – II : Measurement of Displacement:** Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

**Measurement Of Temperature:** Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators..

**UNIT – III : Measurement Of Pressure:** Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

**UNIT – IV ; Measurement Of Level:** Direct method – Indirect methods – capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

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

**UNIT – V : Measurement Of Speed:** Mechanical Tachometers – Electrical tachometers – Stroboscope, Non- contact type of tachometer

**Measurement of Acceleration and Vibration:** Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

**UNIT – VI : 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, Strain gauge Rosettes.

**UNIT – VII : Measurement Of Humidity:** Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter

**Measurement Of Force, Torque And Power:** Elastic force meters, load cells, Torsion meters, Dynamometers.

**UNIT – VIII : Elements Of Control Systems:** Introduction, Importance – Classification – Open and closed systems Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems.

#### Pre-Requisite:

**Objective:** This subject provides insight into the different mechanical measurement systems and working and testing procedures

#### TEXT BOOKS:

1. Measurement Systems: Applications & Design by D.S Kumar, Anuradha Agencies
2. Instrumentation, measurement & Analysis by B.C.Nakra & K.K.Choudhary, TMH

#### REFERENCE BOOKS:

1. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age
5. Instrumentation & mech. Measurements by A.K. Tayal ,Galgotia Publications.

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## (57140) AUTOMOTIVE CHASSIS AND SUSPENSION

## (ELECTIVE - I)

## UNIT-I Introduction to Chassis System:

**Introduction:** Requirements of an automobile with types of automobiles, layout of an automobile with reference to power plant, power required for propulsion, various resistances to motion of the automobile.

## UNIT-II

**Frames:** Types of frames, materials, calculation of stresses on sections, constructional details, loading points, testing of frames.

**Wheels and tyres:** Types of wheels, construction, structure and function of tyres, static and function of tyres.

## UNIT-III

**Steering systems:** types of steering gears, front axle, under steer and over steer, wheel alignment, power steering, steering geometry, wheel balancing, centre point steering, steerability.

## UNIT-IV

**Brakes:** Necessity of brake, stopping distance and time, brake efficiency, weight transfer, brake shoe theory, determination of braking torque, braking systems -mechanical, hydraulic, disc, parking and emergency brakes, servo and electrical brakes, details of hydraulic system, mechanical system and components, types of master cylinders, factors influencing operation of brakes such as operating temperature, lining, brake clearance, pedal pressure, linkages etc.

## UNIT-V

**Suspension:** Types of suspension, leaf springs, materials, independent suspension, torsion bar, air bellows or pneumatic suspension, hydraulic suspension, constructional details of telescopic shock absorbers, types, vibrations and riding comfort, role axis of spring suspension.

## UNIT-VI

Front Wheel Mounting, Rear Wheel Mounting, Engine mounting, Various

types of springs used in suspension system. Requirements and various types. Material.

## UNIT-VII

**Testing:** Testing procedures, types of tests and chassis components, equipment for lab and road tests, preparation of test reports.

## UNIT-VIII

**Two and three wheelers:** Classification of two and three wheelers, construction details, construction details of frames and forks, suspension systems and shock absorbers, different arrangement of cylinders, Carburetion system and operation.

## TEXTBOOK:

1. Automotive chassis and body -P. L. Kohli, TMH

## REFERENCE BOOKS

1. Introduction to automobile engineering -N.R. Khatawate, Khanna pub.
2. Automotive mechanics -Joseph I heitner, Affiliated East West Press
3. Problems in Automobile Engineering -N.K.Giri, Khanna Pub
4. Automotive Chassis -P.M. Heldt, Chilton & Co.
5. Automobile Engineering -T.R. Banga & Nathu Singh, Khanna



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME I Semester

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3 1/- 3

## (57141) AUTOMOTIVE POLLUTION AND CONTROL

(ELECTIVE - I)

## UNIT - I

**Laws and Regulation:** Historical background, regulatory test procedures (European cycles), Exhaust gas pollutants (European rail road limits), particulate pollutants, European statutory values, inspection of vehicles in circulation (influence of actual traffic conditions and influence of vehicle maintenance).

**Analysis of pollutants:** Carbon and Nitrogen Compounds - (CO, CO<sub>2</sub>, NO<sub>x</sub>), Ammonia and Amines, Hydrocarbons, volatile compounds, evaporative losses, analysis of particulates.

## UNIT - II

**Pollutants from SI engines:** Mechanism & formation of HC, CO, and NO<sub>x</sub> in SI engines. Engine and operating variables affecting pollutants in SI engines.

## UNIT - III

**Pollution from CI engines:** Mechanism of formation of HC, CO, NO<sub>x</sub>, and Soot in CI engines. Factors affecting emissions in CI engines.

## UNIT - IV

**Lean burn & stratified charge engines.** Multipoint fuel injection and Gasoline direct injection methods. Common rail fuel injection in diesel engines. Exhaust gas recirculation.

## UNIT - V

**Post combustion treatments:** Introduction, exhaust gas composition before treatment, catalytic converters, oxidation and three way types thermal reactors, installation of catalysts in exhaust lines, NO<sub>x</sub> treatment in diesel engines, particulate traps for diesel engines, particulate trap regeneration.

## UNIT - VI

**Economic challenges:** Introduction, cost of improvement to SI engines, cost of injection systems, cost of improvement in Diesel engines,

economic consequences of introducing the catalyst, additional costs incurred by diesel traps, cost of periodic inspection of pollution control systems and evaporative control systems.

## UNIT - VII

**Instrumentation for pollution measurements:** NDIR-analysers, thermal conductivity and flame ionization detectors, analysers for NO<sub>x</sub>, Gas chromatograph, Orsat apparatus, smoke meters- spot sampling and continuous indication types like Bosch, Hartridge. Particulate measuring systems. Dilution tunnels - full flow and partial flow.

## UNIT - VIII

**SI and CI engine fuel requirements.** Knock in SI and CI engines. Knock rating of SI and CI Engine fuels. Alternative fuel like Hydrogen, Natural gas, LPG, Vegetable oil and biodiesel, their production, properties, storage and performance as engine fuels.

## TEXT BOOKS :

1. Bosch - Gasoline fuel injection - Bosch Publications
2. Bosch - Diesel fuel injection - Bosch Publications

## REFERENCES:

1. Automobiles and Pollution - Paul Degobert (SAE)
2. Diesel engine operation manual - V.L Maleev, CBS Pub
3. I.C. Engines - E.F. Obert, Harper & Row
4. Engine emission - Springer and Patterson, Plenum Press
5. Heins Aeisth - Internal Combustion Engines - SAE Publications.

# JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME I Semester

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## (57028) MECHATRONICS

### (ELECTIVE - I)

#### UNIT - I

**Introduction :** Definition - Trends - Control Methods: Standalone, PC Based ( Real Time Operating Systems, Graphical User Interface, Simulation ) - Applications: SPM, Robot, CNC, FMS, CIM.

#### UNIT - II

**Signal Conditioning :** Introduction - Hardware - Digital I/O, Analog input - ADC, resolution, speed channels Filtering Noise using passive components - Resistors, capacitors - Amplifying signals using OP amps - Software - Digital Signal Processing - Low pass, high pass, notch filtering

#### UNIT - III

**Precision Mechanical Systems:** Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

#### UNIT - IV

**Electronic Interface Subsystems:** TTL, CMOS interfacing - Sensor interfacing - Actuator interfacing - solenoids, motors Isolation schemes- opto coupling, buffer IC's - Protection schemes - circuit breakers, over current sensing, resetable fuses, thermal dissipation - Power Supply - Bipolar transistors / mosfets

#### UNIT - V

**Electromechanical Drives:** Relays and Solenoids - Stepper Motors - DC brushed motors - DC brushless motors - DC servo motors - 4-quadrant servo drives, PWM's - Pulse Width Modulation - Variable Frequency Drives, Vector Drives - Drive System load calculation.

#### UNIT - VI

**Microcontrollers Overview:** 8051 Microcontroller, micro processor

structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming -Assembly, C ( LED Blinking, Voltage measurement using ADC).

#### UNIT - VII

**Programmable Logic Controllers:** Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

#### Unit - VIII

**Programmable Motion Controllers:** Introduction - System Transfer Function - Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position, Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive, Capacitive, Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P, PI, PID Control - Control modes - Position, Velocity and Torque - Velocity Profiles - Trapezoidal - S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation, PTP, Linear, Circular - Core functionalities - Home, Record position, Go to Position - Applications : SPM, Robotics.

#### TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W. Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

#### REFERENCES:

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics- N. Shanmugam / Anuradha Agencies Publisers.
3. Mechatronics System Design / Devdas shetty/Richard/Thomson.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. AME I Semester	L	T/P/D	C
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**(57027) MECHANICAL VIBRATIONS**  
**(ELECTIVE – I)**

**Unit I**

**Single degree of Freedom systems - I:** Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

**Unit II**

**Single degree of Freedom systems - II:** Response to Non Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

**Unit III**

**Vibration measuring instruments:** Vibrometers, velocity meters & accelerometers

**Unit IV**

**Two degree freedom systems:** Principal modes- undaped and damped free and forced vibrations; undamped vibration absorbers;

**Unit V**

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

**Unit VI**

**Numerical Methods:** Rayleigh's stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods.

**Unit VII**

**Continuous system:** Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Torsional vibrations of shafts.

**Unit VIII**

**Critical speeds of shafts:** Critical speeds without and with damping, secondary critical speed.

**TEXT BOOKS:**

1. Elements of Vibration Analysis by Meirovitch, TMH, 2001
2. Mechanical Vibrations by G.K.Groover,

**REFERENCES:**

1. Mechanical Vibrations by SS Rao, Pearson, 2009, Ed 4,
2. Mechanical Vibration – Rao V.Dukkipati & J Srinivas, PHI, 2010.
3. Mechanical Vibrations – V. Ram Murthy.
4. Vibration problems in Engineering by S.P. Timoshenko.
5. Mechanical Vibrations- S Graham Kelly, Schaum's Outline, TMH

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**IV Year B.Tech. AME I Semester**

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**(57075) MICROPROCESSORS AND MICRO CONTROLLERS  
(ELECTIVE – II)**

**UNIT-I**

**8086 Architecture:** Functional Diagram, Register Organization, Addressing modes, Instructions, Functional schematic, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing Diagrams.

**UNIT-II**

**Assembly Language Programming of 8086:** Assembly Directives, Macro's, Simple Programs using Assembler, Implementation of FOR Loop, WHILE, REPEAT and IF-THEN-ELSE Features, String Manipulation, Procedures.

**UNIT-III**

**I/O INTERFACE:** Parallel data transfer scheme, Programmed I/O, Interrupt Driven I/O, 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing, Stepper Motor Interfacing.

**Unit-IV**

**Interfacing With Advanced Devices:** 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control), Memory Interface using RAMS, EPROMS and EEPROMS.

**UNIT-V**

**Communication Interface:** Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Trouble shooting, Software Debugging tools, MDS.

**UNIT-VI**

**Introduction To Micro Controllers:** Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming.

**UNIT-VII**

**8051 Interrupts Communication:** Interrupts, Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External H/W interrupts, Programming the serial communication interrupts, Interrupt Priority in the 8051, Programming 8051 Timers, Counters and Programming.

**UNIT-VIII**

**Interfacing And Industrial Applications:** Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC interfacing.

**TEXT BOOKS:**

1. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
2. Kenneth J Ayala, "The 8086 Micro Processors Architecture, Programming and Applications", Thomson Publishers, 2005.

**REFERENCES:**

1. Ajay V. Deshmukh, "Microcontrollers – theory applications", Tata McGraw-Hill Companies – 2005.
2. D.V.Hall, "Micro Processor and Interfacing ", Tata McGraw-Hill.
3. Ray and BulChandi, "Advanced Micro Processors", Tata McGraw-Hill.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. AME I Semester	L	T/P/D	C
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**(57090) COMPUTATIONAL FLUID DYNAMICS****(ELECTIVE – II)****UNIT-I**

Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

**UNIT - II**

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

**UNIT - III**

Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

**UNIT - IV**

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

**UNIT - V**

Introduction to first order wave equation; stability of hyperbolic and elliptic equations; fundamentals of fluid flow modeling; conservative property, the upwind scheme.

**UNIT - VI**

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

**UNIT -VII**

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

**UNIT-VIII**

Finite volume method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

**TEXT BOOKS:**

1. Numerical Heat Transfer and Fluid Flow / Suhas V. Patankar  
Hema shava Publishers Corporation & McGraw Hill.
2. Computational Fluid Flow and Heat Transfer/ Muralidaran- Narosa Publications

**REFERENCES:**

1. Computational Fluid Dynamics: Basics with applications –John D. Anderson/ Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME I Semester	L	T/P/D	C
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## (57009) FINITE ELEMENT METHODS

## (ELECTIVE – II)

## UNIT-I:

**Introduction to FEM:** basic concepts, historical back ground, application of FEM, general description, comparison of FEM with other methods. Basic equations of elasticity, Stress – Strain and strain - displacement relations. Rayleigh- Ritz method, Weighted residual methods.

## UNIT-II:

**One Dimensional problems:** Stiffness equations for a axial bar element in local co-ordinates using Potential Energy approach and Virtual energy principle - Finite element analysis of uniform, stepped and tapered bars subjected to mechanical and thermal loads - Assembly of Global stiffness matrix and load vector - Quadratic shape functions - properties of stiffness matrix.

## UNIT-III:

**Stiffness equations for a truss bar element oriented in 2D plane -** Finite Element Analysis of Trusses – Plane Truss and Space Truss elements – methods of assembly.

## UNIT-IV:

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

## UNIT-V:

**2-D problems:** CST - Stiffness matrix and load vector - Isoparametric element representation – Shape functions – convergence requirements – Problems.

## Unit – VI:

Two dimensional four noded isoparametric elements - Numerical integration - Finite element modelling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements - 3-D problems – Tetrahedran element.

## UNIT-VII:

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

## UNIT-VIII:

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

## TEXT BOOKS:

1. The finite element methods in Engineering – S.S. Rao – Elsevier – 4<sup>th</sup> edition
2. Introduction to finite elements in engineering – Tirupathi K. Chandrupatla and Ashok D. Belagundu

## REFERENCES:

1. Finite Element Methods/ Alavala/TMH
2. An Introduction to Finite Element Methods – J. N. Reddy – Mc Grawhill
3. The Finite element method in engineering science – O.C. Zienkowitz, Mc Grawhill.
4. Concepts and applications of finite element analysis – Robert Cook – Wiley
5. Introduction of Finite Element Analysis – S.Md.Jalaludeen – Anuradha publications



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IV Year B.Tech. AME I Semester	L	T/P/D	C
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**(57142) VEHICLE BODY ENGINEERING AND SAFETY  
(ELECTIVE -II)**

**UNIT-I**

**Structural materials:** Aluminium alloy sheet, extrusion and casting, Austenitic and Ferritic stainless steels, alloy steels. Different types of composites, FRP & Metal Matrix Composites. Structural timbers - properties designing in GRP and high strength composites different manufacturing techniques of composites. Thermo plastics, ABS and styrenes. Load bearing plastics, semi-rigid PUR foams and sandwich panel construction

**UNIT-II**

**Shaping and packaging:** Product design and concepts, Aesthetics and industrial design, formal aesthetics and shape. Computer aided drafting, surface development, interior ergonomics. Ergonomics system design, dash-board instruments, advances in electronic display, CV legal dimension. CV-cab ergonomics, mechanical package layout.

**UNIT-III**

**Aerodynamics:** Basics, aerofoils, aerodynamics drag lift, pitching, yawing and rolling moments, determination of aerodynamic coefficients (wind tunnel testing), racing car aerodynamics, bluff body aerodynamics, local air flows.

**Unit-IV**

**Load Distribution:** Types of load carrying structures -closed, integral, open, flat types. Calculation of loading cases- static, asymmetric, vertical loads. Load distribution, stress analysis of structure, body shell analysis.

**Unit-V**

**Body Fitting and I Controls:** Driver's seat, window winding mechanism, Door lock mechanism, other interior mechanisms, driver's visibility and tests for, visibility, minimum space, requirements and methods or

improving space in cars, electric wiring and electronic control systems, advanced body electronics, networking or body systems controls.

**UNIT-VI**

**Noise, Vibration, Harshness :** Noise and vibration basics, body structural vibrations, chassis bearing vibration, designing against fatigue, rubber as an isolator, CV body mountings, automatic enclosures, sandwich panels, structure dynamics applied, surety under impact: Impact protection basics, design for crash worthiness, occupant and cargo restraints, Passive restraint systems, slide impact analysis, bumper system, energy absorbant foams, laws of mechanisms applied to safety.

**Unit-VII**

**Vans, trucks and buses:** Types of mini coach with trailers, single and double deckers, design criteria based on passenger capacity, goods to be transported and distance to be Covered, constructional details: weights and dimensions; conventional and integral type.

**UNIT-VIII**

**Vehicle stability:** Steering geometry vehicle and a curvilinear path, and lateral stability, effects of tyre factors, mass distribution and engine location on stability.

**TEXT BOOKS:**

1. Body Engineering -Sydney F Page
2. Vehicle body engineering -Gilcs J Pawlowski,

**REFERENCES:**

1. Automotive chassis -P.M. Heldt, chilton & Co
2. Handbook on vehicle body design -SAE Publications.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME I Semester	L	T/P/D	C
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## (57635) MACHINE TOOLS AND METROLOGY LAB

## Section A:

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

## Section B:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and Tapping
5. Shaping and Planing
6. Slotting
7. Milling
8. Cylindrical Surface Grinding
9. Grinding of Tool angles.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME I Semester	L	T/P/D	C
	0	-/3/-	2

## (57636) AUTOMOTIVE ENGINES LAB-II AND CAD/CAM LAB

## AUTOMOTIVE ENGINES LAB II:

1. Dismantling and assembly of LMV components as following :  
a. Gear box b) clutch assembly c) Propeller shaft d) differential gear box e) rear axle f) suspension system g) steering mechanism.
2. Dismantling and assembly of door frames, door locks and window locks
3. Study of driver's seat layout in anyone LMV and anyone HMV.
4. Testing, servicing and charging of batteries
5. Servicing of generator, alternator and starter motor with dismantling, testing, inspection and assembly.
6. Servicing of ignition systems
7. Drawing of general electrical wiring diagrams of various vehicles ( two and four wheelers )
8. Calibration of micrometer, measurement of plain plug, measurement of plain ring gauge, taper gauge
9. Measurement of taper using sine bar and other instruments.
10. Measurement of base circle diameter and tooth thickness of spur and helical gears
11. Use of slip gauges, measurement of screw threads using screw thread micrometer, use of comparators, experiments involving profile projectors.

**Note:** Driving practice of a geared two wheeler and anyone LMV for a minimum of 10 hours during 5th & 6th semester must be provided.

**Objective:** To impart practical knowledge on automobile working, Servicing and maintenance of selected components.

**Pre Requisite:** Automobile Engines.



**CAD/CAM Lab:**

1. Drafting : Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.
2. Part Modeling : Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.
3.
  - a. Determination of deflection and stresses in 2D and 3D trusses and beams.
  - b. Determination deflections component and principal and Von-mises stresses in plane stresses in plane stress, plane strain and Axisymmetric components.
  - c. Determination of stresses in 3D and shell structures (at least one example in each case)
  - d. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
  - e. Study state heat transfer Analysis of plane and Axisymmetric components.
4.
  - a) Development of process sheets for various components based on tooling Machines.
  - b) Development of manufacturing defects 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.

**JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. AME II Semester**

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**(58105) ALTERNATE FUELS FOR AUTOMOBILES****Unit-I**

**An Over View:** Introduction-classification of alternative fuels and drive trains-scenario of conventional auto fuels- oil reserves of the world- fuel quality aspects related to emissions- technological up gradations required- Need for alternative fuels – regulatory frame work for CNG / LPG vehicles in India- Third - party inspection check list for alternative fuels vehicles-comparison of alternative fuel technologies – business driving factors for alternative fuels – implementation barriers for alternative fuels – government alternative fuels- Stakeholders of alternative fuels- Road map for alternative fuels – AFV development world wide .

**Unit-II**

**Compressed Natural Gas (CNG):** Introduction-History of CNG-Production of CNG- properties of CNG-CNG storage-Piping for CNG-Advantages and Disadvantages of CNG-CNG dispensing systems-CNG transportation-Material compatibility for CNG-CNG fuel kits-Engine modifications for CNG operations-CNG combustion- Stoichiometric vs. Lean burn CNG engines- Engine optimization- Vehicle emission from CNG- After treatment of CNG exhaust – CNG fuelling station safety systems- CNG standards and regulations - Third - party inspection for alternative fuels vehicles. CNG vehicles world wide – CNG scenario in India.

**Unit-III**

**Liquefied Natural Gas (LNG):** Introduction-history LNG-production of LNG – properties-economics of LNG- Advantages and Disadvantages-transportation and storage of LNG-Piping for LNG-LNG dispensers-LNG to CNG conversion system-regulations for LNG-LNG vehicle world wide- Vehicle performance characteristics for LNG- Vehicle emissions from LNG-LNG India.

**Unit-IV**

**Liquefied Petroleum Natural Gas (LPG):** Introduction-History of LPG- Production of LPG- properties, Storage of LPG-dispensing of LPG-LPG nozzles and receptacles-material compatibility for LPG- Piping, safety systems and transportation of LPG-Advantages and disadvantages of LPG- LPG engine developments-LPG fuel kits and combustion, Emission from LPG-LPG Standards-LPG Vehicle world wide-LPG Scenario in India

**Unit-V**

**Liquefied Hydrogen:** Properties of Hydrogen- Production of hydrogen-photochemical production of Hydrogen – Algal production of Hydrogen (Bio Hydrogen)- On- board storage of Hydrogen-metal

hydrates-compressed hydrogen gas- activates carbon storage-Hazards with  $LH_2$ - Advantages and Disadvantages of  $LH_2$ - Transportation of  $LH_2$ -Piping for  $LH_2$ - Dispensers for  $LH_2$  vehicle emissions from  $LH_2$ - BMW liquid hydrogen cars- liquid hydrogen in India.

#### Unit-VI

**Bio-Fuels:** Bio gas- Methanol- Ethanol- Butanol- straight vegetable oil- bio diesels- properties- production- storage methods- power densities- advantages and disadvantages over conventional fuels- specific design criteria use in automobiles.

#### Unit-VII

**Electric vehicles:** Introduction- batteries electric vehicle-components of EV- EV batteries- EV chargers- EV drives- EV tractive force- EV transmission- EV motor design- EV Power devices and controllers- Advantages and Disadvantages- Performance characteristics- testing- EV challengers- EV scenario in India- Hybrid electric vehicles- International status of Hybrid EVs- HEV batteries- HEV ultra capacitors- HEV motors- HEV transmissions- drive train components, HEV performance specifications.

#### Unit VIII

**Fuel cell Power vehicles:** Fuel cell vehicle- Benefits of fuel cells for automotive industry- Basics, efficiency and types of fuel cells- Fuel cell options for fuel cell vehicle- fuel regulations- Fuel cell hybrid vehicle- Fuel cell solar vehicle, Solar photovoltaic cell, Solar car electrical system and drive train, solar array-solar car body and chassis- Hybrid gas turbine EV- Nuclear car-road map for alternative powertrains.

#### TEXT BOOKS:

1. Alternative fuels/ SS Thipse/ JAICO Publishers/ 2010
2. Alternative fuel technology/ Erjavec, Arias/ Yesdee Publications/ 2009

#### REFERENCES:

1. A text book of alternative fuel of Automobile Engine, Ramireddy and Yousuf, Front line Publishers
2. The Complete Idiot's Guide to Hybrid and Alternative Fuel Vehicles by Jack R. Nerad.
3. Hybrid and Alternative Fuel Vehicles (New Edition) by James D. Halderman
4. Powering Your Vehicle With Straight Vegetable Oil by Forest Gregg

### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME II Semester	L	T/P/D	C
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#### (58106) VEHICLE TRANSPORT MANAGEMENT (ELECTIVE - III)

#### UNIT - I

**Historical Background:** Introduction, the growth of a network, trams, trolley buses, private car's subsidies. **The Infrastructure:** Road- Approach Road. Highways National, State, District, traffic condition, relief of congestion, pedestrians, zebra lines, margins, shopping centres. Bus-stops, shelters. Bus stations. Garages layout of premises, equipment, use of machinery, conveyance of staff, facilities for passengers. Maintenance -preventive, breakdown, overhauling - major, minor.

#### UNIT - II

**Organisation and Management:** Forms of ownership, principle of transport, management -internal organisation, centralised condition, decentralised condition (Engineering, traffic and administration), staff administration: industrial relation, administration, recruitment and training, welfare, health and safety.

#### UNIT - III

**Public relations divisions:** Dissemination of information, maintaining goodwill- handling complaints, traffic advisory, committees- local contractors co-operation with the press news and articles- facilities for visitors- forms of publicity importance of quality -inter departmental liaison advertisements, signs, notice and directions general appearance of premises, specialized publicity.

#### UNIT - IV

**Prevention of accidents:** Emphasis of safe driving-annual awards bonus encouragement vehicle design platform, layout, location of steps, scheduled route hazards records elimination of accident prone devices.

**Route planning:** Source of traffic, town planning, turning points, stopping places, shelters survey of route preliminary schedule test runs elimination of hazards factors affecting. Frequency direction of traffic flow estimated traffic possibility single verses double deck.



**UNIT - V**

**Timing, bus working and schedules:** Time table layout uses of flat graph method of presentation preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers use of the vehicle running numbering determination of vehicle efficiency, checking efficiency of crew, duty arrangements.

**UNIT - VI**

**Fare collections systems:** Principles of collection the way bill, bell punch system reduced ticket stocks wilk brew system T.I.M and straight /M/C/S. The verometer lenson parason coach tickets exchanges, box system personal and common stock flat fare platform control.

**UNIT - VII**

**The fare structure:** Basis of fares historical background effects of competition and control calculating average zone system straight and tapered scale elastic and inelastic demand coordination of fares concessions fares changes for workman. Anomalies double booking inter availability through booking and summation private hire charges.

**UNIT - VIII**

**Operating cost and types of vehicles:** Classification costs, average speed running costs supplementary costs depreciation obsolescence, life of vehicles sinking fund factor affecting post per vehicles mile incidence of wages and overheads 100 seats miles basis, average seating capacity vehicles size and spread overs, types of vehicle economic considerations authorization of trolley, bus services, statutory procedure taxes and hire cars.

**TEXT BOOKS:**

1. Bus Operation -L.D.Kitchen, Cliffe & Sons
2. Bus & Coach Operation -Rex W. Faulks, Butterworth Version Of 1987

**REFERENCES:**

1. Compendium of Transport Terms, CIRT, Pune
2. M.V. Act 1988 Central Law Agency, Allahabad
3. The Elements Of Transportation -R.J. Eaton
4. Goods Vehicle Operation -By C.S. Dubbar 5. Road Transport Law- L.D. Kitchen
5. Road Transport Law - L.D.Kitchen
6. Compendium Of Transport Terms CIRT, Pune (Report
7. M.V. Act 1988, Pub Central Law Agency, Allahabad.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. AME II Semester	L	T/P/D	C
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**(58107) PRODUCT DESIGN AND ASSEMBLY AUTOMATION  
(ELECTIVE - III)**

**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.

**UNIT - II**

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 - III**

**Assembly Automation:** Development of the assembly process, choice of assembly method, automation advantages, social effects of automation.

**UNIT-IV**

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

**UNIT-V**

**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-VI 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.

#### UNIT-VII

Avoiding jams during assembly, reducing risk assembly problems, effects of holding down, manual assembly data base and design data sheets, application of the DFA methodology and general design guidelines.

#### UNIT-VIII

**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. Feasibility study.

#### TEXT BOOK:

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

#### REFERENCES:

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

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IV Year B.Tech. AME II Semester	L	T/P/D	C
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#### (58018) MAINTENANCE AND SAFETY ENGINEERING (ELECTIVE - III)

#### UNIT-I

**INTRODUCTION:** Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance Strategy for the 21st Century, Engineering Maintenance Objectives and Maintenance in Equipment Life Cycle, Terms and Definitions.

#### UNIT-II

**Maintenance Management And Control:** Maintenance Manual, Maintenance, Facility Evaluation, Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices.

#### UNIT-III

**Types of maintenance:** Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and Improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

#### UNIT-IV

**Inventory Control In Maintenance:** Inventory Control Objectives and Basic Inventory Decisions, ABC Inventory Control Method, Inventory Control Models Two-Bin Inventory Control and Safety Stock, Spares Determination Factors Spares Calculation Methods

#### UNIT-V

**Quality And Safety In Maintenance:** Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to Improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers



**UNIT-VI**

**Maintenance Costing:** Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and Steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models

**UNIT-VII**

**Reliability, Reliability Centered Maintenance, Rcm:** Goals and Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement Indicators, RCM Benefits and Reasons for Its Failures, Reliability Versus Maintenance and Reliability in Support Phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

**UNIT-VIII**

**Maintainability:** Maintainability Importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

**TEXT BOOKS:**

1. Reliability, Maintenance and Safety Engineering by Dr. A.K.Guptha / Laxmi Publications.
2. Industrial Safety Management by L.M. Deshmukh/TMH

**REFERENCES:**

1. Maintenance Engineering & Management by R.C.Mishra/ PHI
2. Reliability Engineering by Elsayed/ Pearson
3. Engineering Maintenance a modern approach, B.S Dhallon, 2002, C.R.R publishers

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**(58017) RELIABILITY ENGINEERING****(ELECTIVE – III)****Unit-I**

**Basics concepts of reliability:** Introduction, Reliability and quality, Failures and failure modes, Causes of failures and reliability, Maintainability and availability, History of reliability, reliability literature.

**Unit-II**

**Reliability mathematics:** Introduction, Random experiment, Probability, Random variables, Distribution functions, Discrete distribution, Continuous distribution, Numerical characteristics of random variables, Laplace transform.

**Unit-III**

**Component reliability and hazard models:** Introduction, Component reliability from test data, Mean time to failure, Time – dependent hazard models, Stress- Dependent hazard models, Derivation of reliability function using Markov, Treatment of field data.

**Unit-IV**

**System reliability models:** Introduction - Systems with component with in series - Systems with parallel components - k-out – of- m systems - Non series parallel systems - Systems with - mixed – mode failures - Fault- tree technique

**Unit-V**

**Maintainability and availability concepts:** Introduction - Maintainability function - Availability function - Frequency of failures - Two-unit parallel systems with repair - k-out-of-m systems - Preventive maintenance.

**Unit-VI**

**Reliability improvement:** Introduction - Improvement components - Redundancy - Element redundancy - Unit redundancy - Stand by redundancy - Optimization - Reliability – cost trade – off

**Unit-VII**

**Economics of reliability engineering :** Economic issues - Manufacture's cost - Customer's cost - Reliability achievement cost - models - Reliability utility cost models - Depreciation cost models - Availability - cost - model of parallel systems.

**Unit-VIII**

**Reliability management:** Reliability programming - Management policies and decision - Reliability management by objectives - Reliability group - Reliability data : Acquisition and analysis - Managing people for reliability

**TEXT BOOKS ;**

1. Reliability Engineering - Balaguruswamy- TMH
2. Reliability Engineering- L.S.Srinath

**REFERENCE BOOKS:**

1. Reliability Engineering- Patrick DTO-Wiley Conon-India
2. Reliability Engineering and life testing -Naikan-PHI

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IV Year B.Tech. AME II Semester

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**(58071) PRINCIPLES OF ENTREPRENEURSHIP****(Elective-IV)****Unit I:**

**Introduction to Entrepreneurship:** Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

**Unit II:**

Creating and Starting the Venture Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.

**Unit III:**

The Business Plan Nature and scope of Business plan , Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

**Unit IV:**

Financing and Managing the new venture Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls . Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

**Unit V:**

New venture Expansion Strategies and Issues Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

**Unit VI:**

Institutional support to Entrepreneurship Role of Directorate of Industries, District Industries, Centres (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), Technical consultancy Organisation (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India(SIDBI)



**Unit VII:**

Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

**Unit VIII:**

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act. This course replaces the course offered in earlier years as 'Entrepreneurship & Management'

**TEXT BOOKS:**

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5<sup>th</sup> Edition.
2. Dollinger: Entrepreneurship, 4/e, Pearson, 2004.

**REFERENCES:**

1. Vasant Desai: Dynamics of Entrepreneurial Development and management, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J. Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.
5. Bolton & Thompson : Entrepreneurs- Talent, Temperament, Technique, Butterworth Heinemann, 2001.
6. Agarwal : Indian Economy , Wishwa Prakashan 2005.
7. Dutt & Sundaram : Indian Economy. S. Chand, 2005.
8. Srivastava: Industrial Relations & Labour Laws, Vikas, 2005.
9. Aruna Kaulgud: Entrepreneurship Management by. Vikas publishing house, 2003.
10. Thomas W. Zimmerer & Norman M. Scarborough: Essential of Entrepreneurship and small business management, PHI, 4/e, 2005.
11. Mary Coulter: Entrepreneurship in Action, PHI, 2/e, 2005.
12. Kaplan: Patterns of Entrepreneurship, Willey, 2005.
13. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2005.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. AME II Semester

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3 -/- 3

**(58067) AUTOMATION IN MANUFACTURING****(ELECTIVE – IV)****UNIT – I**

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

**UNIT – II**

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

**UNIT – III**

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

**UNIT – IV**

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

**UNIT – V**

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

**UNIT -VI**

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

**UNIT – VII**

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

**UNIT – VIII**

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

**TEXT BOOK:**

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover./Pearson Edu.

**REFERENCES :**

1. Computer control of Manufacturing Systems by Yoram Koreom.
2. CAD / CAM/ CIM by Radhakrishnan.
3. Automation by W. Buekinsham.

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IV Year B.Tech. AME II Semester

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3 -/- 3

(58020)RENEWABLE ENERGY SOURCES

(ELECTIVE - IV)

**UNIT – I**

**PRINCIPLES OF SOLAR RADIATION :** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT-II**

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

**UNIT-III**

**SOLAR ENERGY STORAGE AND APPLICATIONS:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-IV**

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

**UNIT-V**

**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 and economic aspects.

**UNIT-VI**

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



**UNIT-VII**

**OCEAN ENERGY:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy; Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT-VIII**

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and Joule-Thomson 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, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy Sources /G.D. Rai

**REFERENCES:**

1. Renewable Energy Sources /Twidell & Weir
2. Solar Energy /Sukhatme
3. Solar Power Engineering / B.S Magal Frank Kreith & J.F Kreith.
4. Principles of Solar Energy / Frank Kreith & John F Kreider.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
6. Non-Conventional Energy Systems / K Mittal /Wheeler
7. Renewable Energy Technologies /Ramesh & Kumar /Narosa

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IV Year B.Tech. AME II Semester

L	T/P/D	C
3	-/-	3

**(58019) PLANT LAYOUT AND MATERIAL HANDLING****(Elective - IV)****UNIT - I Introduction :**

Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout

**UNIT - II Process layout & Product layout:**

Selection, specification, Implementation and follow up, comparison of product and process layout

**UNIT - III :** Heuristics for Plant layout - ALDEP, CORELAP, CRAFT

**UNIT - IV :** Group Layout, Fixed position layout-Quadratic assignment model. Branch and bound method

**UNIT - V :** Introduction, Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout

**UNIT - VI : Basic Material Handling systems:**

Selection, Material Handling method- path, Equipment, function oriented systems

**UNIT - VII :** Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling

**UNIT - VIII :** Ergonomics of Material Handling equipment. Design, Miscellaneous equipments

**TEXT BOOKS:**

1. Operations Management/ PB Mahapatra/PHI
2. Aspects of Material handling/ Dr. KC Arora & Shinde, Lakshmi Publications

**REFERENCES:**

1. Facility Layout & Location an analytical approach/ RL Francis/ LF Mc Linnis Jr, White/ PHI
2. Production and Operations Management/ R Panneerselvam/ PHI
3. Introduction to Material handling/ Ray, Siddhartha/ New Age

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IV Year B.Tech. AME II Semester	L	T/P/D	C
	0	-/-	2

(58669) INDUSTRY ORIENTED MINI PROJECT

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME II Semester	L	T/P/D	C
	0	-/6/-	2

(58670) SEMINAR

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME II Semester	L	T/P/D	C
	0	-/15/-	10

(58671) PROJECT

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. AME II Semester	L	T/P/D	C
	0	-/-	2

(58672) COMPREHENSIVE VIVA



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDRABAD  
IV Year B.Tech. AEST II Semester

DESIGN, INDUSTRY ORIENTED PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDRABAD  
IV Year B.Tech. AEST II Semester

UNIT 1: INTRODUCTION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDRABAD  
IV Year B.Tech. AEST II Semester

UNIT 2: PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDRABAD  
IV Year B.Tech. AEST II Semester

(UNIT 2) COMPREHENSIVE PROJECT