

## **ACADEMIC REGULATIONS**

### **B. Tech, Four Year Degree Programme with CBCS (For the batches admitted from the academic year 2015-16) and B. Tech. Lateral Entry Scheme (For the batches admitted from the academic year 2016-17)**

The following rules and regulations will be applicable for the batches of Four year B. Tech. degree admitted from the academic year 2015-16 onwards.

#### **1. ADMISSION:**

##### **1.1 Admission into First year of Four year B. Tech. Degree programme of study in Engineering:**

As per the existing stipulations of Andhra Pradesh State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made into the first year of four year B. Tech. Degree programme as per the following pattern.

- a) Category-A seats will be filled by the Convener, AP-EAMCET.
- b) Category-B seats will be filled by the Management as per the norms stipulated by Govt. of Andhra Pradesh.

##### **1.2 Admission into the Second Year of Four year B. Tech. Degree programme (lateral entry).**

As per the existing stipulations of Andhra Pradesh State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

#### **2. PROGRAMMES OF STUDY OFFERED BY AITS LEADING TO THE AWARD OF B.TECH DEGREE:**

Following are the four year undergraduate Degree Programmes of study offered in various disciplines at Annamacharya Institute of Technology and Sciences, Rajampet (Autonomous) leading to the award of B. Tech. (Bachelor of Technology) Degree:

1. B. Tech. (Computer Science and Engineering)
2. B. Tech. (Electrical and Electronics Engineering)
3. B. Tech. (Electronics and Communication Engineering)
4. B. Tech. (Information Technology)
5. B. Tech. (Mechanical Engineering)
6. B. Tech. (Civil Engineering)

and any other programme as approved by the concerned authorities from time to time.

#### **3. ACADEMIC YEAR:**

The entire course of study is of four academic years and each year will have **TWO** Semesters (Total **EIGHT** Semesters). The minimum instruction days for each semester shall be 90.

#### **4. COURSE STRUCTURE:**

Each programme of study shall consist of:

##### **4.1 General Courses comprising of the following :( 5 to 10%)**

- a) Language / Communication Skills
- b) Humanities and Social Sciences : Environmental Science
- c) Economics and Accounting
- d) Principles of Management

**4.2 Basic Science Courses comprising of the following: (15 to 20%)**

- a) Computer Literacy with Numerical Analysis
- b) Mathematics
- c) Physics
- d) Chemistry

**4.3 Basic Engineering Courses comprising of the following (depending on the branch):( 15 to 20%)**

- a) Engineering Drawing
- b) Engineering and IT Workshop
- c) Engineering Mechanics
- d) Basic Mechanical Engineering
- e) Electrical and Electronics Engineering
- f) Basic Civil Engineering
- g) Computer Programming

**4.4 Compulsory Discipline Courses :( 30 to 40%)**

The lists of professional subjects are chosen as per the suggestions of the experts, to impart broad based knowledge needed in the concerned branch of study.

**4.5 Professional subjects - Electives: (10 to 15%)**

Electives will be offered to the students to diversify the spectrum of knowledge, based on the interest of the student to broaden his individual skill and knowledge.

**4.6 Open Electives-(5 to 10%)**

Open subjects will be offered from other technical and / or emerging subject areas

**4.7 Project work, seminar and /or internship :(10-15%)**

Project work, seminar and /or internship in industry or elsewhere.

**4.8 Mandatory courses:**

Environmental studies, Technical English and Technical Communication & Soft Skills are included as subjects under mandatory courses but with credit weightage.

**4.9** There shall be a subject like comprehensive Computer Science and Engineering with 2 hours per week introduced in final year first semester.

**4.10** Every programme of study shall be designed to have 42-44 theory courses and 19-22 laboratory/seminar/comprehensive courses.

**4.11** Every programme has included foundation courses to the extent of 30%, programme core and programme elective subjects to the extent of 60%,open electives and mandatory courses to the tune of 10% approximately of the total credits.

**4.12 Audit Courses(to be included in III B.Tech. I Sem & II Sem)**

Interested students who want to supplement their knowledge can opt for audit courses namely Professional Ethics/Stress Management & Advanced English Communication laboratory and can appear/Pass in Continuous Internal Evaluation and Semester End Examination of these courses, will be included in marks memo only when they pass.

**4.13 Open Elective**

IV Year I Semester student has to necessarily select a subject from the list of open electives.

**4.14 Contact Hours:** Depending on the complexity and volume of the course, the number of contact hours per week will be assigned.

**5. CREDIT SYSTEM:**

Credits are assigned based on the following norms.

	Semester Pattern	
	Period(s) / Week	Credit(s)
Theory	01	01
Practical	3	02
Comprehensive Course	02	02
Seminar	–	02
Final Year Project	12	08

**6. EXAMINATION SYSTEM:** All components in any programme of study will be evaluated continuously through internal evaluation and an external evaluation component conducted as semester-end examination.

**6.1 Distribution of Marks:**

S. No.	Description	Marks	Examination and Evaluation	Scheme of Evaluation
1.	Theory	70	Semester-End examination.	The question paper shall be of subjective type with <b>Five</b> questions with internal choice to be answered in 180 Minutes duration.
		30	<p>Mid-Examinations of 120 Minutes duration to be evaluated for 20marks.</p> <p>The question paper shall be of subjective type in which four questions with an internal choice are to be answered.</p> <p>Remaining 10 marks is for continuous evaluation.</p> <p>The method of allotting these marks will be decided by the teacher dealing that subject in consultation with the Head of the Department. Teacher has to announce the evaluation method in the beginning of the semester.</p>	<p><b>Two</b> MID - Examinations are to be conducted for 20 marks each in a semester. 80% weightage for better performance and 20% for other shall be considered.</p> <p><b>MID-I:</b> after first spell of instructions(I &amp; II-Units).</p> <p><b>MID-II:</b> after second spell of instructions (III, IV &amp; V-Units).</p> <p>The student who has missed both the Mid examinations will be permitted to appear for a substitute examination covering the total syllabus. This substitute examination will be given a weightage of 80%. This is to be conducted before the commencement of end semester exams, can be even outside the working hours, can be even two mid exams a day also.</p>

S. No.	Description	Marks	Examination and Evaluation	Scheme of Evaluation
2.	Laboratory Drawing or	70	Semester - End Lab Examination	<b>For laboratory courses:</b> <b>180 minutes</b> duration – two examiners. For Drawing and /or Design: like for the theory examination.
		30	<b>20 Marks</b> for Day to Day evaluation	Performance in laboratory experiments
			<b>10 Marks</b> for Internal evaluation	Performance of one best out of two tests to be considered.
3	Seminar	100	Internal Evaluation 20 Marks for Report 20 Marks for subject content 40 Marks for presentation 20 Marks for Question and Answers	Continuous evaluation during a semester by the Departmental Committee (DC) consisting of two/three faculty members allotted by Head of the Department.
4	Comprehensive Course	100	The marks can be allotted based on the performance in viva-voce conducted by Head of the department and two senior faculty members in the department.	
5	Project Work	100	70 Marks for External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed under 6.2
			30 Marks for Internal evaluation	Continuous evaluation by the DC 15 Marks by DC as detailed under 6.2.1 15 Marks by Supervisor

## 6.2 Project Work Evaluation:

- 6.2.1 The Internal Evaluation shall be made by the Departmental Committee, on the basis of average of two seminars presented by each student on the topic of his project, the best one to be considered. The presentations shall be evaluated by the Departmental Committee (DC) consisting of Head of the Department, supervisor and a senior faculty member.
- 6.2.2 The Semester-End Examination (viva-voce) shall be conducted by a Committee consisting of External examiner nominated by the Chief Controller of Examinations, HOD and Supervisor. The evaluation of project work shall be conducted at the end of the IV year II Semester.

### **6.3 Eligibility to appear for the Semester-End examination:**

- 6.3.1 A student shall be eligible to appear for end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in the semester.
- 6.3.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the Institute Academic Committee if the reason for shortage is convincing.
- 6.3.3 Shortage of Attendance below 65% in aggregate shall in no case be condoned.
- 6.3.4 A stipulated fee shall be payable towards condonation of shortage of attendance to the Institute as per following slab system
  - 1<sup>st</sup> Slab** : Less than 75% attendance but equal to or greater than 70% a normal condonation fee can be collected from the student.
  - 2<sup>nd</sup> Slab** : Less than 70% but equal to or greater than 65%, double the condonation fee can be collected from the student.
- 6.3.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their End examination of that class and their registration for that semester shall stand cancelled.
- 6.3.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable.
- 6.3.7 A student detained due to shortage of attendance, will have to repeat that semester when offered next.

### **6.4 Revaluation / Recounting:**

Students shall be permitted to request for recounting/ revaluation of the end theory examination answer scripts within a stipulated period after payment of prescribed fee.

After recounting or revaluation, records are updated with changes if any and the student will be issued a revised memorandum of marks. If there are no changes, the student shall be intimated the same through a letter or a notice.

### **6.5 Improvement of marks:**

Students are permitted for improvement examinations once for a maximum of four subjects after completion of the study course but before applying for provisional certificate and consolidated marks memo after payment of prescribed fee.

### **6.6 Supplementary Examination:**

All Regular examinations are understood as Regular/Supplementary examinations. The supplementary students have to appear for the supplementary examinations along with their regular examinations conducted at the end of each semester. However, separate supplementary examinations will be conducted for the II-Semester subjects at the end of I-Semester and vice-versa.

### **6.7 Internship Programme:**

The weightage of two credits given for an internship of three weeks duration and more, when a student undergoes internship / industrial training from the specified industries / research organizations / Universities. In such a case, the student has to submit a report on that internship which will be evaluated by a team of three faculty members (decided by the HOD) of the department for those two credits. Student is given a chance to drop one seminar in place of a successful internship / industrial training.

### **6.8 Massive Open Online Course (MOOC):**

MOOC is one of the courses introduced in IV year II semester. The list of subjects under MOOC will be intimated before commencement of class work.

## 7. ACADEMIC REQUIREMENTS FOR PROMOTION/ COMPLETION OF B.TECH PROGRAMME OF STUDY:

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/ completion of B. Tech. Programme of study.

### 7.1 For students admitted into B. Tech. (Four Year) programme:

- 7.1.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, drawing subject 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.
- 7.1.2 For promotion from I B.Tech.to II B. Tech. a student must satisfy the attendance requirements in I year (two semesters).
- 7.1.3 A Student shall be promoted from II year to III year, if he fulfills the academic requirements of securing a minimum of **50** credits from I year I and II-Semesters, II year I and II Semesters examinations conducted till that time.
- 7.1.4 A student shall be promoted from III year to IV year if he / she fulfills the academic requirements of securing a minimum of **74** credits from I year I and II-Semesters, II year I and II-Semesters and the III year I and II- Semester examinations conducted till that time.
- 7.1.5 A student shall register for all the subjects and earn all the **195** credits. Marks obtained in all the credits shall be considered for the calculation of the class based on CCPA.
- 7.1.6 A student who fails to earn all the **195** credits as indicated in the course structure within **eight** academic years from the year of admission shall forfeit his seat in B. Tech. Programme and his admission stands cancelled.

### 7.2 For Lateral Entry Students (batches admitted from 2016-2017):

- 7.2.1 Academic requirements for pass in a subject are the same as in 7.1.1 and attendance requirements as in 6.3.
- 7.2.2 A student shall be promoted from II year to III year if he fulfills the academic requirements of securing a minimum of **22** credits from II year I and II-Semesters examinations conducted till that time.
- 7.2.3 A student shall be promoted from III year to IV year if he fulfills the academic requirements of securing a minimum of **46** credits from II year I and II-Semesters and the III year I and II-Semester examinations conducted till that time.
- 7.2.4 A student shall register for all the subjects and earn all **139** credits. Marks obtained in all such credits shall be considered for the calculation of the class based on CCPA.
- 7.2.5 A student who fails to earn all the **139** credits as indicated in the course structure within **six** academic years from the year of his admission shall forfeit his seat in B. Tech. Programme and his admission stands cancelled.

## 8. TRANSITORY REGULATIONS:

Students who got detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work for the next batch or later batches with the same (or) equivalent subjects as and when subjects are offered and they continue to be in the academic regulations of the batch he is joining later.

## 9. CREDIT POINT AVERAGE (CPA) AND CUMULATIVE CREDIT POINT AVERAGE (CCPA):

### 9.1 For a semester:

$$\text{Credit Point Average [CPA]} = \frac{1}{10} \frac{\sum_i C_i T_i}{\sum_i C_i}$$

Where  $C_i$  = Credits earned for Course  $i$  in any semester,

$T_i$  = Total marks obtained for course  $i$  in any semester

**9.2 For the entire programme:**

$$\text{Cumulative Credit Point Average [CCPA]} = \frac{1}{10} \frac{\sum_n \sum_i C_{ni} T_{ni}}{\sum_n \sum_i C_{ni}}$$

Where  $n$  = the semester in which such courses were credited

**9.3 Overall Performance:**

CCPA	Classification of final result
7.0 & above	First class with distinction
6.0 & above but below 7.0	First class
5.0 & above but below 6.0	Second class
4.0 & above but below 5.0	Pass

**10. TRANSCRIPTS:**

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued up to any point of study to a student on request.

**11. ELIGIBILITY:**

A student shall be eligible for the award of B. Tech. Degree if he fulfills all the following conditions:

- (i) Registered and successfully completed all the components prescribed in the programme of study to which he is admitted.
- (ii) Successfully acquired all **195/139 credits** as specified in the curriculum corresponding to the branch of study within the stipulated time.
- (iii) No disciplinary action is pending against him.

**12. AWARD OF B.TECH DEGREE:**

**12.1** A student is permitted to select one of the extracurricular / extension activities like NSS / Sports / Games / Cultural activities. A certificate in one of these activities is a must for the student to become eligible for the award of Provisional Certificate or Degree.

**12.2** The B. Tech. Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendations of the Principal of Annamacharya Institute of Technology and Sciences, Rajampet (Autonomous).

**13. AMENDMENTS TO REGULATIONS:**

The chairman, Academic Council of Annamacharya Institute of Technology and Sciences, Rajampet (Autonomous) reserves the right to revise, amend, or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

14. Any legal issues are to be resolved in Rajampet Jurisdiction.

**15. GENERAL:**

Where the words "he", "him", "his", "himself" occur in the regulations, there include "she", "her", "herself".

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**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

Regulations : **R15**Programme Code: **G5****I Year B. Tech., I Semester**

Subject Code	Subject Name	Hours / Week			C
		L	T	P	
5GC11	English through Literature	2	1	0	2
5GC12	Engineering Chemistry	4	1	0	4
5GC14	Engineering Mathematics-I	3	1	0	3
5G111	Problem solving techniques and introduction to C Programming	3	1	0	3
5G511	Engineering Mechanics –I	3	1	0	3
5G512	Engineering Graphics –I	2	--	6	5
5GC16	ELCS Lab-I	--	--	3	2
5GC17	Engineering Chemistry Lab	--	--	3	2
5G112	Programming in C Lab	--	--	3	2
5G514	Engineering workshop	--	--	3	2
<b>Total</b>		<b>17</b>	<b>5</b>	<b>18</b>	<b>28</b>

**I Year B. Tech., II Semester**

Subject Code	Subject Name	Hours / Week			C
		L	T	P	
5GC21	Technical English	2	1	0	2
5GC23	Engineering Physics	4	1	0	4
5GC24	Engineering Mathematics-II	3	1	0	3
5G121	C programming and Data Structures	3	1	0	3
5G521	Engineering Mechanics –II	3	1	0	3
5G522	Engineering Graphics –II	2	--	6	5
5GC26	ELCS Lab-II	--	--	3	2
5GC28	Engineering Physics Lab	--	--	3	2
5G122	Data structures Lab	--	--	3	2
5G124	IT Workshop	--	--	3	2
<b>Total</b>		<b>17</b>	<b>5</b>	<b>18</b>	<b>28</b>

Note: L - Lecture; T-Tutorial; P – Practical; C – Credits



**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

Regulations : **R15**Programme Code: **G5****II Year B. Tech., I Semester**

Subject Code	Subject Name	Hours / Week			C
		L	T	P	
5GC31	Mathematics -II	3	1	0	3
5G531	Mechanics of Solids	3	1	0	3
5G532	Metallurgy & Material Science	3	1	0	3
5G533	Basic Thermodynamics	3	1	0	3
5G534	Manufacturing Technology	3	1	0	3
5G535	Machine Drawing <sup>#</sup>	2	--	6	3
5GC35	Aptitude And Reasoning Skills	2	--	0	2
5G536	Manufacturing Technology Lab	0	--	3/2	2
5G537	Material Science Lab and Mechanics of Solids Lab <sup>*</sup>	0	--	3/2	2
<b>Total</b>		<b>19</b>	<b>05</b>	<b>6/4</b>	<b>24</b>

**NOTE:**

<sup>\*</sup>The Students will attend the Material Science lab and Mechanics of Solids lab in alternate week that is 3/2 per week.

<sup>#</sup>The End exam for Machine Drawing will be for 4 hrs in the following format.

All questions are to be answered

Q1: Questions set on section I & II of the syllabus 2 out of 3 or 2 out of 4 to be answered with a weightage of 4 marks each – 08 marks

Q2: Questions set on Section II of the syllabus 2 out of 3 to be answered with a weightage of 10 marks each – 20 marks

Q3: Drawing of assembled views of Section III items of Syllabus with a weightage of 42 marks.  
 Note that, all answers should be on the drawing sheet only. Answers on the drawing sheet only will be valued.

**II Year B. Tech., II Semester**

Subject Code	Subject Name	Hours / Week			C
		L	T	P	
5GC42	Probability and Statistics	3	1	0	3
5GC43	Environmental Science	3	1	0	3
5G248	Electrical Engineering and Electronics Engineering	3	1	0	3
5G541	Applied Thermodynamics - I	3	1	0	3
5G542	Fluid Mechanics and Hydraulic Machinery	3	1	0	3
5G543	Kinematics of Machinery	3	--	0	3
5G249	Electrical Engineering and Electronics Engineering lab <sup>*</sup>	0	--	3	2
5G544	Fluid Mechanics and Hydraulic Machines Lab	0	--	3	2
5G545	Seminar – I	0	--	2	2
<b>Total</b>		<b>24</b>	<b>05</b>	<b>08</b>	<b>30</b>

Note: L - Lecture; T-Tutorial; P – Practical; C – Credits

<sup>\*</sup>The Students will attend the Electrical Engineering lab and Electronics Engineering lab in alternate week that is 3/2 per week.

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**I Year B. Tech. I Semester**

**(5GC11) ENGLISH THROUGH LITERATURE**

**(Common to all branches)**

**Course Objectives:**

- To improve the language proficiency of the students in English through literature
- To enhance the vocabulary of the students in English through the use of diverse authentic materials
- To enable the students absorb the human values expressed in literature

**Text Books:**

1. For Detailed study: Texts from Open Sources (Available on Web)
  2. For Non-detailed study: *Trailblazers* published by Orient Black Swan
- Texts from open sources are included in the syllabus to make the teaching-learning process more interesting and inspiring. Also, the literary texts from open sources will allow the student learn language through literature. The book for the non-detailed study allows the student to have an insight into the lives and careers of some legendary personalities.
  - The text for non-detailed study is meant for extensive reading by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements etc.

**Unit I**

Detailed Study: *Cabuliwallah* by Rabindranath Tagore; *The Road not Taken* by Robert Frost

Non-detailed Study: G. D. Naidu

**Unit II**

Detailed Study: *A Dog's Tale* by Mark Twain; *If* by Rudyard Kipling

Non-detailed Study: Sudha Murthy

**Unit III**

Detailed Study: *The Gift of Magi* by O. Henry; *Leisure* by W. H. Davies

Non-detailed Study: Vijay Bhatkar

**Unit IV**

Detailed Study: *An Astrologer's Day* by R. K. Narayan; *Night of the Scorpion* by Nissim Ezekiel;

Non-detailed Study: Jagadish Chandra Bose

**Unit V**

Detailed Study: *The Proposal* by Anton Chekhov

Non-detailed Study: Homi Jehangir Baba

**Course Outcomes:**

- The student will appreciate the significance of silent reading and comprehension
- The student develops critical thinking and creative writing skills through exposure to literary texts
- The student will understand the components of different forms of writing

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**I Year B. Tech. I Semester**

**(5GC12) ENGINEERING CHEMISTRY**  
**(Common to ME and CE)**

**Course Objectives:**

- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers with their applications, analytical methods, engineering materials and water chemistry.

**Unit I**

**WATER TREATMENT :** Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity and chlorides in water, Water treatment for domestic purpose Disinfection- Definition, Kinds of disinfectants (Bleaching powder, Ozone, chloramine, UV light and Chlorine), Break point chlorination.

**Industrial Use of water:** For steam generation, Boiler troubles: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water: Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate conditioning. External Treatment: Permutit/ Zeolite process, Ion-Exchange process, Desalination of brackish water by Reverse Osmosis.

**Unit II**

**ELECTROCHEMISTRY:** Electrochemical cells: Basic concepts, classification of electrochemical cells, numerical calculations, Batteries: classification of batteries: Primary (Leclanche battery, mercury battery) and Secondary /rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries) Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen)

**Electrochemical sensors:** Potentiometric Sensors and voltammetric sensors. Examples: analysis of Glucose and urea.

**Corrosion:** Definition & Types (dry & wet Corrosions), Electrochemical Theory of corrosion, concentration cell corrosion, galvanic corrosion, factors affecting the corrosion, Prevention: Anodic and Cathodic protection, Electroplating (Nickel, copper and chromium) & Electrolessplating

**Unit III**

**POLYMERS:** Introduction to polymers, Polymerization process- types (without mechanism), Plastics: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Bakelite, nylons.

**Natural Rubber:** Processing, vulcanization and compounding of rubber. Elastomers: Preparation, properties and engineering applications of Buna-S, Buna-N and polyurethane rubbers.

**Conducting polymers:** Mechanism, synthesis and applications of polyacetylene, polyaniline. Biodegradable polymers Carbohydrates, proteins

**Inorganic Polymers:** Basic Introduction Silicones, polyphosphazines.

#### Unit IV

**FUEL TECHNOLOGY:** Classification of Fuels – Characteristics of Fuels- Calorific Value – Units, its determination using bomb calorimeter, Numerical Problems. Solid Fuels-Coke: Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

**Liquid Fuels:** Petroleum: Refining of Petroleum, Gasoline: Knocking, Octane Number, Synthetic Petrol: Bergius Processes, Fischer Tropsch's synthesis. Diesel and Cetane number. Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

**Gaseous Fuels:** Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas. Flue Gas analysis by Orsat's apparatus, Solving of problems on Combustion.

#### Unit V

##### CHEMISTRY OF ENGINEERING MATERIALS

**Cement:** Composition & manufacture of Portland cement, Setting and Hardening (Hydration and Hydrolysis), Refractories: Classification with suitable examples, properties and applications

**Lubricants:** Definition and properties of lubricants, theory of lubrication, and applications of lubricants.

**Rocket Propellants:** Classification, Characteristics of a good propellant

#### Text Books:

1. Engineering Chemistry by K.N.Jayaveera, G.V.Subba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, New Delhi, Fourth Edition, 2012.
2. A Text Book of Engineering Chemistry, Jain and Jain, DhanapathRai Publishing Company, New Delhi, 15th Edition, 2010.

#### Reference Books:

1. A Text book of Engineering Chemistry by S.S Dhara, S.S.Umare, S. Chand Publications, New Delhi, 12th Edition, 2010.
2. Engineering Chemistry by K.B.ChandraSekhar, UN.Das and Sujatha Mishra, SCITECH, Publications India Pvt Limited, Chennai, 2nd Edition, 2012.
3. Concepts of Engineering Chemistry- Ashima Srivastava and N.N. Janhavi, Acme Learning Pvt Ltd, First Edition, 2013.
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu, BS Publications, Hyderabad, 3rd Edition, 2008.
5. Text Book of Engineering Chemistry, Shashichawla, DhanapathRai Publications, New Delhi, 4th Edition, 2011.
6. Engineering Chemistry, K. SessaMaheswaramma and MrudulaChugh, Pearson Education, First Edition, 2013.

#### Course outcomes:

The student is expected to:

- The student will be able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention.
- Understand industrially based polymers, various engineering materials.
- Differentiate between hard and soft water.
- Understand the disadvantages of using hard water domestically and industrially.
- Select and apply suitable water treatment methods domestically and industrially.
- Understand the manufacture of synthetic petrol.
- Differentiate between thermoplastics and thermosetting plastics.
- Understand the manufacture, setting and hardening of cement.

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**I Year B. Tech. I Semester**

**(5GC14)ENGINEERING MATHEMATICS – I  
(Common to all branches)**

**Course Objectives:**

The course aims to provide the student with the ability

1. To understand the Differential equations of first, second and higher orders with their applications.
2. To understand the concept of partial differentiation and its applications.
3. To understand the concept of curve tracing in various forms

**Unit I**

Linear and Bernoulli equations. Applications to Newton's law of cooling, law of natural growth and decay, Chemical reaction and solutions, orthogonal trajectories.

**Unit II**

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax/\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ , method of variation of parameters. Applications to oscillatory electrical circuits.

**Unit III**

Rolle's Theorem – Lagrange's Mean Value Theorem (without proof). Simple examples of Taylor's and Maclaurin's Series.

Infinite series – Comparison test, Integral test, Ratio test, Cauchy's root test– Alternating series: Leibnitz rule (Without proof).

**Unit IV**

Functions of several variables – Partial differentiation- Chain rule-Jacobian – Maxima and Minima of functions of two variables, Lagrangian method of Multipliers with three variables only.

**Unit V**

Curve tracing – Tracing of Cartesian, polar and parametric curves.

**Text Books:**

Higher Engineering Mathematics, B. S. Grewal, Khanna publishers-43<sup>rd</sup> Edition (2014)

**Reference Books:**

1. Higher Engineering Mathematics, by Kreyszing
2. A Text Book of Engineering Mathematics, B.V. Ramana, Tata McGraw Hill.
3. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and others, S.Chand& Company.

**Course Outcomes:**

Upon completion of the course, students should be able to

- Understand the various types of ordinary differential equations
- Have the knowledge on functions of several variables.
- Understand the concepts of curve tracing

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**B. Tech. I Year I Semester**

**(5G111) PROBLEM SOLVING TECHNIQUES AND INTRODUCTION TO C PROGRAMMING  
(Common to ALL branches)**

**Course Objectives:**

- Introduction to computer peripherals, Software development.
- Describe when and how to use the stand C statement and to Write, Compile and Debug basic C programs using an IDE
- Write and debug programs using an IDE and the principles of designing
- structured programs when and how to use the appropriate statements available in the C language
- Write basic C programs using , Selection statements, Repetitive statements, Functions, Pointers, Arrays and Strings
- Implementation of C applications for data structures, sorting and searching.

**Unit I**

**Introduction to Computer Problem Solving:** Introduction to Computer Systems, Computer Environments, Computer Languages, Introduction to Problem Solving Aspect, Top- down Design, Implementation of Algorithms, Flow Charts, SDLC.

**Unit II:**

**Introduction to C Language:** Structure of a C Language program, Creating and Running C programs, Keywords, Identifiers, Data Types, Typedef, enumerated Types variables, constants, input/output. Operators and Expressions, precedence and associativity, Type Conversions, Bitwise Operators. Example programs for each topic.

**Unit III**

C Program Statements, Selection and Decision making Statements-two way selection –if...else statements, multi way selection-switch statements. Loop Control Statements-concept of a loop, Loops in C-while loop, do...while loop, for loop, Other Related Statements -break, continue, goto, example programs for each topic.

**Unit IV**

**ARRAYS:** Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Multidimensional Arrays.

**Strings:** String Basics, String Library Functions, Array of Strings, example programs for each topic.

**Unit V**

**Functions:** Library Functions in C, User defined Functions,-declaration, definition, calling of function , types of User defined functions, Parameter passing methods-pass by value, pass by reference, Scope, Storage Classes - Auto, Register, Static, Extern, Scope rules, Type Qualifiers, Recursion - Recursive Functions, Preprocessor Commands. Using Array Elements as Function Arguments. Example programs for each topic.

**Text Books:**

1. C Programming and Data Structures.B.AForouzan,R. F.Gilberg,Cengage learning, Indian edition.
2. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
3. C and Data Structures, E.Balaguruswamy, Tata McGraw Hill.
4. How to Solve it By Computer ,R.G.Dromey,PHI.

**Reference Books:**

1. C and Data Structures, A snapshot oriented treatise with live engineering examples, Dr. N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand.
2. LET US C, YeswanthKanitkar, Ninth Edition, BPB Publication.

**Course Outcomes:**

- Understand the importance of the software development process and System development tools.
- Understand general principles of C programming language and able to write simple program in C. Able to develop programs based on arrays and functions.

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**I Year B. Tech. I Semester**

**(5G511) ENGINEERING MECHANICS-STATICS  
(Common to ME and CE)**

**Course Objective:**

This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.

Develop an understanding of the principles of statics and the ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams. Ability to analyze the statics of trusses, frames and machine

**Unit I**

**INTRODUCTION TO ENGINEERING MECHANICS:** Basic concepts - System of forces– Resultant of a force system, Moment of forces and its Application & Couples, spatial Forces- Components in space, Resultant Equilibrium of system forces, free body diagrams.

**Unit II**

**Types of Supports** – Support reactions for beams with different types of loading – concentrated, uniformly distributed load, uniformly varying loading and couple.

**Analysis of Frames (analytical Method)** Types of Frames – Assumptions for forces in members of a perfect frame. Method of Joints, Method of Sections, Cantilever trusses and simply supported trusses.

**Unit III**

**FRICTION:** Types of friction– Static and Dynamic Frictions, laws of Friction–Limiting friction and impending motions–Cone of limiting friction– Motion of bodies – Wedge friction – Ladder friction.

**Unit IV**

**CENTROID AND CENTER OF GRAVITY:** Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies –Theorem of Pappu’s and Guldinus Centre of Gravity of Composite figures. (Simple problems only).

**Unit V**

**MOMENT OF INTERIA:** Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures,

**MASS MOMENT OF INERTIA:** Moment of Inertia of Simple solids, Moment of Inertia of composite masses. (Simple problems only)

**Text Books:**

1. Engineering Mechanics-Statics and Dynamics, A.Nelson, Tata McGraw-Hill Company.
2. Engineering Mechanics, R.K Bansal - Laxmi Publications
3. Singer’s Engineering Mechanics, B. Vijay kumarreddy – B.S. Publishers.
4. Engineering Mechanics, Bhavikatti and Rajasekharappa

**Reference Books:**

1. Engineering Mechanics by Timoshenko & young, Tata McGraw-Hill Company
2. Engineering Mechanics – B. Bhathacharya- Oxford University Publications
3. Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage Learning
4. Engineering Mechanics-Statics & Dynamics—Johnson & Beer



**Course Outcomes:**

The students are able to

- Use the concepts of force, moment and its application.
- Construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
- Get knowledge of internal forces and moments in members.
- Learn concept of friction and applications.
- Drawing free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
- Find centroid and centre of gravity of simple and composite bodies.
- Find moment of inertia and polar moment of inertia including transfer methods and their applications.

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**I Year B. Tech. I Semester**

**(5G512) ENGINEERING GRAPHICS – I  
(Common to ME and CE)**

**Course Objectives:**

- To enable the students with various concepts like Dimensioning, Conventions and standards related to working drawing in order to become professionally efficient.
- To introduce fundamental concepts of curves used in engineering, projection of points, lines and planes.
- To impart and inculcate proper understanding of the theory of projections.
- Able to understand and visualize geometrical curves, projections of lines and planes.

**Unit I**

**INTRODUCTION:** Lettering – Geometrical constructions - Curves used in Engineering Practice: Conic Sections– General method only. Special methods: Ellipse – Oblong method, Arcs of circle method, Concentric circles methods - Rectangle method and Tangent method for Parabola - Rectangular Hyperbola.

**Unit II**

**CYCLOIDAL CURVES:** Cycloid, Epicycloid and Hypocycloid (treatment of simple problems) – Involute – Square, Pentagon, Hexagon and Circle.

**Unit III**

**PROJECTIONS OF POINTS AND LINES:** Projections of Points and Projections of Lines- inclined to one reference plane - inclined to both reference planes, finding the True lengths - Traces.

**Unit IV**

**PROJECTIONS OF PLANES:** Projections of regular Plane surfaces inclined to one reference plane and both reference planes.

**Unit V**

**AUXILIARY PLANES:** Projection of lines and planes using auxiliary planes.

**Text Books:**

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers
2. Engineering Drawing, K.L. Narayana, P. Kanniah, Scitech Pub.

**Reference Books:**

1. Engineering Drawing and Graphics, Venugopal/ New age.
2. Engineering Drawing, Johle, Tata McGraw-Hill
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education

**Course Outcomes:**

- Students will be able to know and understand the conventions and the methods of Engineering Graphics.
- Able to understand the application of industry standards and techniques applied in engineering graphics.
- Dimension and annotate two-dimensional engineering drawings.
- Students will be able to improve their visualization skills so that they can apply these skills in developing the new products.

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**I Year B. Tech. I Semester**

**ENGLISH LANGUAGE COMMUNICATION SKILLS LAB - I  
(Common to all branches)**

**Course Objectives:**

- To train students to use language effectively in everyday conversations
- To expose the students to a varied blend of self-instructional, learner-friendly modes of language learning
- To enable the students learn better pronunciation through emphasis on individual speech sounds

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

- 1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants**
- 2. Situational Dialogues and Role-play**
- 3. Telephone Skills**
- 4. Describing Objects / Situation / People**

**Manual cum Record**, prepared by the Faculty Members of English of the college will be used by Students.

**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. an LCD projector, a digital stereo –audio & video system and camcorder etc.

**Suggested Software:**

Sky Pronunciation Suite

Connected Speech from Clarity

Clarity Pronunciation Power – Part I

Mastering English in Vocabulary, Grammar, Spellings, Composition

English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Language in Use, Foundation Books Pvt Ltd with CD

Learning to Speak English - 4 CDs

Cambridge Advanced Learners' English Dictionary with CD.

Murphy's English Grammar, Cambridge with CD

**Course Outcomes**

- The student will be able to express himself fluently in social and professional contexts
- The student will learn how to neutralize his accent

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**I Year B. Tech. I Semester**

**(5GC17) ENGINEERING CHEMISTRY LAB  
(Common to ME and CE)**

**Course Objectives:**

- The student will learn practical understanding of the redox reaction.
- The student will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications.
- The student will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**LIST OF EXPERIMENTS**

**Any 10 of the following experiments has to be performed**

**VOLUMETRIC ANALYSIS**

**Redox titrations**

1. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
2. Estimation of Chloride ion using potassium Chromite indicator (Mohr's method)

**Water analysis**

3. Determination of total hardness of water by EDTA method
4. Estimation of Dissolved Oxygen by Winkler's method
5. Determination of acidity of Water
6. Determination of Alkalinity of Water.

**Complexometry**

7. Determination of Copper by EDTA method

**Iodometry**

8. Determination of Copper by Iodometry

**INSTRUMENTATION**

**Colorimetry**

9. Estimation of Iron in Cement by Colorimetry.

**Conductometry**

10. Conductometric titration of strong acid Vs strong base (Neutralization titration)

**Fuel analysis**

11. Determination of Calorific Value of fuel by using Bomb Calorimeter

**Lubricants**

12. Determination of Viscosity of oils using Redwood Viscometer I
13. Determination of Viscosity of oils using Redwood Viscometer II

**PREPARATION OF POLYMERS**

14. Preparation of bakelite
15. Preparation of Thiokol rubber

**Manual cum Record:** Prepared by the Faculty Members of Engineering Chemistry of the college will be used by Students.

**Equipment Required:**

- ✓ Analytical weighing balance
- ✓ Digital Conductometer
- ✓ Photo-colorimeter
- ✓ Bomb calorimeter
- ✓ Redwood viscometers
- ✓ Deionizer plant
- ✓ Digital electronic balance

**Glassware Required:** Pipettes, burettes, conical flasks, standard flasks, beakers, reagent bottles, spatulas, wash bottles, BOD Bottles, measuring cylinders, glass rods, Bunsen burners, funnels, thermometers etc.

**Chemicals Required:** EDTA, Hypo, Mohr Salt Solution, HCl, Sulphuric Acid, Copper Solution, Iron Solution, Potassium Dichromate Solution, Potassium Iodide Solution, Buffer Solution, diphenyl amine, EBT indicator, NaOH solution, Benzoic acid Urea, distilled water etc.

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et al, Pearson Education, Sixth Edition, 2012.
2. Chemistry Practical – Lab Manual by K.B.ChandraSekhar, G.V. Subba Reddy and K.N.Jayaveera, SM Publications, Hyderabad, 3rd Edition, 2012.

**Outcomes:**

- The student would be confident in understanding of redox systems
- The student would have acquired the practical skill to handle the analytical methods with confidence.
- The student would feel comfortable to think of design materials with the requisite properties
- The student would be in a position to technically address the water related problems.

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**I Year B. Tech. I Semester**

**(5G113)PROBLEM SOLVING THROUGH C LAB**  
**(Common to ECE, EEE, ME and CE branches)**

**Course 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 with ANSI C/ TURBO C Compiler and Supporting Editors

**Exercise 1:**

Minimum of 4 programs on Data types, Variables, Constants and Input and Output.

**Exercise 2:**

Minimum of 4 programs on each Operator, Expressions and Type Conversions.

**Exercise 3:**

Minimum of 4 programs on Conditional Statements [two way and multipath].

**Exercise 4:**

Minimum of 4 programs on each Loop Control Statements[for, while and do-While]

**Exercise 5:**

Minimum of 4 programs on Unconditioned JUMP Statements- break, continue, Goto.

**Exercise 6:**

Minimum of 4 programs on Declaring Arrays, Referencing Arrays, Array Subscripts. Using for loop for sequential Access.

**Exercise 7:**

Minimum of 4 programs on Multidimensional Arrays.

**Exercise 8:**

Minimum of 4 programs on String Basics, String Library Functions and Array of Strings.

**Exercise 9:**

Minimum of 4 programs on simple user defined functions, Parameter passing methods- pass by value, pass by reference.

**Exercise 10:**

Minimum of 4 programs on Storage classes- Auto, Register, Static and Extern

**Exercise 11:**

Minimum of 4 programs on Recursive Functions, Preprocessor commands.

**Exercise 12:**

Minimum of 4 programs on using Array Elements as Function Arguments.

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**I Year B. Tech. I Semester**

**(5G514) ENGINEERING WORKSHOP  
(Common to ME and CE)**

**Course Objectives:**

The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.

**1. TRADES FOR EXERCISES:**

- a. **Carpentry shop**– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- b. **Fitting shop**– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock.
- c. **Sheet metal shop**– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet.
- d. **House-wiring**– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- e. **Foundry**– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- f. **Welding** – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint

**2. TRADES FOR DEMONSTRATION:**

- a. **Plumbing**
- b. **Machine Shop**
- c. **Metal Cutting**

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

**Reference Books:**

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas.
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

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**I Year B. Tech. II Semester**

**(5GC21) TECHNICAL ENGLISH  
(Common to all branches)**

**Course Objectives:**

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

**TEXT BOOK**

**Sure Outcomes published by Orient Black Swan (with CD)**

- The book prescribed serves as students' handbook. The reader comprises essays which are particularly relevant to engineering students.
- The teacher should focus on developing LSRW skills of students while using the prescribed text and exercises. The classes should be interactive. The students should be encouraged to participate in the classroom proceedings and also to write short paragraphs and essays. The main aim is to encourage two-way communication in place of one-sided lecture.

**Unit I**

Sure Outcomes: Technology with a Human Face

Grammar: Kinds of Verbs and their Use; Writing: Official Letters; Vocabulary: Synonyms and Antonyms, Prefixes and Suffixes, Idioms and Phrases

**Unit II**

Sure Outcomes: Climatic Change and Human Strategy

Grammar: Tenses; Writing: Letters of Application; Vocabulary: One-word Substitutes

**Unit III**

Sure Outcomes: Emerging Technologies: Solar Energy in Spain

Grammar: Types of Sentences: Simple, Compound and Complex; Declarative, Interrogative, Imperative and Exclamatory; Writing: E-mails; Vocabulary: Commonly Confused Words

**Unit IV**

Sure Outcomes: Water: The Elixir of Life

Grammar: Subject-Verb Agreement; Writing: Official Reports, Technical Reports; Vocabulary: English Spelling, Commonly misspelt words

**Unit V**

Sure Outcomes: The Secret of Work

Grammar: Active and Passive Voice; Writing: Note-making; Vocabulary: Connotations

**Reference Books:**

1. Essential Grammar in Use, (with CD), Raymond Murphy, 3/e, Cambridge University Press, 2009
2. Basic Communication Skills for Technology, Andrea J Ruthurford, Pearson Education, Asia.
3. English for Technical Communication, Aysha Viswamohan, Tata Mc-Graw Hill
4. English Grammar and Composition, David Grene, Mc Millan India Ltd.
5. Murphy's English Grammar, Raymond Murphy, CAMBRIDGE
6. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
7. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, 2008



8. Developing Communication Skills, 2/e. by Krishna Mohan & Meera Banerji, Macmillan, 2009
9. English for Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
10. Longman Dictionary of Contemporary English with DVD, Pearson Longman

**Course Outcomes:**

- The student will demonstrate the ability to guess the contextual meaning of the words and grasp the overall message of the text to draw inferences
- The student will understand the components of different forms of writing
- The student will exhibit effective writing skills through his understanding of English Grammar

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**I Year B. Tech. II Semester**

**(5GC23) ENGINEERING PHYSICS**  
**(Common to ME and CE)**

**Course Objectives:**

- The mission of the Engineering Physics course is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology.
- The Engineering Physics course educates the principles of optical science and engineering necessary to understand optical systems.
- The Crystallography, X-ray diffraction of crystals and crystal defects explains how basic structure modulate properties of materials.
- The principles of quantum mechanics and electron theory of metals gives an idea on basic development of energy in metals.
- The main objective of this course is to provide basic understanding of different engineering materials (semiconductors, magnetic, superconducting and nano materials).

**Unit I**

**PHYSICAL OPTICS, LASERS AND FIBRE OPTICS:**

**Physical Optics:** Introduction - Interference in thin films by reflection – Newton's Rings – Fraunhofer diffraction due to single slit, double slit and diffraction grating.

**Lasers:** Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients - Population inversion – Ruby laser - He-Ne laser – Semiconductor laser - Applications of lasers. Holography: Construction and Re-Construction of hologram - Applications

**Fiber optics:** Introduction– Construction and working principle of optical fiber – Numerical Aperture and acceptance angle – Types of optical fibers – Optical fiber communication system – Applications of optical fibers in communications, sensors and medicine.

**Unit II**

**CRYSTALLOGRAPHY AND ULTRASONICS:**

**Crystallography:** Introduction – Space lattice –Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Inter planar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method– Defects in solids: point defects and types.

**Ultrasonics:** Introduction – Properties – Production of ultrasonics by piezoelectric method and detection – Applications in non-destructive testing.

**Unit III**

**QUANTUM MECHANICS AND FREE ELECTRON THEORY:**

**Quantum Mechanics:** Introduction to matter waves – de-Broglie's hypothesis - Heisenberg's uncertainty principle - Schrodinger's time independent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well.

**Free electron theory:** Classical free electron theory – Sources of electrical resistance – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Kronig - Penny model (qualitative) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

**Unit IV**

**SEMICONDUCTORS AND MAGNETIC MATERIALS:**

**Semiconductors:** Introduction – Intrinsic and extrinsic semiconductors – Drift & diffusion currents and Einstein's equation – Hall Effect - Direct and indirect band gap semiconductors – Working principle of p-n junction diode, LED and photodiode.

**Magnetic materials:** Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis - Soft and hard magnetic materials and applications.

## Unit V

### **SUPERCONDUCTIVITY AND NANOMATERIALS:**

**Superconductivity:** Introduction – Properties of superconductors - Meissner effect – Type I and type II superconductors – Flux quantization – London penetration depth – BCS theory (qualitative) – ac and dc Josephson effects- Applications of superconductors.

**Nanomaterials:** Introduction - Significance of nanoscale – Basic principles of nano materials (Surface area and quantum confinement) – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials: ball mill, chemical vapor deposition, sol-gel, plasma arcing methods – Carbon nanotubes (CNT) and properties – Applications of nanomaterials.

### **Text Books:**

1. Engineering physics – K. Thyagarajan, MacGraw Hill Publishers, 2013.
2. Engineering Physics – S. ManiNaidu, Pearson Education, I Edition, 2012.
3. Engineering physics – P.K. palanisamy, scietech publisher, Edition, 2013.

### **Reference Books:**

1. Engineering Physics – R.V.S.S.N. Ravi Kumar and N.V. Siva Krishna, Maruthi Publications , 2013
2. Engineering Physics – D.K. Battacharya and A. Bhaskaran, Oxford Higher Education I Edition 2010.
4. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning, I Edition, 2012.
5. Engineering Physics – D.K. Battacharya and A. Bhaskaran, Oxford University press.
6. Engineering Physics – M. Arumugam, Anuradha Publications II Edition, 1997.
7. Engineering physics – M.N. Avadhanulu and P.G. KrishiSagar, Chand and Co, Revised Edition 2013.
8. Solid State Physics – A.J. Dekkar, McMillan Publishers, Latest edition, 2012.
9. Engineering Physics – Gaur and Gupta Dhanapati, Rai Publishers , 7th Edition, 1992.
10. Text book of Nanoscience and Nanotechnology: B S Murthy, P. Shankar, Baldev Raj B B Rath, James Murday, University Press, I Edition, 2012.

### **Course Outcomes:**

The student is able to

- Understand basic principles of optics, optical engineering materials and incorporation of optics in engineering field.
- Identify different types of crystal structures in materials and x-ray diffraction through crystals.
- Know about importance of ultrasonic's in engineering field.
- Analysis of basic concepts of quantum mechanics and electron theory and consequences.
- Explain about basic mechanism of different types of advanced materials used in engineering field.
- Get brief idea about synthesis, properties and applications of nano materials.

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**I Year B. Tech. II Semester**

**(5GC24) ENGINEERING MATHEMATICS – II  
(Common to all branches)**

**Course objectives:**

The course aims to provide the student with the ability

- To apply this knowledge to evaluate the multiple integrals in real life situations.
- To apply the knowledge of Laplace transforms and vector calculus for engineering problems

**Unit I**

Multiple integral: –Double integral – Evaluation - Change of Variables - Change of order of integration- Area and volumes using double integral. Triple integral - Evaluation.

**Unit II**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions – Inverse Laplace transform – Convolution theorem.

**Unit III**

Application of Laplace transforms to ordinary differential equations of first and second order.

**Unit IV**

**Vector Calculus:** Scalar and vector point functions, Gradient and its geometrical interpretation, Divergence –physical interpretation of divergence, Curl -physical interpretation of curl, Del applied twice to point functions, Line integral - Area, Surface and volume integrals.

**Unit V**

**Vector integral theorems:** Green's theorem – Stoke's theorem and Gauss's Divergence Theorem (without proofs) and their applications.

**Text Book:**

Higher Engineering Mathematics, B.S.Grewal, Khanna publishers-43<sup>rd</sup> Edition (2014)

**Reference Books:**

1. Higher Engineering Mathematics, by Kreyszing
2. A Text Book of Engineering Mathematics, B.V. Ramana, Tata McGraw Hill.
3. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and others, S. Chand & Company.\* Tutorial

**Course Outcomes:**

Upon completion of the course, students should be able to

- Understand the concepts of applications of integration.
- Have the knowledge of Laplace transforms and their applications.
- Master vector integral theorems.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET  
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**I Year B. Tech. II Semester**

**(5G121) C PROGRAMMING AND DATA STRUCTURES  
(Common to ALL branches)**

**Course Objectives:**

- Structured programs when and how to use the appropriate statements available in the C language
- Write basic C programs using , Selection statements, Repetitive statements, Functions, Pointers, Arrays and Strings
- Implementation of C applications for data structures, sorting and searching.

**Unit I**

**Pointers** - Introduction, Features of Pointers, Pointer Declaration and Definition, Void Pointers, pointers for inter function communication, Pointers to Pointers, Pointer Applications: arrays and pointers, pointer arithmetic, Dynamic Memory Allocation, Pointers to Functions, pointer to void and command line arguments.

**Unit II**

**Structures** – Definition, initialization, accessing structures, nested structures, array of structures, structures and functions. Pointer and Structures. Unions. Sample programs

**Files:** Introduction Streams and File, Standard library input/output functions, formatted input/output functions, character input/output functions; Text verses binary Streams, Standard library functions for files. File examples.

**Searching and Sorting** - Exchange (Bubble) Sort, Selection Sort, Quick Sort, Insertion Sort, Merge Sort, Searching- Linear and Binary Search Methods.

**Unit III**

**Data Structures:** Overview of Data Structure. **Stack:** Representation of a Stack, Operation on a Stack, Implementation of a Stack using Arrays and Pointers, Representation of Arithmetic Expressions, Infix, Prefix, and Postfix Notations, Evaluation of Postfix Expression, Recursion.

**Queues:** Representation of Queue, Insertion, Deletion, Searching Operations, Circular Queues.

**Unit IV**

**Linked List:** Singly Linked List, Linked List with and without header, Insertion, Deletion and Searching Operations.

**Doubly Linked List:** Insertion, Deletion and Searching Operations.

**Circular Linked List:** Insertion, Deletion and Searching Operations.

**Unit V**

**Trees:** Introduction to Trees, Binary Trees, creation of binary tree, Operations on Binary Tree. Introduction to Binary Search Tree, Operations on Binary Search Trees.

**Graphs:** Defining graph, basic terminology, graph representation.

**Text Books:**

1. C Programming and Data Structures. B.A Forouzan, R. F. Gilberg, Cengage learning, Indian edition.
2. Programming in C and Data Structures, J.R. Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
3. Data Structures and Algorithms: Concepts, Techniques and Applications G.A.V. Pai [UNIT-V]

**Reference Books:**

1. C and Data Structures, A snapshot oriented treatise with live engineering examples, Dr. N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand.
2. LET US C, YeswanthKanitkar, Ninth Edition, BPB Publication.

**Course Outcomes:**

- Understand the purpose of pointers for parameter passing, referencing and dereferencing and understands the concepts of structures, unions and File management.
- Understands what and how to design data structure programs using C programming language.
- Understands how to solve applications like searching and sorting using C Programming language.

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**I Year B. Tech. II Semester**

**(5G521) ENGINEERING MECHANICS-DYNAMICS  
(Common to ME and CE)**

**Course Objective:**

- This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.
- To teach the basic principles of particle and rigid body kinematics and kinetics.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.

**Unit I**

**KINEMATICS OF PARTICLES:** Introduction, motion of particle, displacement, velocity and acceleration, Rectilinear motion, Rectilinear motion Along X-axis, Uniformly Accelerated motion, motion curves, rectilinear motion along vertical Y-axis

Curvilinear motion- introduction, rectangular coordinates, projectile motion, tangential and normal components of acceleration, radial and transverse components of acceleration.

**Unit II**

**KINEMATICS OF RIGID BODIES:** Introduction, rotational motion about a fixed axis, rotational motion with constant angular acceleration, rotational motion with constant angular velocity, relationship between angular and linear motions, general plane motion.

**Unit III**

**KINETICS OF PARTICLES:** Introduction, laws of motion, mass of bodies in rectangular coordinates, motion of connected bodies, D’alembert’s principle, variable acceleration, tangential and normal components of acceleration, Virtual work method.

**Unit IV**

**WORK AND ENERGY:** Introduction, work done by a force, work done by a variable force, work done in stretching a spring, power, energy, work done by internal forces, potential energy.

**IMPULSE AND MOMENTUM:** Introduction, impulsive force, impulse and momentum, non-impulsive force, impact of jet on plates or vanes.

**Unit V**

**KINETICS OF RIGID BODIES:** Introduction, system of particles, translational motion of a system of particles, rotational motion of system of particles, kinetic equations of motion for a rigid body, work energy method.

**Text Books:**

1. Engineering Mechanics-Statics and Dynamics, A.Nelson, Tata McGraw-Hill Company.
2. Engineering Mechanics, R.K Bansal - Laxmi Publications
3. Singer’s Engineering Mechanics, B. Vijay kumarreddy – B.S. Publishers.
4. Engineering Mechanics, Bhavikatti and Rajasekharappa

**References Books:**

1. Engineering Mechanics by Timoshenko & young, Tata McGraw-Hill Company
2. Engineering Mechanics – B. Bhathacharya- Oxford University Publications
3. Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage Learning
4. Engineering Mechanics-Statics & Dynamics—Johnson & Beer

**Course Outcomes:**

The students are able to

- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts).
- Understand basic dynamics concepts – force, momentum, work and energy
- Understand and be able to apply Newton’s laws of motion.
- Understand and be able to apply other basic dynamics concepts - D’alembert’s principle, the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.



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**I Year B. Tech. II Semester**

**(5G522) ENGINEERING GRAPHICS – II  
(Common to ME and CE)**

**Course Objectives:**

- To impart and inculcate proper understanding of the theory of projections of solids and simple machine components.
- Able to visualize projections of solids with sectioning, isometric views and orthographic views.
- To prepare the student for future engineering positions.

**Unit I**

**PROJECTIONS OF SOLIDS:** Projections of Regular Solids – Cylinder, Cone, Prism and Pyramid - inclined to one reference plane & both reference planes – Auxiliary Views.

**Unit II**

**SECTIONS OF SOLIDS:** Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

**Unit III**

**DEVELOPMENT OF SURFACES:** Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid, Cone and their Sectioned parts.

**INTERPENETRATION OF RIGHT REGULAR SOLIDS:** Projections of curves of Intersection of Cylinder Vs Cylinder - Cylinder Vs square prism – Cylinder Vs Cone and Square prism Vs Square prism (Axis bisecting problems only).

**Unit IV**

**ISOMETRIC PROJECTIONS / VIEWS:** Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids.

**Unit V**

**CONVERSION OF VIEWS:** Conversion of Isometric views to Orthographic Views and Conversion of Orthographic views to Isometric views.

**Text Books:**

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers
2. Engineering Drawing, K.L. Narayana, P. Kanniah, Scitech Pub.

**Reference Books:**

1. Engineering Drawing and Graphics, Venugopal/ New age.
2. Engineering Drawing, Johle, Tata McGraw-Hill
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education

**Course Outcomes:**

- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
- Able to apply auxiliary or sectional views to most practically represent engineered parts.
- Can employ freehand 3D pictorial sketching to aid in the visualization process and to efficiently communicate ideas graphically.
- Analyze a drawing and bring out any inconsistencies to put forth inferences graphically.

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**I Year B. Tech. II Semester**

**(5GC18) ENGINEERING PHYSICS LAB  
(Common to ME and CE)**

**Course Objectives:**

- The student will be able to handle and understanding of different apparatus to perform experiments.
- The student will learn practical measurement of different physical quantities.
- The student will be able to characterize the materials and their properties.
- The student allows to learn practical experience of theory conceptual values.

**List Of Experiments**

**Any 10 of the following experiments has to be performed**

1. Determination of wavelengths of various colors of mercury spectrum using diffraction grating in normal incidence method
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method
4. Determination of radius of curvature of lens by Newton's Rings
5. Laser : Diffraction due to single slit
6. Laser : Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber
9. Meldi's experiment: Determination of the frequency of tuning fork
10. Determination of particle size by using laser.
11. Energy gap of a material using p-n junction diode
12. Hall effect : Determination of mobility of charge carriers in semiconductor
13. B-H curve
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
15. Determination of rigidity modulus –Torsional pendulum

**Manual cum Record:**

Prepared by Engineering Physics Faculty Members of Annamacharya Institute of Technology and Sciences.

**Reference Book:**

1. Engineering Physics Practicals – Dr. B. Srinivasa Rao V.K.V. Krishna K.S Rudramamba
2. Engineering Practical Physics – S.L Kakani& Shubra Kakani

**Equipment required:**

Spectrometers  
Microscopes  
Meldi's apparatus  
Stewart-Gee's apparatus  
Torsional pendulum  
Light sources  
Optical fiber cables

**Course Outcomes:**

- The student would be confident in handling apparatus to perform experiments.
- The student would have developed practical skill.
- The student would have knowledge in practical values and applications

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**I Year B. Tech. II Semester**

**(5G123) PROGRAMMING IN C AND DATA STRUCTURES LAB  
(Common to ECE, EEE, ME and CE branches)**

**Course 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 with ANSI C/ TURBO C Compiler and Supporting Editors

**Exercise 1:**

Minimum of 4 Programs on pointer basics [declaration, A, Pointers, pointers for inter function communication.

**Exercise 2.**

Minimum of 4 Programs on Pointers applications.

**Exercise 3**

Minimum of 4 programs on structures and unions

**Exercise 4**

Minimum of 4 programs on basic File operations.

**Exercise 5**

Minimum of 4 programs on searching and sorting techniques .

**Exercise 6**

Implementation of Stack and perform all Stack operations using  
i) Arrays ii) Pointers

**Exercise 7**

Implementation of Queue and perform all Queue operations using  
i) Arrays ii) Pointers

**Exercise 8**

Implement Circular Queue (its operations) using  
i) Arrays ii) Pointers

**Exercise 9**

Implementation of Single Linked List and its operations using  
i) Arrays ii) Pointers

**Exercise 10**

Implementation of Double Linked List and its operations using  
i) Arrays ii) Pointers

**Exercise 11**

Implementation of Circular Linked List and its operations using  
i) Arrays ii) Pointers

**Exercise 12**

C program that uses Stack operations to perform the following:  
i) Converting infix expression into postfix expression  
ii) Evaluating the postfix expression

**Exercise 13**

Implement Binary Tree using Double Linked List and its operations.

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**I Year B. Tech II Semester**

**(5G124) I.T. WORKSHOP  
(Common to ME and CE)**

**Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

**Preparing your Computer**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

**Networking and Internet**

**Task 5: Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, search process using different natural languages, and creating e-mail account. Draft syllabus, R13 regulations (UG)

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

**Productivity tools**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text,

images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations:** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

### Optional Tasks:

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO Draft syllabus, R13 regulations (UG)
- Function Generator
- Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

**References Books:**

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH

**Course Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

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**II Year B. Tech. I Semester**

**(5GC31) ENGINEERING MATHEMATICS – III**

**Course Objectives:**

1. This course aims at providing the student with the concepts of Matrices, Numerical differentiation and Numerical integration, Numerical solution of ordinary differential equations, Fourier series, partial differential equations, complex variables and complex integrations which find the applications in engineering.
2. Emphasis will be more on logical and problem solving development in Numerical methods and their applications.

**Unit I**

Rank – Echelon form Solution of Linear System of Homogenous and Non Homogeneous equations  
Eigen values-Eigen vectors-properties, Cayley -Hamilton theorem-inverse and powers of a matrix  
by Cayley Hamilton theorem.

**Unit II**

Solution of algebraic and transcendental Equations-Bisection Method-Method of false position-  
Newton-Raphson method

Interpolation-Forward differences-Backward differences-Newton's forward and backward  
difference formulae – Lagrange's interpolation formula.

Numerical Differentiation-Numerical integration-Trapezoidal Rule-Simpson's one third Rule-  
Simpson's  $3/8^{\text{th}}$  Rule (without proofs).

**Unit III**

Numerical solutions of ordinary differential equations-Taylor's series-Euler's method-Picard's  
method- Runge-kutta fourth order method-Milne's predictor-corrector method (Without proofs).

**Unit IV**

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

Partial differential equations: Formation of partial differential equations by eliminating arbitrary  
constants and functions--Method of separation of variables

**Unit V**

Functions of complex variable –continuity-differentiability-Analyticity-Properties-Cauchy  
Riemann equations in Cartesian and polar co-ordinates(without proofs).Harmonic and conjugate  
harmonic functions-Milne-Thomson's method.

Complex integration: Cauchy's integral Theorem-Cauchy's integral Formula-Generalized integral  
formula (without proofs).

**Text Books:**

1. Higher Engineering Mathematics, B. S. Grewal, 40<sup>th</sup> Edition, Khanna Publishers, New Delhi.
2. A text book of Mathematical Methods, E. Keshava Reddy, and G. Sankara Rao, I. K. International.

**Reference Books:**

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8<sup>th</sup> Edition, New Age International (Pvt) Limited.
2. A text book of Engineering Mathematics, B. V. Ramana, Tata McGraw Hill.
3. Mathematics - II, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
4. Mathematics - III, E. Keshav Reddy and Rukmangadachari, Pearson Education.



**Course Outcomes:**

- The student becomes familiar with the application of Mathematical techniques like Fourier series.
- The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, Partial differential equations and Numerical methods.

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**II Year B. Tech. I Semester****(5G531) MECHANICS OF SOLIDS****Course Objective:**

The objective of the subject is to learn the fundamental concepts of stress, strain and deformation of solids with applications to bars and beams. The students shall understand the theory of elasticity including strain/displacement and Hooke's law relationships. To access stresses and deformations through the mathematical models of beams for bending and bars for twisting or combination of both. The knowledge of this subject will help in the design & Theory of machines courses.

**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 –Mohr's circle for plane stress and plain strain (Simple problems).

**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, UDL, 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.

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

**Unit IV**

**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.

**TORSION OF CIRCULAR SHAFTS:** Theory of pure torsion- Derivation of torsion equations;  $T/J=q/r=N\theta/l$  – Assumptions made in the theory of pure torsion- torsional moment of resistance- polar section modulus

**Unit V**

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

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

**COLUMNS AND STRUTS:** Classification of columns – Assumptions – Expression for crippling load of different cases – effective length of a column-slenderness ratio – limitation of Euler's formula – Rankine's formula

**Text Books:**

1. Bhavikatti, *Strength of Materials*, Lakshmi publications.
2. B C Punmia, *Mechanics of Materials*, Lakshmi publications.

**Reference books:**

1. Jindal, *Strength of Materials*. Umesh Publications.
2. Vazirani and Ratwani, *Analysis of structures*, Khanna publishers.
3. S.B.Junnarkar , *Mechanics of Structures Vol-III*, Charotar publishing house.
4. S.Timoshenko, *Strength of Materials, D Van Nostrand company*.

**Course Outcomes:**

- How to measure the strength of materials based on calculating stresses, strains and deformations for basic geometries subjected to axial loading and thermal effects.
- How to draw shear force and bending moment diagrams for calculating maximum shear force and maximum bending moment for different types of beams with different lateral loadings conditions.
- About the strength of the beams with different sections by bringing the relationship between the bending stress and maximum bending moment, between the shear stress and maximum shear force which is calculated from previous unit.
- How to calculate the shear strength of the solid and hollow shafts which are subjected to torsional loading in power transmitting. How to calculate deflections of beam using different methods under different boundary and loading conditions.
- This gives application to mechanics of solids for students in which how to calculate different stresses and strains for the thin and thick cylinders in identifying safe design for boiler shells and thick shells as such in like domestic cylinders, air compressor and high pressure vessels used in thermal plants etc. How to calculate the columns and struts for different cases of loads.

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**II Year B. Tech. ME – I Semester**

**(5G532) METALLURGY AND MATERIAL SCIENCE**

**Course Objectives:**

- To gain and understand the relationship between the basic structure, properties of metals mechanism of crystallization, imperfections in crystals.
- To learn about the method of processing, heat treatment and applications of metallic, non metallic components to select suitable materials for various engineering applications.
- To learn about Ceramic and composite materials to select for various engineering applications
- To learn about various methods of steel making processes and its application in various applications.

**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.

**CONSTITUTION OF ALLOYS:** Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

**Unit II**

**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 and Fe-Fe<sub>3</sub>C.

**Unit III**

**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.

**NON-FERROUS METALS AND ALLOYS:** Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

**Unit IV**

**HEAT TREATMENT OF ALLOYS:** Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

**Unit V**

**CERAMIC MATERIALS:** Crystalline ceramics, glasses, cermets. **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 Carbon – Carbon composites.

**Metallurgy:** Steel Making - Introduction, Methods of steel making – crucible process, Bessemer converter process, Open Hearth Process, Electric Furnace Process.

**Text books:**

1. Sidney H. Avener, *Introduction to Physical Metallurgy*, TMH
2. Donald R. Askeland, *Essential of Materials Science and Engineering*. Thomson.

**Reference books:**

1. Kodgire, *Material Science and Metallurgy*.

2. Agarwal, *Science of Engineering Materials*.
3. William and collister, *Materials Science and Engineering*.
4. V. Rahghavan, *Elements of Material science*.
5. R. A Flinn and P K Trojan, *Engineering Materials and Their Applications*. Jaico Books.
6. R.K.Rajput, *Engineering materials and metallurgy*. S.Chand.
7. O.P. Khanna, *Material Science and Metallurgy*. Dhanpat rai Publications.

**Course Outcomes:**

- Students will get knowledge on various crystal structures, types of bonds in solids, mechanism of crystallization, imperfections in crystals and methods of determining grain size.
- They will understand alloys & its necessity, solid solutions, factors affecting solid solution and the concept of intermediate alloy phases.
- Students will understand the concept of equilibrium diagrams, Isomorphous alloy systems, peritectic systems, Solid state transformations etc., and will be able to construct equilibrium diagrams by experimental methods.
- Students will be able to learn the structure and properties of cast iron, steels and Non ferrous alloys like copper, Aluminum, Titanium.
- Students will be able to learn the various heat treatment processes and TTT diagrams, surface hardening methods, and cryogenic treatment of alloys.
- Students will understand the importance of advanced composite materials in application to sophisticated machine and structure of components.
- Students will be able to learn the various methods of steel making processes

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**II Year B. Tech. I Semester****(5G533) BASIC THERMODYNAMICS****Course objectives:**

- To get the awareness on basic thermodynamic principles, skills to perform the analysis and design of thermodynamic systems.
- To learn the concept of zeroth law, first law and second law of thermodynamics and its applications to a wide variety of systems.
- The students shall become familiar with the principles of psychrometry and properties of pure substances.
- Able to learn the concept of various air standard cycles with the help of P-V and T-S Diagrams.

**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.

Zeroth Law of Thermodynamics – 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 II**

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature.

Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

**Unit III**

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, Constructional use of Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

**Unit IV**

**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.

**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, specific heats and Entropy of Mixture of perfect Gases and Vapour.

**Unit V**

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

**Text Books:**

1. PK Nag, *Engineering Thermodynamics*. TMH, 3<sup>rd</sup> Ed.
2. A. Venkatesh, *Basic Engineering Thermodynamics*. Orient Longman.

**Reference Books:**

1. Sonntag, Borgnakke and Van wylen, *Fundamentals of Thermodynamics*. John Wiley & sons (ASIA) Pt Ltd.
2. Yunus Cengel & Boles, *Thermodynamics – An Engineering Approach*. TMH.
3. J.P.Holman, *Thermodynamics*. McGrawHill.
4. YVC Rao, *An introduction to Thermodynamics*. New Age.
5. Jones & Dugan, *Engineering Thermodynamics*, PHI

**Course Outcomes:**

- Student able to understand the concept of thermodynamic properties and equations of state.
- Student able to understand the concept of the zeroth and first law of thermodynamics and when applied to flow system.
- Students able to understand the concept of entropy and second law of thermodynamics.
- Student can analyze about reversible and irreversible processes and reasons of irreversibility.
- Student can understand the about the pure substances with Molliers chart, P-V-T charts.
- Student able to understand various laws like Dalton law, Avogadro law etc. in mixtures of perfect gases.
- Student understands about thermodynamic potentials and Elementary Treatment of the Third Law of Thermodynamics.
- Student understands about various air standard cycles like Otto, Diesel, Dual, Atkinson etc., cycles.

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**II Year B. Tech. I Semester**

**(5G534) MANUFACTURING TECHNOLOGY**

**Course objective:**

- By this subject the students will understand how manufacturers use technology to change raw materials into finished products. The students shall also introduce the basic concepts of casting, pattern preparation, gating system
- Students shall also introduce the basic knowledge on basic features of various welding and cutting processes.
- To study the concepts of hot working and cold working processes, rolling processes, metal forming processes, extrusion of metals, their principle of working, mechanism and their machining process, applications. And also to study the concept of forging process, tools and dies, its types, their principle of working and applications.
- Students shall also introduce the basic knowledge on plastics, classification, processing of plastics and its applications.

**Unit I**

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

**Solidification of casting** – Concept – Solidification of pure metal and alloys, short & long freezing range alloys, Solidification time calculations. Risers – Types function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die 3) Investment.

**Unit II**

**Welding:** Classification of welding process types of welds and welded joints. Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding. Inert Gas welding, TIG & MIG welding Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive and nondestructive testing of welds.

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

**Unit III**

**Metal Working Process:** 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. Problems on Forces in rolling and power requirements – defects in rolled products.

**Press Working Process:** 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. Force and Power calculations.

**Unit IV**

**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 V**

**Plastics:** Classification – Properties – Plastics as engineering materials – Method of processing plastics – compression moulding, transfer moulding, injection moulding, blow moulding.



**Text Books:**

1. P.N. Rao, *Manufacturing Technology*. TMH.
2. Kalpak Jain, *Manufacturing Technology*. Pearson education.

**Reference books:**

1. R.K. Jain, *Production Technology*, Khanna Publishers.
2. Lindberg, PE, *Process and materials of manufacturing*, Allyn and Bacon.
3. Rosenthal, *Principles of Metal Castings*, TMH.
4. Parmar, *Welding Process*, Khanna Publishers.
5. R.K. Rajput, *Manufacturing Technology*. Laxmi Publications.
6. Rafiq Noorani, *Rapid Prototyping Principles and Applications*. Wiley Pub.
7. V.K. Jain, *Unconventional Machining Processes*. Allied Pub.
8. K.L Narayana, *Production Technology*. I.K. International Pub.

**Course Outcomes:**

- Students can understand the elements of casting, construction of patterns and gating systems, moulds, methods of moulding, moulding machines and solidification of castings of various metals. Students are advised to visit URLs <http://www.nptel.iitm.ac.in/> and [iitr.ac.in](http://iitr.ac.in), [www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm](http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm). The students are advised to visit MT Lab in the college.
  - The student will be able to understand the different types of special casting methods and their applications, design of risers and feeding systems, crucible melting, cupola operation and steel making process. The students may also be able to design a casting process on his own. The students are also advised to visit a Casting Industry nearby to get practical exposure.
  - The student will be able to understand the different types of welding processes, welds and weld joints, their characteristics, cutting of ferrous and non-ferrous metals by various methods. The students are advised to visit nearby welding shop for better understanding of welding process. About advanced welding process, heat affected zone (HAZ), Defects and Identification Methods. The students are advised to visit nearby welding shop in MT Lab in the college.
  - Students can understand Hot working and cold working processes, recrystallization on metal properties by hot and cold working process, rolling process, types of roll mills. And also metal forming process.
  - Students can understand Extrusion of metals, classifications. Forging process, its classification, tools & die design for forging processes. The students are advised to visit MT Lab in the college.
- Students can understand about the plastics, its processing for producing of different components in real time applications. The students are advised to visit MT Lab in the college.

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**II Year B. Tech. I Semester**

**(5G535) MACHINE DRAWING**

**Course Objective**

- To make the students to understand the concepts of I.S. conventions, methods of dimensioning, the title boxes, to draw the machine elements and simple parts.
- To make the students to understand and draw assemblies of machine parts and to draw their sectional Views

**I. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS:**

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

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cotter joints- socket and spigot, sleeve and cotter, gib and cotter and knuckle joint.
- c) Riveted joints for plates
- d) Shaft couplings- sleeve, clamp, flange and flexible, spigot and socket pipe joint.
- e) 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.

- a) Engine parts – stuffing box, cross head, Eccentric, Petrol Engine connecting rod, piston assembly.
- b) Other machine parts – Screws jack, Machine Vice, Drill jig, Tailstock.
- c) Valves: Steam stop valve, feed check valve and air cock.

**III. PART DRAWINGS:**

Plummer block, Blow- off cock, indexing drill jig, Tool post, Petrol Engine connecting rod.

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

**Text books:**

1. Dhawan, *Machine Drawing*. S.Chand Publications.
2. K.L.Narayana, P.Kannaiah & K. Venkata Reddy, *Machine Drawing*. New Age Publishers.
3. Production Drawing, K.L. Narayana, New Age International.

**Reference books :**

1. P.S.Gill, *Machine Drawing*, S K Kataria & Sons
2. Luzzader, *Machine Drawing*.
3. K.C.John, *Textbook of Machine Drawing*. PHI learning, 2009.

**Course Outcomes & Suggested Student Activities:**

- This unit is useful to prepare the students for representing their ideas at International standards and will be able to convey the drawings much effective.
- Students can represent various details of an object quickly. These drawings can be easily prepared and understood by both the people in a manufacturing industry and the consumers too. Students are advised to visit machine shop.
- Students can understand the working principles of an assembly or subassembly so that he/she will be able to produce the final product by procuring the units from various sources/suppliers and still produce any useful product serving effectively. It is not necessary that all the components to be made locally only.
- Students are advised to visit body building and assembly unit.

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**II Year B. Tech. I Semester**

**(5GC35) APTITUDE AND REASONING SKILLS**

**QUANTITATIVE APTITUDE:**

1. Number Systems
2. Averages
3. Problems on ages
4. Allegations
5. Percentages
6. Profit and loss
7. Simple interest and Compound interest
8. Ratio and Proposition and variation
9. Time and Work
10. Time and Distance
11. Mensuration
12. Permutation and Combinations
13. Progressions
14. Inequalities
15. Logarithms
16. HCF and LCM
17. Decimal Fractions
18. Simplification
19. Square Roots and Cube Roots
20. Pipes and Cisterns
21. Area, Volume and Surface Areas
22. Calendar, Clocks
23. True Discount, Banker's Discounts
24. Data Interpretation, Tabulation, Bar Graphs, Pie charts, Line Graphs

**Reasoning:**

1. Directions
2. Blood Relations
3. Problems on Cubes
4. Series and Sequences
5. Odd man out
6. Coding and Decoding
7. Data sufficiency
8. Logical deductions
9. Arrangements and Combinations
10. Groups and Teams
11. Puzzles to Puzzle you. More puzzles, Brain Teasers, Puzzles and Teasers

**Reference Books:**

1. Arun Sharma, How to Prepare for Quantitative Aptitude, TMH Publishers, New Delhi, 2003.
2. R. S. Agarwal, Quantitative Aptitude, S. Chand Publishers, New Delhi, 2005.

3. Sharon Weiner-Green, Irn K.Wolf, Barron's GRE, Galgotia Publications, New Delhi, 2006.
4. R. S. Agarwal, Vrebal and Non-Verbal Reasoning, S.Chand Publishers, New Delhi, 1998.
5. Shakuntala Devi, Puzzles to Puzzle you, Orient Paper Backs Publishers(OPB), New Delhi, 2005.
6. Shakuntala Devi, More Puzzles, OPB, New Delhi, 2006.
7. Ravi Narula, Brain Teasers, Jaico Publishing House, New Delhi, 2005.
8. George J Summers, Puzzles and Teasers, Jaico Publishing House, Mumbai, 2005.

**Library:**

1. Mittal.U, Puzzles to Puzzle you (Book-I & II).
2. Aptitude (Quantitative, Analytical, Logical), By Globarena.
3. Aptitude – Student work book, Part-I &II, By Globarena.
4. Material for Soft Skills, By Globarena

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**II Year B. Tech. I Semester**

**(5G536) MANUFACTURING TECHNOLOGY LAB**

Minimum of 10 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 Exercise.
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.

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**II Year B. Tech. I Semester**

**(5G537) MATERIAL SCIENCE LAB AND MECHANICS OF SOLIDS LAB**

**(A) MATERIAL SCIENCE 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. Hardeneability 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 been
2. Bending test on
  - a. Simple supported beam
  - 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

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**II Year B. Tech. II Semester**

**(5GC42)PROBABILITY AND STATISTICS**

**Course Objectives:**

1. To quantify the measure of uncertainty.
2. To apply this knowledge to Insurance, statistics, Engineering.

**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 – Distribution functions - mean and variance.

**Unit II**

Binomial distribution –Poisson distribution- Uniform distribution - Normal distribution.

**Unit III**

Sampling distribution: Population and sample - Sampling distributions of means ( $\sigma$  known and unknown). Estimation: Point estimation – interval estimation - one mean – two means (large sample) and one proportion – two proportions (large sample).

**Unit IV**

Test of Hypothesis – Large samples: hypothesis concerning one and two means. Test of proportions (one and two).Small samples: t- test.

**Unit V**

F-test,  $\chi^2$ -Tests– goodness of fit, rxc contingency tables.

**Text Books:**

1. Fundamentals of Mathematical Statistics, S C Gupta and V K Kapoor, Sultan schand & sons.
2. A text book of Probability & Statistics, B. V. Ramana, Tata McGraw Hill.

**Reference Books:**

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8<sup>th</sup> edition, New Age International (Pvt) Limited.
2. Probability & Statistics, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
3. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.

**Course Outcomes:**

1. Understand the concepts of sample space and events.
2. Gain the knowledge on probability distributions.
3. Understand the concepts of random variables, sampling distributions of means.

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**II Year B. Tech. II Semester**

**ENVIRONMENTAL SCIENCE**

**Unit I**

Multidisciplinary nature of environmental studies - Scope & Importance of environmental studies - Need for public awareness - Global environmental crisis (over-exploitation of natural resources, decline of ecosystems, loss to biodiversity, environmental pollution, and population growth) – People in environment – Institutions in environment

**Unit II**

Renewable & non-renewable natural resources. Forest resources: Use – deforestation, case studies - dams & their effects on forest & tribal people Water resources: Use - floods, drought- conflicts over water. Mineral resources: Use - environmental effects of extracting mineral resources, case studies. Food resources: Impacts of over grazing, traditional agriculture and modern agriculture, Energy resources: Renewable and non – renewable energy resources - use of alternate energy resources. Land resources: Land as a resource, land degradation, soil erosion. Role of an individual in the conservation of natural resources.

**Unit III**

Ecosystems: Producers, consumers & decomposers - Food chains, food webs & ecological pyramids - Energy flow in the ecosystem- Cycling of nutrients (Bio geo chemical cycles-water, oxygen, carbon, nitrogen & energy cycles) – Types and characteristic features of the following ecosystems :(a)Forest ecosystems (b) Grass land ecosystems (c) Desert ecosystems (d) Aquatic ecosystems ( lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation: Definition - Values of biodiversity: consumptive value, productive value, social value, ethical value, aesthetic value & option values - Hot spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wild life - Conservation of biodiversity: In –situ & Ex-situ conservation

**Unit –IV**

Environmental Pollution: Definition, causes, effects & control measures of: Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Marine pollution, Nuclear hazards - Solid waste management: Causes, effects and control measures of urban wastes.

**Unit V**

Social Issues and the Environment: Rain water harvesting - Environmental ethics: Issues & possible solutions - Global warming - Acid rain - Ozone layer depletion – Wasteland reclamation - Environment protection Act.-Air (Prevention & Control of Pollution) Act.-Water (Prevention & Control of Pollution) Act.-Wildlife Protection Act-Forest Conservation Act.

Human Population & Environment: Population explosion – Family Welfare Program -Environment & human health - Human Rights (in relation to environment) - Value Education (environmental values) - HIV/AIDS.

**Text Books:**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, University press.
2. Environmental Studies by R. Rajagopalan Oxford University Press.
3. Perspectives In Environmental Studies by Anubha Kaushik and C.P.kaushik, New Age International Publishers.

**Reference Books:**

1. Comprehensive Environmental Studies by J.P.Sharma, Laxmi Publications.
2. Environmental Studies by Anindita Basak – Pearson education.
3. Environmental Studies by Benny Joseph, Mc.GrawHill Publications.



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**II Year B. Tech. I Semester**

**(5G248) ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING**

**Course objective:**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of various Electrical Machines.
- To know about various electronic devices.
- To understand the various parts of CRO.

**Unit I**

**ELECTRICAL CIRCUITS:** Basic definitions, types of elements, ohm's law, resistive, inductive, capacitive networks, series- parallel circuits , star and delta transformations, Kirchhoff's laws.

**Unit II**

**DC MACHINES:**

**DC Generator:** Principle of operation, emf equation, types.

**DC Motor:** principle of operation, torque equation, types, three point starter, losses and efficiency.

**Testing:** brake test, Swinburne's test, and speed control methods.

**Unit III**

**AC MACHINES:**

**1- $\phi$  Transformers:** Principle of operation, emf equation, losses, efficiency and regulation. OC and SC tests.

**Alternator:** Principle of operation of alternators-Regulation by synchronous impedance method.

**3- $\phi$  Induction motor:** Principle of operation of induction motor-slip-torque characteristics.

**Unit IV**

**DIODE AND TRANSISTORS:**

**Diode:** PN junction diode, symbol, V-I characteristics, applications, Half wave, full wave and bridge rectifiers (simple problems).

**Transistors:** PNP and NPN junction transistors, Transistor as an amplifier, single stage CE amplifier, Frequency response of CE amplifier, concepts of feedback amplifier and necessary conditions for oscillators.

**Unit V**

**ELECTRIC HEATING AND CRO:**

**Induction Heating:** Theory of induction heating, applications in industries.

**Dielectric heating:** Theory of dielectric heating and its industrial application

**CRO:** Principle of CRT (cathode ray tube), Deflection sensitivity, electronic and magnetic deflection, applications of CRO, voltage, current and frequency measurements.

**Text books:**

1. V.K.Mehta, *Principles of Electrical and Electronics Engineering*. S.Chand&Co.
2. T.Thyagarajan, *Fundamentals of Electrical and Electronics Engineering*. SciTech publications, 2007, 5<sup>th</sup> Ed.

**Reference books:**

1. M.S Naidu and S.Kamakshaiah, *Introduction to Electrical Engineering*. TMH Publications.
2. Kothari and Nagrath, *Basic Electrical Engineering*, TMH, 2<sup>nd</sup>Ed.
3. Mill man and Halkias, *Electronics devices and circuits*.

**Course Outcome:**

After the completion of the course, the student should be able

- To predict the behaviour of electrical circuits.
- To identify the type of electrical machine used for that particular application.
- To identify various electronic devices and CRO parts.

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**II Year B. Tech. II Semester**

**(5G541) APPLIED THERMODYNAMICS - I**

**Course Objectives:**

- An ability to solve common engineering problems in the thermal sciences field, including problems involving application of the first and second laws of thermodynamics in the analysis of energy (availability).
- Awareness of actual cycles and their analysis.
- An ability to understand the working and combustion phenomena of I C engines.
- An ability to solve and evaluate performance parameters of I.C engines.
- An ability to learn the concept of compressors and to solve engineering problems of compressors including: Reciprocating compressors, Rotary (positive displacement type) compressors, Axial flow compressors.

**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.

**I.C. ENGINES:** Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles.

Engine systems – Fuel, Simple Carburetor, Fuel Injection System – Air Injection system, Solid Injection system and Electronic Injection system. Ignition – Battery ignition system and Magneto ignition system, Cooling – Air cooling (Cooling Fins) and liquid cooling system – Thermosyphon system and Forced Circulation system and Lubrication - Importance - Mist Lubrication System, Wet sump Lubrication system and Dry sump Lubrication system.

**Unit II**

**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.

**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 III**

**TESTING AND PERFORMANCE OF ENGINES:** 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.

**Unit IV**

**COMPRESSORS:** Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor

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

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

**Unit V**

**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 requirements.

**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. V. Ganesan, *I.C. Engines*. TMH.
2. Thermal engineering, Rathore. TMH

**Reference Books:**

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

**Course Outcomes:**

- Student can able to understand the basic working of I.C engines & its types along with its different systems like ignition system, injection system etc.
- Student can able to understand the complete concept of combustions in S.I. engines & C.I engines.
- Student gets the knowledge on the various parameters of performance of the I.C. engines and various engine testing methods.
- Student acquires knowledge on the basic working of compressors and its types.
- Student gets the knowledge on the basic working principle along with performances of various compressors like reciprocating, centrifugal and axial flow compressors.
- Student can able to understand the differences between the actual cycles & air standard cycles in I.C. engines.

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**II Year B. Tech. II Semester****(5G542) FLUID MECHANICS AND HYDRAULIC MACHINERY****Course Objective:**

To introduce the study of various fluid properties and their significance in engineering problems and the basic concepts of fluid flow, both kinematics and dynamics, including the derivation of energy equation needed for the analysis of fluid flow problems, different types of flow in pipes, theory of boundary layer, losses in pipes and basics of turbo machinery and performance of different turbines in hydro electric power plants.

**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 – Buoyancy.

**FLUID KINEMATICS:** Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows. Equation of continuity for one dimensional flow.

**Unit II**

**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.

**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: pitot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter.

**Unit III**

**HYDROELECTRIC POWER STATIONS:** Elements of hydro electric power station-types. Concept of pumped storage plants- storage requirements.

**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 IV**

**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.

**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 V**

**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. Modi and Seth, *Hydraulics, fluid mechanics and Hydraulic machinery*, Standard Book house
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*.

**Reference Books:**

1. D.S. Kumar, *Fluid Mechanics and Fluid Power Engineering*. Kotaria & Sons.
2. D. Rama Durgaiyah, *Fluid Mechanics and Machinery*. New Age International.

3. Banga & Sharma, *Hydraulic Machines*. Khanna Publishers.
4. James W. Dally, William E. Riley, *Instrumentation for Engineering Measurements*. John Wiley & Sons Inc. 2004.
5. Rajput, *Fluid Mechanics and Hydraulic Machines*.

**Course Outcomes:**

- An ability to understand the fluid properties and their engineering significance and able to differentiate between different pressures and the methods of fluid pressure measurement.
- The student shall have basic idea about the fundamentals of fluid flow The student is exposed to the fundamental equations, used in the analysis of fluid flow problems like continuity, energy and momentum equations.
- An ability to understand the different types of pipe flow and the conditions governing them and understands the working of the different devices used for measurement of fluid flow under different conditions.
- An ability to understand the fundamentals of turbo machinery, elements of hydro electric power plant.
- An ability to understand the performance of hydraulic turbines and hydraulic pumps.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: RAJAMPET**  
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**II Year B. Tech. II Semester****(5G543) KINEMATICS OF MACHINERY****Course Objective:**

The objective of this course is to cover the kinematics of planar mechanisms. To develop general mathematical and computational skills so as to enable the kinematic analysis of machine elements including linkages, cams and gears and also becomes familiar with gear terminology and drawing of the cam profiles, velocity & acceleration diagrams of mechanisms.

**Unit I**

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

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

**Unit II**

**VELOCITY AND ACCELERATION ANALYSIS OF MECHANISMS:** Velocity and acceleration – Motion of link in machine – Determination of Velocity and Acceleration diagrams – Graphical method – Application of relative velocity method - four bar chain.

**Plane motion of body:** Instantaneous center of rotation - 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

**Analysis of Mechanisms:** Analysis of single slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for simple mechanism - Coriolis acceleration, determination of Coriolis component of acceleration- Klein's construction.

**Unit III**

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

**STEERING MECHANISMS:** Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

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

**Unit IV**

**GEARS:** friction wheels and toothed gears – types – law of gearing - condition for constant velocity ratio for transmission of motion - forms of teeth - cycloidal and involute profiles - velocity of sliding path of contact, arc of contact and contact ratio– phenomena of interference – methods to avoid interference - condition for minimum number of teeth to avoid interference.

**GEAR TRAINS:** Introduction – Train value – Types – Simple, Compound, Reverted and Epicyclic gear Train - Methods of finding train value or velocity ratio of Epicyclic gear trains- sun & planetary gear systems- Differential gear for an automobile.

**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, uniform acceleration and retardation method & cycloidal - Maximum velocity and maximum acceleration during outward and return strokes in the above 4 cases.

**Text Books:**

1. S. S. Rattan, *Theory of Machines and Mechanisms*, Tata McGraw Hill Publishers.

2. R.S Khurmi & J.K Gupta, *Theory of Machines*, S.Chand.

**Reference Books:**

1. Jagdish Lal, *Theory of Mechanisms and Machines*, Metropolitan Company Pvt. Ltd.
2. R.K Bansal, *Theory of Machines*, Lakshmi publications.
3. Thomas Bevan, *Theory of Machines*, CBS.
4. PL. Ballaney, *Theory of machines*, Khanna Publishers.

**Course Outcomes:**

- Students are in a position to identify different mechanisms, inversions of different kinematic chains and also to find mobility of mechanisms.
- Students are able to draw velocity and acceleration diagrams of simple plane mechanisms by using relative velocity method and instantaneous center method.
- Students are able to understand the mechanism of straight line motion mechanisms, steering mechanisms and Hooke's joint and are also able to solve numerical problems on steering mechanisms, Hooke's joint.
- Students are able to know gear terminology, types of gears, length of path of contact, contact ratio, interference in gears and application of bevel gears in differential gear. Further students are also able to design the gears to avoid interference and to calculate train value for different gear trains.
- Students are able to draw displacement diagram and cam profile for different types of motions of the follower. And also to find the displacement, velocity and acceleration of the follower at different positions of cam with specified contours.



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**II Year B. Tech. II Semester**

**(5G249) ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING LAB**

Any **ten** Experiments to be conducted.

**ELECTRICAL ENGINEERING LAB**

1. Swinburne's test on D.C shunt machine (pre determination of efficiency of a given D.C shunt machine working as generator and motor).
2. OC and SC tests on single phase transformer (pre determination of efficiency and regulation at a given power factors).
3. Brake test on three phase induction motor (determination of performance characteristics).
4. Regulation of alternator by synchronous impedance method.
5. Speed control of D.C shunt motor by  
(a) Armature control method (b) field flux control method.
6. Brake test on D.C shunt motor (determination of performance characteristics).

**ELECTRONICS ENGINEERING LAB**

1. Study of CRO (Measurement of voltage frequency and phase of periodic signals).
2. V-I Characteristics of PN junction diode.
3. Full wave rectifier with and without capacitive filter.
4. Input and output characteristics of Common Emitter (CE) Configuration.
5. Frequency response of a single stage CE amplifier.
6. Sinusoidal signal generation using RC phase shift oscillator circuit.

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**II Year B. Tech. II Semester**

**(5G544) FLUID MECHANICS AND HYDRAULIC MACHINES LAB**

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

**Note:** Any 10 of the above 12 experiments are to be conducted.