ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2014-15)
and
B.Tech. Lateral Entry Scheme
(For the batches admitted from the academic year 2015-16)

The following rules and regulations will be applicable for the batches of 4 year B.Tech degree admitted from the academic year 2014-15 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 A.P 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, 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 A.P 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 & Engineering)
2. B.Tech (Electrical & Electronics Engineering)
3. B.Tech (Electronics & 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 institute shall follow Year-wise pattern for First year course and Semester pattern for II, III and IV years. An academic year shall consist of a first semester and a second semester from second year onwards.

The first year of four year B.Tech programme shall have duration to accommodate a minimum of 180 instruction days. From second year onwards each semester shall have 90 instruction days.

4. COURSE STRUCTURE:

Each programme of study shall consist of:

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

i. Language / Communication Skills
ii. Humanities and Social Sciences : Environmental Science
iii. Economics and Accounting
iv. Principles of Management

4.2 Basic Science Courses comprising of the following: (15 to 25%)

i. Computer Literacy with Numerical Analysis
ii. Mathematics
iii. Physics
iv. Chemistry

4.3 Basic Engineering Courses comprising of the following (depending on the branch) :(15 to 25%)

i. Engineering Drawing
ii. Engineering and IT Workshop
iii. Engineering Mechanics
iv. Basic Mechanical Engineering
v. Electrical and Electronics Engineering
vi. Basic civil Engineering
vii. Computer Programming

4.4 Compulsory Discipline Courses :(45 to 55%)

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 Elective Courses: (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 In the final year first semester a subject like comprehensive Mechanical Engineering, with 2 hours / week is introduced.

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

4.8 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.

	Year Pattern		Semester Pattern	
	Period(s)/ Week	Credits	Period(s)/ Week	Credit(s)
Theory	01	02	01	01
Practical	03	04	03	02
Comprehensive Mechanical Engineering	--	--	02	02
Seminar	--	--	01	01
Final Year Project	--	-	12	12

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

6.1 Distribution of Marks:

S. No		Marks	Examination and Evaluation	Scheme of Evaluation
1.	Theory	70	Year-end / Semester-end examination	The question paper shall be of descriptive type with 5 questions with internal choice are to be answered in 3hours duration of the examination.
		30	Mid - Examination of 120 Min. duration - Internal evaluation-20 marks. The question paper shall be of descriptive type of 4 questions with internal choice are to be answered. Remaining 10 marks for Assignments, 3-5 in number will be given and each assignment will be evaluated for 10 marks and average considered.	**For I B Tech:** Three (03) mid exams, each for 20 marks are to be conducted. Two best performances to be considered. **Mid-I:** After first spell of instructions (I Unit). **Mid-II:** After second spell of instructions (II & III Units) **Mid-III:** After third spell of instructions (IV & V Units) **For a Semester**: Two mid-exams 20 marks each are to be conducted. Better one to be considered. **Mid-I:** After first spell of instructions (I & II Units). **Mid-II:** After second spell of instructions (III to V Units).

S. No		Marks	Examination and Evaluation		Scheme of Evaluation
2	Laboratory, Design and / or drawing	70	Year-end / Semester-end Lab Examination		**For laboratory courses:** **3** hours duration – two examiners. For drawing and/ or Design: like for the theory examination.
		30	20	Day to Day evaluation	Performance in laboratory experiments
			10	Internal evaluation	Practical Tests (For first year one best out of two tests and for semester one best out of two tests)
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)
4	Comprehensive Mechanical Engineering	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	External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed under 6.2
			30	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.

6.3. Eligibility to appear for the year-end / 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 year/ semester.

6.3.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in first year or 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

1st Slab: Less than 75% attendance but equal to or greater than 70% a normal condonation fee can be collected from the student.

2nd 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 First year/any semester are not eligible to take their End examination of that class and their registration for that semester / year 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 year/semester, as applicable.

6.3.7 A student detained due to shortage of attendance, will have to repeat that year/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 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.

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

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

7.1 For students admitted into B.Tech. (Regular) programme:

7.1.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the End examination and a minimum of 40% of marks in the sum total of the internal evaluation and End examination taken together. For the seminar he should secure a minimum of 40% marks.

7.1.2 For promotion from I B.Tech to II B.Tech a student must satisfy the attendance requirements in I year.

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 56 credits from I year, II year I-Semester and II year II-Semester examinations conducted till that time.

7.1.4 A student shall be promoted from III year to IV year if he fulfills the academic requirements of securing a minimum of 86 credits from I year, 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 236 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 236 credits as indicated in the course structure within **eight** academic years from the year of his admission shall forfeit his seat in B.Tech. Programme and his admission stands cancelled.

7.2 For Lateral Entry Students (batches admitted from 2015-2016):

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 28 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 58 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 such 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 180 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/year 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/year:

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/ year,

T_i= Total marks obtained for course i in any semester/year,

9.2 For the entire programme:

CUMULATIVE CREDIT POINT AVERAGE [CCPA]
$=\frac{1}{10}\frac{\sum_n \sum_i C_{ni} T_{ni}}{\sum_n \sum_i C_{ni}}$

n -refers to the semester in which such courses were credited

9.3 Overall Performance:

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

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 **236 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:

The B.Tech Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapur on the recommendations of the Principal of Annamacharya Institute of Technology and Sciences (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, they include "she", "her", "herself".

***

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

I Year B.Tech

Subject Code	**Subject Name**	**Hours/ Week**			**C**	**Maximum marks**		
		L	**T**	**P**		**Internal**	**External**	**Total**
4GC11	English	2	0	0	4	30	70	100
4GC12	Engineering Physics	2	0	0	4	30	70	100
4GC13	Engineering Chemistry	2	0	0	4	30	70	100
4GC14	Mathematics – I	3	1	0	6	30	70	100
4G113	Programming in C and Introduction to data structures	3	1	0	6	30	70	100
4G511	Engineering Mechanics	3	1	0	6	30	70	100
4G512	Engineering Graphics	1	1	6	10	30	70	100
4GC16	Engineering Physics and Chemistry Lab	0	0	3	4	30	70	100
4GC17	English Language and Communication Skills Lab	0	0	3	4	30	70	100
4G114	Programming in C and Introduction to data structures Lab	0	0	3	4	30	70	100
4G411	Engineering and IT workshop	0	0	3	4	30	70	100
	Total	**16**	**4**	**18**	**56**	**330**	**770**	**1100**

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

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

II Year B.Tech I Semester

Subject Code	Subject	Hours/ Week			Maximum marks		
		L	P	C	Internal	External	Total
4GC31	Mathematics -II	4	0	4	30	70	100
4G236	Electrical Engineering and Electronics Engineering*	4	0	4	30	70	100
4G531	Mechanics of Solids	4	0	4	30	70	100
4G532	Metallurgy & Material Science	4	0	4	30	70	100
4G533	Basic Thermodynamics	4	0	4	30	70	100
4G534	Machine Drawing#	2	6	4	30	70	100
4GC35	Aptitude And Reasoning Skills	2	0	2	30	70	100
4G238	Electrical Engineering Lab and Electronics Engineering Lab**	0	3/2 (each)	2	30	70	100
4G535	Material Science Lab and Mechanics of Solids Lab***	0	3/2 (each)	2	30	70	100
	Total	**24**	**12**	**30**	**270**	**630**	**900**

NOTE:

*In Electrical Engineering and Electronics Engineering two questions from each part should be chosen to answer five questions in the End semester examination.

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

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

#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.

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

II Year B.Tech II Semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4GC42	Probability and Statistics	4	0	4	30	70	100
4GC43	Environmental Science	4	0	4	30	70	100
4G541	Kinematics of Machinery	4	0	4	30	70	100
4G542	Applied Thermodynamics - I	4	0	4	30	70	100
4G543	Fluid Mechanics and Hydraulic Machinery	4	0	4	30	70	100
4G544	Manufacturing Technology	4	0	4	30	70	100
4G545	Fluid Mechanics and Hydraulic Machines Lab	0	3	2	30	70	100
4G546	Manufacturing Technology Lab	0	3	2	30	70	100
4G547	Seminar - I	0	2	2	100	00	100
	Total	**24**	**8**	**30**	**340**	**560**	**900**

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

III Year B.Tech I Semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4GA51	Managerial Economics and Financial Analysis	4	0	4	30	70	100
4G551	Applied Thermodynamics - II	4	0	4	30	70	100
4G552	Dynamics of Machinery	4	0	4	30	70	100
4G553	Machine tools	4	0	4	30	70	100
4G554	Design of Machine Elements-I	4	0	4	30	70	100
4G555	Heat Transfer	4	0	4	30	70	100
4GC53	English For Competitive Examinations	2	0	2	30	70	100
4G556	Heat Transfer Lab	0	3	2	30	70	100
4G557	Thermal Engineering Lab	0	3	2	30	70	100
Total		**26**	**6**	**30**	**270**	**630**	**900**

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

III Year B.Tech II Semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4G561	Instrumentation and control systems	4	0	4	30	70	100
4G562	CAD/CAM	4	0	4	30	70	100
4G563	Metrology and Surface Engineering	4	0	4	30	70	100
4G564	Applied Thermodynamics-III	4	0	4	30	70	100
4G565	Design of Machine Elements-II	4	0	4	30	70	100
4G566	Industrial Management	4	0	4	30	70	100
4G567	Metrology Lab and Machine Tools Lab	0	3/2 (each)	2	30	70	100
4GC61	Advanced English Language Communication Skills Lab	0	3	2	30	70	100
4G568	Seminar - II	0	2	2	100	00	100
	Total	**24**	**8**	**30**	**340**	**560**	**900**

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

IV Year B.Tech I Semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4G571	Operations Research	4	0	4	30	70	100
4G572	Automobile Engineering	4	0	4	30	70	100
4G573	Finite Element Methods	4	0	4	30	70	100
4G574	Automation and Robotics	4	0	4	30	70	100
ELECTIVE –I		4	0	4	30	70	100
4G575	Tribology						
4G576	Advanced Manufacturing Systems						
4G577	Mechatronics						
ELECTIVE –II		4	0	4	30	70	100
4G578	Un conventional Machining process						
4G579	Tool Design						
4G57A	Rapid Prototyping						
4G57B	Instrumentation lab and optimization lab with MATLAB software	0	3	2	30	70	100
4G57C	CAD/CAM Lab	0	3	2	30	70	100
4G57D	Comprehensive Mechanical Engg	0	2	2	30	70	100
Total		**24**	**8**	**30**	**270**	**630**	**900**

Curriculum for the Programmes under Autonomous Scheme	
Regulation	R 2014
Department	Department of Mechanical Engineering
Programme Code & Name	G5, B.Tech Mechanical Engineering

IV Year B.Tech II Semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4G581	Production & Operations Management	4	0	4	30	70	100
4G582	Power Plant Engineering	4	0	4	30	70	100
ELECTIVE III		4	0	4	30	70	100
4G583	Refrigeration and Air conditioning						
4G584	Computational Fluid Dynamics						
4G585	Non Conventional sources of Energy						
ELECTIVE IV		4	0	4	30	70	100
4G586	Nano technology						
4G48B	Neural Networks and Fuzzy Logic						
4G587	Supply Chain Management						
4G588	Seminar - III	0	2	2	100	00	100
4G589	Project Work	0	12	12	100	00	100
	Total	**16**	**14**	**30**	**320**	**280**	**600**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4GC11) ENGLISH
(Common to all branches)

Course Objectives:

- To improve the language proficiency of the students in English with an emphasis on LSRW skills
- To enhance the vocabulary of the students in English through the use of diversified authentic materials
- To equip the students with comprehension skills to study academic subjects with greater felicity
- To develop English communication skills of the students in formal and informal situations
- To enable the students absorb the human values expressed in literature

Textbooks Prescribed:

- The books prescribed serve as students' handbooks. The reader for detailed study comprises essays which are particularly relevant to engineering students. Texts from open sources are also included in the syllabus to make the teaching-learning process more interesting. Also, the literary texts from open sources will allow the student learn language from 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.
- 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

Detailed Study: a) Technology with a Human Face, b) *Cabuliwallah* by Rabindranath Tagore

Non-detailed Study: G. D. Naidu

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

Unit II

Detailed Study: a) Climatic Change and Human Strategy, b) *If* by Rudyard Kipling

Non-detailed Study: Sudha Murthy

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

Unit III

Detailed Study: a) Emerging Technologies: Solar Energy in Spain, b) *The Gift of Magi* by O. Henry

Non-detailed Study: Vijay Bhatkar

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

Unit IV

Detailed Study: Water: a) The Elixir of Life, b) *Night of the Scorpion* by Nissim Ezekiel

Non-detailed Study: Jagadis Chandra Bose

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

Unit V

Detailed Study: a) The Secret of Work, b) *The Zoo Story*, a One-act Play by Edward Albee

Non-detailed Study: Homi Jehangir Baba

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

For Detailed study: ***Sure Outcomes*** published by Orient Black Swan, Texts from Open Sources (Available on Web)

For Non-detailed study: ***Trailblazers*** published by Orient Black Swan

REFERENCES:

1. Technical Communication, Principles and Practice, Meenakshi Raman and Sangita Sharma, OUP, 2011, 2nd edition
2. Essential Grammar in Use, (with CD), Raymond Murphy, 3/e, Cambridge University Press, 2009
3. Basic Communication Skills for Technology, Andrea J Ruthurford, Pearson Education, Asia.

4. English for Technical Communication, Aysha Viswamohan, Tata Mc-Graw Hill
5. English Grammar and Composition, David Green, Mc Millan India Ltd.
6. Murphy's English Grammar, Raymond Murphy, CAMBRIDGE
7. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
8. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, 2008
9. Developing Communication Skills, 2/e. by Krishna Mohan &MeeraBanerji , Macmillan, 2009
10. English for Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
11. Longman Dictionary of Contemporary English with DVD, Pearson Longman.

Course Outcomes:

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G112) ENGINEERING PHYSICS
(Common to All Branches)

COURSE OBJECTIVS:

- 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 educate 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 to provide basic understanding of different engineering materials (semiconductors, magnetic, superconducting and nano materials).

UNIT 1 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.

Fibre 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 – Bravias lattice –Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Laue and Powder methods – Defects in solids: point defects, line defects (qualitative) - screw and edge dislocation, burgers vector.

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 hypothesis - Heisenberg's uncertainty principle - Schrodinger's time independent and time dependent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well - Eigen values and Eigen functions.

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 vapour deposition, sol-gel, plasma arcing and thermal evaporation methods – Properties of Carbon nanotubes & CNT applications – Applications of nanomaterials.

Text Books:

1. Engineering physics – S. ManiNaidu, Pearson Education, I Edition, 2012.
2.Engineering Physics – V. Rajendran, MacGraw Hill Publishers, I Edition,2008.
3. Engineering physics –P.K.palanisamy, scietech publisher,Edition, 2013.

Reference Books:

1. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers, III Edition, 2012.
2. Engineering Physics – RV.S.S.N. Ravi Kumar and N.V. Siva Krishna, Maruthi Publications , 2013

3. Engineering Physics – D.K.Battacharya and A.Bhaskaran,OxfordHeigher Education I Edition, 2010.
4. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning, I Edition, 2012
5. Engineering Physics – D.K.Bhattacharya 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. KrshiSagar, 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, RaiPublishers , 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 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G113) ENGINEERING CHEMISTRY
(Common to all branches)

Course Objectives:

- 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 course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- 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- 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: Ion-Exchange process, Desalination of brackish water by Reverse Osmosis.

UNIT II: ELECTROCHEMISTRY

Review of electrochemical cells, Numerical calculations, Batteries: 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) concentration cell, galvanic corrosion, Electrochemical Theory of corrosion, Factors affecting the corrosion, Prevention: Anodic and Catholic protection, Electroplating & Electrolessplating

UNIT III: POLYMERS

Introduction to polymers, Polymerization process- types, Elastomers (rubbers), Natural Rubber, Compounding of Rubber, Synthetic Rubber: Preparation, properties and engineering applications of Buna-S & Buna-N rubbers. Plastics: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Bakelite, nylons.

Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

Inorganic Polymers: Basic Introduction, Silicones.

UNIT IV: FUEL TECHNOLOGY

Classifications 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: Octane Number, Synthetic Petrol: Bergius Processes, Fischer Tropsch's synthesis. 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, properties and applications

Lubricants: Theory of lubrication, properties of lubricants and applications, Rocket Propellants: Classification, Characteristics of 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 by S.S Dhara, S.S.Umare, S. Chand Publications, New Delhi, 12th Edition, 2010.

Reference Books:

1. A Text Book of Enigneering Chemistry, Jain and Jain, DhanapathRai Publishing Company, New Delhi, 15th 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.AgarwalandAndra 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. Sesha Maheswaramma and MrudulaChugh, Pearson Education, First Edition, 2013.

Course outcomes:

The student is expected to:

- Understand the electrochemical sources of energy
- 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G114) MATHEMATICS – I
(Common to all branches)

Course Objectives:

The course aims to provide the student with the ability

- To understand the Differential equations of first, second and higher orders with their applications.
- 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

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

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

UNIT II

Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and McLaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrangian method of Multipliers with three variables only.

UNIT III

Curve tracing – Cartesian, polar and parametric curves.

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

UNIT IV

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Second shifting theorem – Convolution theorem – Laplace transform of Periodic function - Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT V

Vector Calculus: Gradient – Divergence – Curl - Line integral - Area, Surface and volume integrals. **Vector integral theorems**: Green's theorem – Stoke's theorem and Gauss's Divergence Theorem (without proofs) and their applications.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers-42 Edition (2012)

REFERENCES:

1. Higher Engineering Mathematics, by Kreyszig
2. A Text Book of Engineering Mathematics, B.V. Ramana, Tata Mc Graw Hill.
3. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and others, S. Chand & Company.
4. A Text Book of Engineering Mathematics-1,E. Rukmangadachari, E. Keshava Reddy, Pearson Education.

Course Outcomes:

Upon completion of the course, students will

- Understand the various types of ordinary differential equations
- Have the knowledge on functions of several variables.
- Understand the concepts of curve tracing, applications of integration.
- Have the knowledge of Laplace transforms and their inverse.
- Learn about vector integral theorems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G113) PROGRAMMING IN C AND INTRODUCTION TO DATA STRUCTURES

(Common to CIVIL, EEE, ME & ECE)

Course Objectives:

1. Introduction to computer peripherals, Software development.
2. Describe when and how to use the stand C statement and to Write, Compile and Debug basic C programs using an IDE
3. 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
4. Write basic C programs using , Selection statements, Repetitive statements, Functions, Pointers, Arrays and Strings
5. Implementation of C applications for data structures, sorting and searching.

UNIT I: Introduction to Computers: Computer Systems, Computer Environments, Computer Languages, Creating and Running C programs, System Development-Algorithms, Flow Charts.

Introduction to C Language: Structure of a C Language program, Keywords, Identifiers, Types, typedef, enumerated Types variables, constants, input/output, simple example programs.

UNIT II

Operators and Expressions, precedence and associatively, Type Conversions, Bitwise Operators. 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, pretest and post test loops ,event and Counter Controlled loops, Loops in C-while loop, do…while loop, for loop, Other Related Statements -break, continue, goto, sample programs.

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

Strings: String Basics, String Library Functions, Array of Strings.

UNIT III

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.

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 IV

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 V

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.

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. C and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill.

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, Yeswanth Kanitkar, Ninth Edition, BPB Publication.
3. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI, Eighth Edition.

Course Outcomes:

1. Understand the importance of the software development process and System development tools.
2. Understand general principles of C programming language and able to write simple program in C. Able to develop programs based on arrays and functions.
3. Understand the purpose of pointers for parameter passing, referencing and dereferencing and understands the concepts of structures, unions and File management.
4. Understands what and how to design data structure programs using C programming language.
5. Understands how to solve applications like searching and sorting using C Programming language.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G511) ENGINEERING MECHANICS
(Common to CIVIL & ME)

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.

UNIT I

INTRODUCTION TO ENGINEERING MECHANICS: Basic concepts - System of forces–Resultant of a force system, Moment of forces and its Application & Couples, Equilibrium system of forces, Free body diagrams
Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading and couple.

UNIT II

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–Motion of bodies – Ladder friction-Wedge 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 Centre of Gravity of Composite figures. (Simple problems only).
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)

UNIT V

KINEMATICS: Rectilinear and Curvilinear motion – Velocity and Acceleration – Motion of a Rigid Body – Types and their Analysis in Planar Motion.

KINETICS : Analysis as particles and Analysis as a Rigid Body in Translation –Equations of Plane Motion – Fixed axis of Rotation –D' Alembert's principle - Work Energy Method – Equation for Translation – Work – Energy application to Particle Motion. Virtual work (Elementary treatment).

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 kumar reddy – B.S. Publishers.
4. Engineering Mechanics, Bhavikatti and Rajasekharappa

References:

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 capable of using the concepts of force, moment and its application.
- The students are capable of drawing free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
- Students are capable of finding centre of gravity, moment of inertia and polar moment of inertia including transfer methods and their applications.
- The students are capable of understanding the motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion
- The students are capable of applying the concepts of work, energy and particle motion

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G512) ENGINEERING GRAPHICS
(Common to CIVIL & ME)

Course objectives:

- By studying the engineering drawing, a student becomes aware of how industry communicates technical information. Engineering drawing teaches the principles of accuracy and clarity in presenting the information necessary about objects.
- This course develops the engineering imagination i.e., so essential to a successful design, By learning techniques of engineering drawing changes the way one things about technical images.
- It is ideal to master the fundamentals of engineering drawing first and to later use these fundamentals for a particular application, such as computer aided drafting.
- Engineering Drawing is the language of engineers, by studying this course engineering and technology students will eventually be able to prepare drawings of various objects being used in technology.

UNIT I – INTRODUCTION TO ENGINEERING GRAPHICS: Engineering Graphics and its Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.

Curves used in Engineering Practice

a) Conic Sections – General method

b) i) Ellipse- oblong, arcs of circle, concentric circle methods.
ii) Parabola – rectangle, tangent methods.
iii) Rectangular hyperbola.

c) Cycloid, Epicycloids and Hypocycloid

d) Involutes.

PROJECTION OF POINTS AND LINES: Principles of Orthographic Projection – Conventions – First and Third Angle Projections.

Projections of Point, Projections of lines inclined to one plane.

UNIT II- PROJECTION OF LINES INCLINED TO BOTH PLANES: Lines inclined to both planes, Finding True lengths & traces.

PROJECTIONS OF PLANES: Projections of regular Plane surfaces/figures, Projection of lines and planes using auxiliary planes.

UNIT III – PROJECTIONS OF SOLIDS: Projections of Regular Solids – cylinder, cone, prism and pyramid - inclined to both planes – Auxiliary Views.
SECTION OF SOLIDS: Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

UNIT IV–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 Prism, Cylinder Vs Cone, Square Prism Vs Square Prism.

UNIT V – ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric projections of spherical parts. Conversion of Isometric views to Orthographic Views – Convertion of Orthographic views to Isometric views.

Text books:
1. Engineering Drawing, N.D. Bhatt, Charotar Publishers
2. Engineering Drawing, Johle, Tata McGraw-Hill
3. Engineering Drawing, K.L. Narayana, P. Kanniah, Scitech Pub.

References:
1. Engineering Drawing and Graphics, Venugopal/ New age
2. Engineering Drawing, Venkata Reddy, B.S.Publishers.
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education

Course Outcomes:
- Student gets knowledge on various drawing instruments and its usage.
- Students capable to draw various curves like conic curves, cycloidal curves and involutes.
- Student can understand about orthographic projection and able to draw points, lines, planes and solids according to orthographic projections.
- Student able to draw, when the simple solids are sectioned and their developments of surfaces.
- Student can imagine and construct the interpenetration of simple solids.
- Student can convert and draw the given orthographic view to isometric view and vice versa.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4GC16) ENGINEERING PHYSICS AND CHEMISTRY LAB
(Common to all branches)

PART A: ENGINEERING PHYSICS LAB

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. Meldes experiment: Determination of the frequency of tuning fork
10. Sonometer: Verification of the three laws of stretched strings
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

References:

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

PART B: ENGINEERING CHEMISTRY LAB

LIST OF EXPERIMENTS

Any 10 of the following experiments has to be performed

1. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
2. Estimation of Chloride ion using potassium Chromite indicator (Mohr's method)
3. Determination of total hardness of water by EDTA method
4. Conductometric titration of strong acid Vs strong base (Neutralization titration)
5. Determination of Copper by EDTA method
6. Estimation of Dissolved Oxygen by Winkler's method
7. Determination of Alkalinity of Water.
8. Estimation of Iron in Cement by Colorimetry.
9. Determination of Calorific Value of fuel by using Bomb Calorimeter
10. Determination of Viscosity of oils using Redwood Viscometer I
11. Determination of Eutectic temperature of binary system (urea-benzoic acid)
12. Determination of Viscosity of oils using Redwood Viscometer II
13. Determination of Copper by Iodometry
14. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
15. Determination of acidity of Water

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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G117) ENGLISH LANGUAGE & COMMUNICATION SKILLS LAB

(Common to all branches)

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

Course Objectives:

- To train students to use language effectively in everyday conversations
- To enable a learner sharpen his public speaking skills
- To expose the students to a varied blend of self-instructional, learner-friendly modes of language learning
- To enable the student learn better pronunciation through emphasis on word accent, intonation, and rhythm

SYLLABUS:

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

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants
2. Introduction to Stress and Intonation
3. Situational Dialogues and Role-play
4. Telephone Skills
5. 'Just A Minute' (JAM)
6. Oral Presentations
7. Describing Objects / Situation / People
8. Information Transfer

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
Dorling Kindersley - Series of Grammar, Punctuation, Composition etc.
Language in Use, Foundation Books Pvt Ltd with CD
Learning to Speak English - 4 CDs
Microsoft Encarta with CD
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 enhance his skills to make a presentation confidently
- The student will learn how to neutralize his accent
- The student will be able to decipher information from graphics and describe it professionally

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G114) PROGRAMMING IN C AND DATA STRUCTURES LAB

(Common to CIVIL, EEE, ME & ECE)

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 Compiler and Supporting Editors

Exercise l.

a) Write a C program to calculate Simple Interest by accepting principle amount, rate of interest and time.
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 2.

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

Exercise 3.

a) Write a C program to find the given number is Armstrong number or not.
($153 = 1^3 + 5^3 + 3^3$)
b) Write a C program to find the given number is Strong number or not.
(145 = 1!+4!+5!)
c) Write a C program to generate all the Armstrong numbers between 1 and n, and Strong number between 1 and n where n is a value supplied by the user

Exercise 4.

a) Write a C program to calculate the following Sum:

$$Sum = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \frac{x^{10}}{10!}$$

b) Write a C program to read in two numbers, x and n, and then compute the sum of the geometric progression:

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

For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Find if any values of x are also illegal? If so, test for them too.

Exercise 5.

a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

Exercise 6.

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

b) Write a C program to convert a Roman number to its decimal equivalent.

Exercise 7.

a) Write a C program to find both the largest and smallest number in a list of integers.

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

i) Addition of Two Matrices ii) Multiplication of Two Matrices

Exercise 8.

Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

iii) To solve Towers of Hanoi problem.

Exercise 9.

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

i) To insert a sub-string into a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not.

Exercise 10.

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

b) Write a C program to count the lines, words and characters in a given text.

Exercise 11.

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

i) Reading a complex number ii) Writing a complex number

iii) Addition of two complex numbers iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Exercise 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

Exercise 13

a) Write a C programme to display the contents of a file.

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

Exercise 14

Write C programs that implement stack (its operations) using

i) Arrays ii) Pointers

Exercise 15

Write C programs that implement Queue (its operations) using

i) Arrays ii) Pointers

Exercise 16

Write C programs that implement Circular Queue (its operations) using

i) Arrays ii) Pointers

Exercise 17

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

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

Exercise 18

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

i) Bubble sort ii) Selection sort iii) Insertion sort

Exercise 19

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

i) Linear search ii) Binary search

Exercise 20

Write C program that implements the Quick sort method to sort a given list of integers in ascending order.

Exercise 21

Write C program that implement the Merge sort method to sort a given list of integers in ascending order.

REFERENCE BOOKS

1. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
2. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
3. Computer Basics and C Programming, V. Rajaraman, PHI Publications.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

I Year B.Tech. ME

(4G411) ENGINEERING & I.T. WORKSHOP
(Common to all branches)

ENGINEERING WORKSHOP

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 labor 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 gauge 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.

I.T. WORKSHOP

Course Objectives:

- 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 (5 weeks)

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 (4 weeks)

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. Crimpling 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 (6 weeks)

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, hyperlinking, 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:

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

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.

Course Outcomes:

- 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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – I Semester

(4GC31) MATHEMATICS – II
(Common to CIVIL & ME)

Course Objective:

- 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.
- Our emphasis will be more on the logical and problem solving development in the Numerical methods and its 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 $3/8^{th}$ 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, 40thEdition, 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, 8thEdition, 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – I Semester

(4G236) ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING
(Common for ME, CSE & IT)

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-φTransformers: 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-φ 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, 5th Ed.

Reference books:

1. M.S Naidu and S.Kamakshaiah, *Introduction to Electrical Engineering.* TMH Publications.

2. Kothari and Nagrath, *Basic Electrical Engineering*, TMH, 2nd Ed.

3. Mill man and Halkias, *Electriconics 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – I Semester

(4G531) 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 accesses 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 cripping 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*.

Reference books:

1. Jindal, *Strength of Materials*. Umesh Publications.
2. Vazirani and Ratwani , *Analysis of structures*.
3. S.B.Junnarkar , *Mechanics of Structures Vol-III*.
4. S.Timshenko, *Strength of Materials.*
5. Andrew Pytel and Ferdinond L. *Strength of Materials.* Singer Longman.
6. Popov, *Solid Mechanics*.

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 hallow 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – I Semester

(4G532) METALLURGY AND MATERIAL SCIENCE

Course Objective:

- 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_3C.

UNIT III CAST IRONS AND STEELS: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal 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*.
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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – I Semester

(4G533) 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 – Concept of quality of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

UNIT 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 friction 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, 3rd 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*.

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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – I Semester

(4G534) 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. MACHINE DRAWING CONVENTIONS:

Need for drawing conventions – introduction to IS conventions

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

II. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS:

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

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

III. ASSEMBLY DRAWINGS:

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

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
b) Other machine parts – Screws jacks, Machine Vices Plummer block, Tailstock.
c) Valves : Steam stop valve, feed check valve and air cock.

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

Text books :

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

Reference books :

1. P.S.Gill, *Machine Drawing*.
2. Luzzader, *Machine Drawing*.
3. Rajput, *Machine Drawing*.
4. 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – I Semester

(4GC35) 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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II YEAR B. TECH. ME – I SEMESTER

(4G238) ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING LAB
(Common for ME, CSE & IT)

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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II YEAR B. TECH. ME – I SEMESTER

(1G535) 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

Note*:* *Internal and End examinations evaluation will be done separately and the average will recorded.*

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – II Semester

(4GC42) PROBABILITY AND STATISTICS
(Common to CE, ME & IT)

Course objectives:

- To quantify the measure of uncertainty.
- 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 –Poison distribution- Uniform distribution - Normal distribution.

UNIT-III

Sampling distribution: Population and sample - Sampling distributions of means (σ 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.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8th 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:

- Understand the concepts of sample space and events.
- Gain the knowledge on probability distributions.
- Understand the concepts of random variables, sampling distributions of means
- The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, ANOVA, Statistical Quality Control and draw appropriate inferences.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – II Semester

(4GC43) ENVIRONMENTAL SCIENCE
(Common to CE, ME &CSE)

COURSE OBJECTIVES:

- Understand & appreciate the importance of Environmental Science.
- In order to make the students environmentally educated
- To protect the environment by preventing environmental pollution& degradation.

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.

References:

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.graHill Publications.

Course outcomes:

Upon completion of the course, students will

- Student gets awareness on global environment crisis & to understand the different resources and their problems.
- To make the student know about different types of pollution, their sources, effects & control measures.
- Student gets Broad awareness about ecosystems, biodiversity, solid waste & disaster management.
- Student can understand the main social issues & population issues related to the environment.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – II Semester

(4G541) 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 - centrode and axode – 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 slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism - Kleins construction - Coriolis acceleration, determination of Coriolis component of acceleration.

UNIT III
STRAIGHT LINE MOTION MECHANISMS: Exact and approximate copiers and generated types –Peaucellier, Hart and Scott Russul – Grasshopper, Watt T-Chebicheff and Robert Mechanisms and straight line motion - 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 - 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 – phenomena of interference – methods of interference - condition for minimum number of teeth to avoid interference - expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.
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 - 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 and uniform acceleration - Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.
Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.

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. Thomas Bevan, *Theory of Machines*, CBS.
2. R.K Bansal, *Theory of Machines*.
3. Jagdish Lal, *Theory of Mechanisms and Machines*, Metropolitan Company Pvt. Ltd.
4. Sadhu Singh, *Theory of Machines*. Pearson Edn.
5. JS Rao and RV Dukkipati, *Mechanism and Machine Theory*, New Age
6. The Theory of Machines, Shiegley, Oxford.
7. 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – II Semester

(4G542) 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 cooing 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.

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. Rajput, *Thermal Engineering*. Lakshmi Publications.

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. Heywood,*I.C. Engines*.McGrawHIll.
6. R.S. Khurmi&J.K.Gupta, *Thermal Engineering*.S.Chand
7. 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
II Year B. Tech. ME – II Semester

(4G543) 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. Viscous flow of incompressible fluids.
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, Boundary Layer.

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 – manomertic 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. Rajput, *Fluid Mechanics and Hydraulic Machines*.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*.

Reference books:

1. Modi and Seth, *Hydraulics, fluid mechanics and Hydraulic machinery*.
2. D.S. Kumar, *Fluid Mechanics and Fluid Power Engineering*. Kotaria & Sons.
3. D. Rama Durgaiah, *Fluid Mechanics and Machinery*. New Age International.
4. Banga & Sharma, *Hydraulic Machines*. Khanna Publishers.
5. James W. Dally, William E. Riley, *Instrumentation for Engineering Measurements*. John Wiley & Sons Inc. 2004.

Course Outcomes:

1. 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.
2. 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.
3. 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.
4. An ability to understand the fundamentals of turbo machinery, elements of hydro electric power plant.
5. An ability to understand the performance of hydraulic turbines and hydraulic pumps.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AUTONOMOUS)

II Year B. Tech. ME – II Semester

(4G544) 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.
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 nondestructive testing of welds.
Cutting of Metals: Oxy – Acetylene Gas cutting. Cutting of ferrous, non-ferrous metals.

UNIT III A) 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.
B) 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. Force and Power Calculations.

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.*
2. Lindberg, PE, *Process and materials of manufacturing*.
3. Rosenthal, *Principles of Metal Castings*.
4. Parmar, *Welding Process*.
5. R.K. Rajput, *Manufacturing Technology.* Laxmi Pub.
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, 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – II Semester

(4G545) 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

II Year B. Tech. ME – II Semester

(4G546) MANUFACTURINGTECHNOLOGY 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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENC ES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4GA51) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to CE, ME & ECE)

Course Objective:

This paper aims to equip the budding engineering student with an understanding of concepts and tools of economic analysis. The focus does not only on understand the concepts but apply them in real life by developing problem solving skills there exists a relationship between Managerial Economics and Accounting and same is dealt in the second part of the course. The focus here is on picking up the basics of Accounting such as Accounting Data and Financial Statements, which constitute the language of Business. The student is exposed and made familiar with journalisation, interpretation and use of Accounting Data.

Unit I

Introduction to Managerial Economics:

Managerial Economics: Meaning and Nature, Definition, Scope, relationship with other areas.

Demand Analysis: Definition and types of Demand, Demand Determinants, Law of Demand and its exceptions, Measurement and Significance of Elasticity of Demand, Demand forecasting methods.

Unit II

Production and Cost Analysis:

Production – Theories of the firm, Production Function, Cobb-Douglas Production function, Iso-quants and Iso-costs, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Determinants of cost, cost-output relationship in short run and Long run.

Break-even Analysis (BEA)- Objectives, Assumptions, Importance, Graphical representation, Limitations, simple numerical problems.

Unit III

Market Structure and forms of Business Organizations:

Markets: Perfect, Monopoly, Monopolistic and Oligopoly Markets. Price-output determination in perfect competition and monopoly in long run and short run.

Forms of Business Organizations Definition, Forms of Business Organizations-**Private Sector**-sole proprietary ship, Partnership, Joint Hindu family business, co-operative societies, joint stock companies.

Public Sector- Departmental organizations, public corporations, government companies**.** Joint Sector.

Unit IV

Capital and Capital Budgeting:

Capital: Definition of Capital and its significance, Types of Capital, Sources of Raising Capital.

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

Unit V

Introduction to Financial Accounting and Analysis:

Financial Accounting : Definition, Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Financial Analysis, Definition of Financial Analysis, Ratios and its significance- types- liquidity Ratios, turnover Ratios - solvency Ratios and profitability ratios.

Text books:

1. Gupta: Managerial Economics, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.
3. Mehta P.L., Managerial Economics-Analysis, Problems, Cases, S Chand and Sons,New Delhi, 2001.
4. M.E.Thukaram Rao., Accounting for Managers, New Age International Publishers.
5. T.S, Reddy and Y. Hari Prasad Reddy, Accounting and Financial Management, Margham Publications.

References:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition,Thomson.
7. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI

8. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.
10. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley.
11. Dwivedi:Managerial Economics, 6th Ed., Vikas

Course Outcomes:

- Provides a basic insight into seeking solutions for managerial problems.
- The student can familiarized with Accounting Data and Financial Statements that can be useful for interpreting the financial information.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4G551) APPLIED THERMODYANICS – II

Course objective:

1) To provide a sound knowledge in various aspects of thermal equipments.
2) The subject has an increasingly dominant role to play in the vital areas of power generation sector.
3) The course contents aims at developing the necessary analytical and technical contents among engineers in these areas.
4) The students shall become familiar with steam power plant, boilers, function of nozzle and steam engines.

UNIT I BASIC CONCEPTS: Rankine's cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration – reheating- combined-cycles.

UNIT II BOILERS: Classification based on Working principles - Fire tube boilers, water tube boilers – High pressure Boilers, boiler Mountings & Accessories.
Performance of Boilers - Boilers horse power, equivalent evaporation, efficiency and heat balance – **Draught:** classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced draught.

UNIT III STEAM NOZZLES: Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis – assumptions -velocity of nozzle at exit- Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio. Criteria for design of nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line –Shock at the exit.
STEAM CONDENSERS: Requirements of steam condensing plant, rare fraction – Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its effects, air pump- cooling water requirement. Cooling towers – Types.

UNIT IV IMPULSE TURBINE: Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-Laval Turbine - its features. Methods to

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

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

UNIT V STEAM ENGINES: Classification – working – parts of steam engine – indicator diagrams – theoretical, actual, Diagram factor, Performance of steam engines, Willian's laws, Governing of simple steam engines.

Text books:

1. R.K. Rajput,*Thermal Engineering*. Lakshmi Publications, 2009, 7th Ed.
2. P.K. Nag, *Basic and Applied Thermodynamics.*TMH.

Reference books:

1. R.Yadav, *Thermodynamics and Heat Engines*. Central Book Depot.
2. R.S Khurmi& JS Gupta, *Thermal Engineering.*S.Chand.
3. M.L.Mathur& Mehta, *Thermal Engineering*. Jain bros.
4. B.S. Reddy and K.H. Reddy, *Thermal Engineering Data Book*. I.K. International.

Course outcomes:

1) Understand the basics working cycles of steam turbines and also increasing the efficiency of the turbines with the help of the different methods.
2) Understand the working of different types of boilers with various mountings and accessories, types of draughts and also to calculate the chimney height for maximum.
3) Understand how to find the boilers performance, efficiency and heat balance
4) Understand what is meant by steam nozzles and its types able to entail the concept of Critical Pressure ratio in calculations.
5) Understanding the working of impulse and reaction turbines, able to construct the velocity triangle and combined velocity triangle and can learn its importance in determining the power produced by the turbine.
6) Understand the importance of steam condenser and its types, able to calculate condenser efficiency.
7) Understand the working of steam engines and to calculate its performance.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4G552) DYNAMICS OF MACHINERY

Course objective:

1. To understand the method of static force analysis and dynamic force analysis of mechanisms, undesirable effects of unbalance in rotors and engines.
2. To understand the concept of vibratory systems and their analysis and also the principles of governors.

UNIT I FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, Friction circle and friction axis: lubricated surfaces, boundary friction and film lubrication.
Clutches: Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

UNIT II BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers – absorption and transmission types – Prony brake, Rope brake, Epi-cyclic train, Belt transmission and torsion dynamometers - General description and methods of Operation
Precession: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

UNIT III TURNING MOMENT DIAGRAM AND FLY WHEELS: Turning moment diagrams for steam engine, I.C. Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed – Fly wheels and their design.
Governors: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs. Sensitiveness, isochronism and hunting –effort and power of a governor.

UNIT IV BALANCING OF ROTATING & RECIPROCATING MASSES: Balancing of rotating masses - single and multiple – single and different planes.
Balancing of Reciprocating Masses: Primary, Secondary and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples – V, multi cylinder, in -line and radial engines for primary and secondary balancing, locomotive balancing – Hammer blow, Swaying couple, variation of tractive force.

UNIT V: VIBRATION: Free Vibration of mass attached to vertical spring – Simple harmonic motion of pendulums, centers of oscillation and suspension. Transverse loads. Dunkerly's method, Rayleigh's method. Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems. Simple problems on forced, damped vibration.

Text books:

1. S.S Ratan, *Thoery of Machines*. MGH.
2. R.S. Khurmi, *Theory of machines*. S.Chand.

Reference books:

1. JS Rao and RV Dukkipati, *Mechanism and Machine Theory*. New Age Publ.
2. Ballaney, *Dynamics of Machinery*. Dhanpat Rai.
3. Thomas Bevan, *Theory of Machines.* CBS Publishers.
4. Jagadish Lal & J.M.Shah, *Theory of Machines*. Metropolitan.

Course Outcomes:

- Students are able to understand the basic concepts of friction in pivots and collars with uniform pressure and uniform wear, and also to solve the numerical problems on clutches.

- Students are able to solve the numerical problems on brakes and dynamometers and can apply gyroscopic principles on Aeroplane, ship, four wheel and two wheel vehicles.

- Students are able to design a flywheel for IC engine. Further to study the basics and definitions related to governors and forces acting on various governors and also to solve numerical problems on different governors.

- Students can solve numerical problems on balancing of rotating masses and reciprocating masses in V-engine and multi cylinder engines.

- Students will perform detailed analysis of the response of vibration systems with free and forced vibrations, evaluate the critical speed of the shaft and simple vibration calculations of rotor systems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4G553) MACHINE TOOLS

Course Objective:

1. To get the basic knowledge of metal cutting theory.
2. Learn about the geometry of cutting tools, chip formation, different forces acting on cutting tool and different cutting tool materials.
3. Become familiar with the different types of machines for machining.
4. Learn about the ways to reduce the surface roughness by using different machining processes.
5. Become familiar with various work holding and tool holding devices.

UNIT I THEORY OF METAL CUTTING

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and machinability.

UNIT II TURNING MACHINES

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle: Swiss type, automatic screw type – multi spindle:

UNITIII RECIPROCATING, DRILLING AND GEAR CUTTING MACHINES

Reciprocating machine tools: shaper, planer, slotter their Types and operations, Kinematic scheme Hole Making: Drilling, reaming, boring, Tapping their Types and operations Milling operations-types of milling machines and their principles of work, Types and geometry of milling cutters– methods of indexing – Accessories to milling machines

UNIT IV ABRASIVE PROCESS AND BROACHING

Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centre less grinding, internal grinding- micro finishing methods - Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT –V LAPPING, HONING AND JIGS AND FIXTURES:

Comparison of grinding, lapping and honing. Lapping, Honing machines: Constructional features, speed and feed Units, machining time calculations.

Jigs and fixtures: Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures – Principles of location and clamping– Types of clamping & work holding devices. Typical examples of jigs and fixtures.

Text books:

1. Roy. A.Lindberg, "Process and materials of manufacture," PHI/Pearson Education fourth, Edition 2006.
2. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 2003.

References:

1. Richerd R kibbe, John E. Neely, Roland O.Merges and Warren J.White "Machine Tool Practices", Prentice Hall of India, 1998
2. HMT – Production Technology, Tata Mc Graw Hill, 1998.
3. Hajra Choudhury. Elements of Workshop Technology – Vol.II. Media Promoters
4. Geofrey Boothroyd, Fundamentals of Metal Machining and Machine Tools, Mc Graw Hill, 1984

Course Outcomes:

1. Understand the significance of machining.
2. Appreciate the difference between Orthogonal and Oblique Cutting.
3. Understand forces acting in metal cutting.
4. Know about different types of machines viz. Lathe, Shaper, Slotter, Planer, Borer, Drill Press, Milling Machine, Grinding Machine, Lapping, Honing and Broaching Machines.
5. Must be able to understand parts, specifications, classification, working principle, operations performed on different machine tools.
6. Must be able to select a machine for the job.
7. Should be able to understand the difference between a jig and a fixture.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

III Year B. Tech. ME – I Semester

(4G554) DESIGN OF MACHINE ELEMENTS – I

Course Objective:

The primary objective of this course is to demonstrate how engineering design is used for many principles learned in previous engineering science courses and to show how these principles are practically applied. This subject will help to the students to learn to analyze and design basic machine elements in mechanical systems. By this subject students will become familiar on design principles, materials selection, stresses developed in machine elements under different loads. The students will also get knowledge on design of the permanent and temporary joints, shafts and keys.

UNIT I

INTRODUCTION: General considerations of design, design process. Selection of Engineering materials - properties –Manufacturing considerations in the design. BIS codes of materials. Preferred numbers.

STRESSES IN MACHINE MEMBERS: Simple stresses – Combined stresses – Torsional and bending Stresses – impact stresses – stress -strain relation – Various theories of failure – factor of safety – Design for strength and rigidity.

UNIT II

STRENGTH OF MACHINE ELEMENTS: Stress concentration –notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line, Design for finite life.

UNIT III

DESIGN OF FASTENERS:

DESIGN OF RIVETED JOINTS: Types of riveted joints, design of riveted joints. Boiler shell riveting, design and eccentric loading design of riveted joints.

DESIGN OF BOLTED JOINTS: Forms of Screw threads. Stresses in Screw fasteners. Design of bolts with pre-stresses, Design of bolted joints under eccentric loading, Bolts of uniform strength.

DESIGN OF WELDED JOINTS: design of welded joints, Strength of Transverse Fillet and parallel fillet Welded Joints & eccentric loading.

UNIT IV

KEYS, COTTERS AND KNUCKLE JOINTS: Design of Keys – Stresses in Keys - Cotter joints - spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT V

SHAFTS AND SHAFT COUPLINGS

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code.

Shaft Couplings: Design of Rigid couplings: Muff, Split muff and Flange couplings-Flexible couplings: bushed pin type.

Text books:

1. Pandya & Shah, *Machine design*. Charotar Publ.
2. V B Bhandari, *Design of machine elements.*
3. R.S. Khurmi & J.S.Gupta, *Machine Design.* S.Chand Publications.

Reference books:

1. J.E. Shigley, *Machine design*.
2. T. Krishna Rao, *Design of Machine Elements-I.* I.K. International.
3. M.F. Spotts, *Design of Machine Elements*. PHI.
4. Kannaiah, *Machine Design.* Scietech.
5. RS Khurmi and Jk Gupta, *Machine design.*
6. *Machine design*, Schaum Series.

Course Outcomes:

- Students are capable to apply design procedures using theories of failure for different elements.
- Students are able to design simple components under cyclic loading using Goodman's and Soderberg's criterions.
- Students are able to design riveted joints with different configuration, boiler shell joint design and eccentric loading design of riveted joints. Further students are able to design bolted joints with direct loading and eccentric loading.
- Students are able to design cotter joint, knuckle joint.
- Students are able to design shafts, various rigid and flexible shaft couplings.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

III Year B. Tech. ME – I Semester

(4G555) HEAT TRANSFER

Course objective:

1) An ability to get an in-depth understanding of the principles governing the transfer of heat, the techniques, tools and skills required to solve typical thermal related problems.
2) To analyse of energy flows in complicated systems and the design of efficient heat transfer equipments.
3) Enables to utilize analogies to solve heat transfer problems.
4) An ability to gain hands-on experience in heat transfer experimentation through a number of laboratory tests.

UNIT I INTRODUCTION: Modes and mechanisms of heat transfer – Basic laws of heat transfer –General applications of heat transfer.
Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.
Simplification and forms of the field equation – steady, unsteady and periodic heat transfer – boundary and Initial conditions.

UNIT II One Dimensional Steady State Heat Conduction: in Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius/thickness of insulation–with internal heat sources or Heat generation. Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to errors in Temperature measurement.
One Dimensional Transient Heat Conduction: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems- Problems on semi-infinite body.

UNIT III CONVECTIVE HEAT TRANSFER: Dimensional analysis– Buckingham π Theorem – Examples – Free & Forced convection.
Forced Convection: External Flows: Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer for flow over-Flat plates, Effect of Turbulence, Cylinders and spheres.
Internal Flows: Division of internal flow through Concepts of Hydrodynamic and Thermal Entry Lengths – Use of empirical relations for convective heat transfer in Horizontal Pipe Flow, annular flow.

FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation.

UNIT IV HEAT TRANSFER WITH PHASE CHANGE: Boiling: Pool boiling – Regimes, determination of heat transfer coefficient in Nucleate boiling, Critical Heat flux and Film boiling. Condensation: Film wise and drop wise condensation.

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

UNIT V HEAT EXCHANGERS: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

Text books:

1. R.C. Sachdeva, *Fundamentals of Engg. Heat and Mass Transfer*. New Age International, 3rd Ed.
2. M. Thirumaleswar, *Fundamentals of Heat and Mass Transfer*. Pearson Edu.

Reference books:

1. P. K. Nag, *Heat Transfer*. TMH, 2010, 2nd Ed.
2. Holman. J. P, *Heat Transfer*. TMH, 2010, 9th Ed.
3. R. K. Rajput, *Heat and Mass Transfer*. S. Chand & Company Ltd.
4. Kondandaraman, C.P., *Fundamentals of Heat and Mass Transfer*. New Age Publ., 3rd Ed.
5. Incropera, *Fundamentals of Heat Transfer*. Wiley India, 5th Ed.
6. Ghoshdastidar, *Heat Transfer*. Oxford Univ. Press, 2004
7. B. S. Reddy and K. H. Reddy, *Thermal Engineering Data Book*. I.K. International, Revised Ed.

Course outcomes:

1) To understand the basic modes of heat transfer like conduction, convection and radiation.
2) To understand the concept and calculation of critical radius of insulation and internal heat generation.
3) To understand the concept of extended surfaces and its applications.
4) To understand one dimensional transient heat conduction problems and Significance of Biot and Fourier Numbers.
5) To understand the convective mode of heat transfer and gain knowledge of empirical correlations of convective heat transfer.
6) To understand concept of hydrodynamic and thermal boundary layer, to gain knowledge of empirical correlations in internal and external flows.
7) Able to calculate heat transfer in condensation and boiling systems, turbulent and laminar film condensation and also to understand the concepts of critical heat flux and different models of critical heat flux.
8) To understand the concept of heat exchanger, types and different methods of calculating heat loads.
9) Understand fundamental laws of radiative heat transfer along with the concept of radiative heat transfer between black bodies and grey bodies.
10) To understand the concept of radiation shields and their applications. Also to determine shape factor for different geometries and can know its importance in determining radiative heat transfer.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4GC53) ENGLISH FOR COMPETITIVE EXAMINATIONS
(Common to CE, ME, CSE & IT)

Course Objectives:

- To allow the students learn Advanced Grammar and English Comprehension
- To expose the students to various kinds of competitive exam papers in English

ENGLISH FOR COMPETITIVE EXAMINATIONS

Correct English Usage: Articles – Prepositions – Tenses – Voice – Error spotting and correcting – Sentence improvement

Vocabulary: Synonyms – Antonyms – Analogy – Words often confused

English Proficiency: One-word substitutions – Idioms and Phrases – Homonyms – Spellings

Logic-based English Language: Rearrangement of jumbled words and jumbled sentences – word pairs – sentence completion

Comprehension Ability: Reading comprehension – Cloze tests

Note: In each lecture class, one practice paper containing objective questions on the said aspects will be discussed thoroughly by the trainer. At the end of the semester, a minimum of 20 papers will have been practiced by students.

As regular method of external assessment is not found suitable, 100 marks will be awarded for internal examinations (30 marks from the average of two Internal Mid Exams and 70 for Internal End Exam)

References:

1. R. S. Agarwal, “Objective English”, S. Chand Publishers
2. Hari Prasad, “Objective English for Competitive Exams”, TMH
3. Collins Cobuild, “English Guides: Confusable Words”

Course Outcomes:

- *The student will be successful in recruitment drives*
- *The student will get through competitive examination in public/private sector*

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4G556) HEAT TRANSFER LAB

1. Thermal conductivity of insulating powder material through Concentric Sphere apparatus.
2. Thermal conductivity of insulating material through lagged pipe apparatus
3. Overall heat transfer co-efficient through Composite Slab Apparatus
4. Thermal Conductivity of metal (conductor).
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer coefficient in forced convection.
8. Heat transfer coefficient in natural convection
9. Experiment on Parallel and counter flow heat exchanger.
10. Emissivity of a gray body through Emissivity apparatus.
11. Experiment on Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Experiment on Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Study of Two – Phase flow.

NOTE: Thermal Engineering data books are permitted in the examinations.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – I Semester

(4G557) THERMAL ENGINEERING LAB

1. Valve / Port Timing Diagrams of an I.C. Engines
2. Performance Test on a 4 -Stroke Diesel Engines
3. Performance Test on 2-Stroke Petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine
5. Retardation and motoring test on 4- stroke engine
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on Variable Compression Ratio Engines, economical speed test.
9. Performance Test on Reciprocating Air – Compressor Unit
10. Study of Boilers
11. Dismantling / Assembly of Engines to identify the parts and their position in an engine.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G561) INSTRUMENTATION AND CONTROL SYSTEMS

COURSE OBJECTIVE:

Students will be able to understand various transducers to measure displacement like Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers and also learn about Calibration procedure, temperature and pressure calibration methods, and measurement of flow stress, strain measurements acceleration and vibration. And also learn about control systems and performance of control systems.

UNIT –I MEASUREMENT AND INSTRUMENTATION:

Measurement, measurement methods, generalized measurement system and its functional elements, classification of instruments, error and its classification, static and dynamic characteristics,

Sensors and Transducers: Introduction, transducers classification and description, transducer sensitivity, variable resistance transducers, variable inductance transducers, capacitive transducers, LVDT, piezo electric and photo electric transducers.

UNIT –II MEASUREMENT OF PRESSURE, FLOW AND TEMPERATURE:

Pressure measurement terms, measurements of low pressure gauges such as McLeod gauge, thermal conductivity gauge, Ionization gauge, measurement of high pressure such as Bourdon gauge and bellows, resistance gauge,

Classification of flow measurement techniques, special flow meters such as Turbine flow meter, Magnetic flow meter, Hot wire anemometer, Ultrasonic flow meter. Temperature measurement instruments, thermocouples, resistance thermometers and thermistors, radiation and optical Pyrometers.

UNIT –III MEASUREMENT OF FORCE, TORQUE, ACCELERATION, VIBRATIONS:

Basic force measurement methods such as elastic load cells, elastic strain gauge load cells, hydraulic and pneumatic load cells, Torque measurement, different types of torsion meters, piezo electric accelerometer, Strain gauge accelerometer. Mechanical type vibration instruments - Seismic instruments as an accelerometer and vibrometer, Calibration of vibration pickups.

STRAIN GAUGES AND MEASUREMENT: Strain measuring techniques, requirement of strain gauges, resistance strain gauges, strain gauges alloys and material, bonded and unbonded strain gauges, bonding techniques, temperature compensation in strain gauges.

UNIT –IV CONTROL SYSTEMS, MATHEMATICAL MODELS AND TRANSFER FUNCTION:

Introduction, examples of control systems, classification of control systems, open loop and closed loop control systems, control system terminology, servomechanism. Physical system and mathematical models, mechanical systems, thermal systems, electrical systems, hydraulic and pneumatic systems, linear control system, transfer function, block diagram and its reduction process, signal flow graphs, mason's rule.

UNIT –V PERFORMANCE OF CONTROL SYSTEMS:

Standard test inputs, response of first order control systems, performance of second order control systems, properties of transient response, steady state error and error constants, Concept of stability, necessary conditions for stability, relative stability, Routh-Hurwitz stability criterion, bode plots, gain and phase margin.

Text books:

1. Beckwith and Buck, *Mechanical Measurements*. Narosa Publication, New Delhi, 1997.
2. S. Ghosh, *Control Systems – Theory & Applications*. Pearson Education, New Delhi, 2005.

Reference books:

1. D.S. Kumar, *Mechanical Measurements and Control*. Metropolitan Books, New Delhi, 2002.
2. B.S.Manke, *Linear Control Systems.* Khanna Publishers, New Delhi, 2004.
3. Doeblin.E.O., *Measurement Systems.* TMH Publishers, New Delhi, 2004.
4. Nagarathan and Gopal, *Control System Engineering*, Narosa Publishers, New Delhi, 2003.
5. Naresh K. Sinha, *Control Systems*, NAI Publishers, New Delhi, 1998.

Course outcomes:

- Students are able to understand working of various instruments used for measuring for displacement, temperature and pressure.
- Students are able to understand working of various instruments used for measuring for temperature and pressure.
- Students are able to understand working of various instruments used for measuring for flow, speed, stress, strain and Vibration
- Students are able to understand various mathematical models, such as differential equation and transfer function models.
- Students are able to Design and/or modify a control system to meet a specified performance in the time or frequency domain and through root locus analysis using analytic, graphical, empirical and computer methods
- Students are able to understand the stability, transient, and steady-state behavior of linear dynamic systems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

III Year B. Tech. ME – II Semester

(4G562) CAD / CAM

COURSE OBJECTIVES:

- To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture
- To get effective knowledge on the usage of mathematical equations in model development through the computer.
- To understand different functions of computers in design and manufacturing.
- To understand the need for integration of CAD and CAM
- Study of different types of production, Knowledge of group technology (GT).
- Detailed study of flexible manufacturing cells and systems and Computer Aided Quality Control

UNIT – I

INTRODUCTIONS, COMPUTER GRAPHICS & DRAFTING

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

Raster scan graphics coordinate system, database structure for graphics modeling, Transformations - 2D and 3D.

Geometric commands - layers, display control commands, editing, dimensioning.

UNIT – II

GEOMETRIC MODELING AND CAD CAM INTERFACE

Introduction to Geometric modeling, Geometric modeling Types - Wireframe, surface and solid modeling, Representation of curves- Hermite curve, Bezier curve, B-spline curves, Representation of surface – Hermite bicubic surface, Bezier and B-spline surfaces, Solid modeling techniques- CSG and B-rep. Data exchange standards- IGES-STEP.

UNIT – III

NUMERICAL CONTROL

Introduction to NC, NC modes, NC elements, NC machine tools, Structure of CNC machine tools, Direct Numerical Control machine tools, Open loop and closed loop control systems - CNC controllers, features of Machining center,

turning center. Computer assisted part programming – APT language structure and commands. CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT - IV

GROUP TECHNOLOGY AND FLEXIBLE MANUFACTURING SYSTEMS

Part family, Parts coding and classification, production flow analysis, machine cell design, applications, advantages and limitations. Computer Aided Processes Planning - Retrieval type and Generative type. FMS - Analysis methods, Material handling systems, computer control systems, Human labor in manufacturing systems, FMS applications, advantages and limitations.

UNIT - V

COMPUTER INTEGRATED PRODUCTION PLANNING AND COMPUTER AIDED QUALITY CONTROL

Capacity planning**,** shop floor control, MRP-I, MRP-II, CIMS benefits, JIT approach. Terminology in quality control, the computer in QC, contact inspection methods, non-contact inspection methods-optical and non optical, computer aided testing, integration of CAQC with CAD/CAM.

Text books:

1. A Zimmers & P.Groover, *CAD/CAM*. PE, PHI.
2. P.N. Rao, *CAD/CAM-Principles and applications*. TMH.

Reference books:

1. Groover, P.E, *Automation, Production systems & Computer integrated Manufacturing*.
2. Radhakrishnan and Subramaniah, *CAD/CAM/CIM*. New Age.
3. Farid Amirouche, *Principles of Computer Aided Design and Manufacturing*. Pearson.
4. R. Sivasubramaniam, *CAD/CAM Theory and Practice*. TMH.
5. Lalit Narayan, *Computer Aided Design and Manufacturing*. PHI.
6. T.C. Chang, *Computer Aided Manufacturing*. Pearson.
7. CSP Rao, *A text book of CAD/CAM*, Hitech Publ.

Course outcomes:

- The basic concepts Automation, components of CAD/CAM, input and output components of CAD, Steps involved in computer aided design.
- The geometric model of the component in CAD technology of computer graphics.
- Mathematical representations of curves used in geometric construction.
- Need of GT as a means of bringing the benefits of mass production to relatively smaller production.
- Understanding the definition and concept of FMS, and its elements etc.
- Good knowledge on computer aided quality control.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G563) METROLOGY AND SURFACE ENGINEERING

Course Objective:

Students will be able to understand the limits and fits, linear measurements, angular measurements, gauges, comparators, optical measuring methods, measurements of flatness and roughness of surface. And also learn about the screw thread and gear measuring methods, Alignment tests on machine tools and surface treatment processes.

UNIT –I: SYSTEMS OF LIMITS AND FITS: Introduction, Definitions, fits and their types – unilateral and bilateral tolerance system, Tolerance analysis .Hole and shaft basis systems – interchangeability and selective assembly. Indian Standard Institution system – International Standard system for plain and screwed work. Limit Gauges: Plug, Ring, Snap, Gap, Taper, Profile and Position gauges. Taylor's principle. Design of Go and No Go gauges.

UNIT –II: LINEAR MEASUREMENT: Length standard, line, ends & wavelength standards slip gauges – calibration of the slip gauges, Dial indicator, micrometers.
Measurement of Angles and Tapers: Different methods – Bevel protractor – angle gauges – spirit levels – sine bar – Sine plate,
Optical Measuring Instruments: optical flat and their uses, optical projector interferometers.
Flatness Measurement: straight edges– surface plates – optical flat and auto collimator.

UNIT –III: SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness- Numerical assessment of surface finish – CLA, R.M.S Values – Ra , Rz values, Methods of measurement of surface finish-profilograph, Talysurf, BIS symbols for indication of surface finish.
Measurement Through Comparators: Comparators – Mechanical, Optical, Electrical, Electronic, Pneumatic comparators and their uses.

UNIT –IV: SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch- Tool maker's microscope.

Gear Measurement: Gear measuring instruments, Gear tooth profile measurement. Measurement of diameter, pitch, pressure angle and tooth thickness.
Coordinate Measuring Machines: Types of CMM and Applications of CMM.

UNIT –V: MACHINE TOOL ALIGNMENT TESTS: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools.
SURFACE ENGINEERING: Surface treatment processes and their characteristics and applications. (a) Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of Surfaces.

Text books:
1. Mahajan, Engineering Metrology. Dhanpat Rai.
2. R.K. Jain, Engineering Metrology. Khanna Publ.

Reference books:
1. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Connie Dotson, Fundamentals of Dimensional Metrology. Thomson, 4th Ed.
3. Bharat Bhushan and B.K.Gupta,Handbook of Tribology: Materials, Coatings, and Surface Treatments.
4. Dehosson J.T., Surface Engineering with Lasers.
5. JR Davis, Surface Engineering for corrosion and wear resistance. Woodhead Publ.

Course Outcomes:

- Students will be able to understand the limits, fits and tolerance ,different types of gauges and design of GO and NOGO gauges.
- The principles of working of the most commonly used instruments for measuring linear and angular distances will be known to the students.
- Students will be able to understand the measuring methods of surface roughness and different types of comparators.
- Students will be able to understand the screw threads elements and measuring methods, gear tooth profile measurement , CMM and its applications.
- Students will be able to conduct alignment tests on machine tools and understand different surface treatment processes.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G564) APPLIED THERMODYNAMICS - III

Course objectives:

- Applied thermodynamics course provides insights in how thermodynamic principles are applied in Gas turbines, Jet propulsion and refrigeration and air conditioning systems.
- It gives details on how different components work and influence each other.
- To understand the principles of Gas turbines, Jet propulsion systems.
- A basic understanding of the combustion physics in combustion chambers
- To understand the thrust equation and how it is used in aircraft and rocket propulsion in an efficient way.
- To understand the principles of refrigeration and air-conditioning.
- To understand the function and operation of the basic components of a vapor compression system & absorption refrigeration systems.
- To calculate the cooling load for different applications.
- To understand the operation of various air conditioning systems.
- To design and implement refrigeration and air conditioning systems using standards.
- To understand different Air conditioning equipment and heat pump circuits.

UNIT –I GAS TURBINES: Simple gas turbine plant – Ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –Closed and Semi-closed cycles – merits and demerits.
JET PROPULSION: Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines –Turbo jet, Turbo prop, Pulse jet – Schematic Diagram. Introduction to Rocket propulsion.

UNIT –II INTRODUCTION TO REFRIGERATION: Necessity and applications – Unit of refrigeration and C.O.P. – Different refrigeration methods - Air Refrigeration: Ideal and Actual cycles, Open and Dense air systems –- problems – Refrigeration needs of Air crafts.
VAPOUR COMPRESSION REFRIGERATION: Basic cycle - working principle and essential components of the plant – COP – Representation η

of cycle on T-S and P-h charts – Expander vs. Throttling, effect of sub cooling and super heating – cycle analysis – Actual cycle- Influence of various parameters on system performance – Construction and Use of P-h charts – numerical Problems.

UNIT –III VAPOUR ABSORPTION REFRIGERATION SYSTEM: description and working of NH_3 – water system and Li Br –water (Two shell & Four shell) System -Calculation of max COP. Principle of operation of three Fluid absorption system.

UNIT -IV INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes – Characterization of Sensible and latent heat loads — Need for Ventilation, Consideration of Infiltrated air – Heat Load concepts: RSHF, GSHF- Problems. Requirements of human comfort and concept of Effective Temperature- Comfort chart –Comfort Air Conditioning- Summer, Winter & year round air conditioning- simple problems.

UNIT –V AIR CONDITIONING EQUIPMENT: humidifiers – dehumidifiers – air filters, fans and blowers.
Heat Pump – Heat sources – different heat pump circuits.

Text books:

1. Rajput, *Thermal Engineering*. Lakshmi Publisations.
2. CP Arora, *Refrigeration and Air Conditioning*. TMH, 2008, 3rd Ed.
3. SC Arora & Domkundwar, *A Course in Refrigeration and Air conditioning*. Dhanpatrai.

Reference books:

1. Manohar Prasad, *Refrigeration and Air Conditioning*. New Age, 2nd Ed.
2. Dossat, *Principles of Refrigeration.*Pearson Edu., 4th Ed.
3. P.L.Ballaney, *Refrigeration and Air Conditioning*. Khanna Publ.
4. R.C.Arora, *Refrigeration and Air Conditioning*. PHI, 2010.
5. V. Ganesan, *Gas Turbines*. TMH.
6. P. Khajuria & S. P Dubey, *Gas Turbines and Propulsive Systems.* Dhanpatrai.

Tables/Codes: Thermal Engineering Data Book containing Refrigerant and Psychrometric property Tables and charts

Course outcomes:

- Understand the role and fundamental performance of gas turbine components.
- Understand the thermodynamics of the Brayton cycle and how they contribute to overall propulsion system performance.
- Able to determine the thrust and fuel consumption of gas turbine and turboprop engines and types, advantages/disadvantages of turbojet, turboprop, turbofan, and ramjet air breathing propulsion systems.
- Understand fundamental refrigeration principles and understand the p-h chart and basic principle of vapour compression cycle.
- Able to determine the coefficient of performance of vapor compression system, Absorption system.
- Understand the various modifications of the basic refrigeration cycles in order to improve their efficiency.
- Understand the principles of air-conditioning and basic design considerations and explain types of air-conditioning systems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G565) DESIGN OF MACHINE ELEMENTS– II

Course Objective:

To aware the student about basic concepts of curved beams with different cross sections, design of power transmission elements; understand the design concepts of various types of springs, various types of bearings and gears. To know the students how to apply design concepts in designing of IC engine parts like Piston, cylinder, connecting rod and crank shaft.

UNIT I

BEARINGS: Types of Journal bearings – Lubrication – Bearing Modulus– bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, bearing life –Failure of bearings, Dynamic loading, selection of bearings, Reliability of bearings .

UNIT II

ENGINE PARTS: Pistons, Forces acting on piston – Construction Design and proportions of piston - Thrust in connecting rod – stress due to whipping action on Connecting rod ends – Cranks and Crank shafts, strength and proportions of centre and over hung cranks.

UNIT III

DESIGN OF MECHANICAL SPRINGS: Stress and deflections of helical Springs-Springs for fatigue loading – Natural frequency of helical springs-Energy storage capacity- Helical Torsion springs- Design of leaf springs.

POWER TRANSMISSIONS SYSTEMS: Design of Flat belt drives & V-belt drives.

UNIT IV

SPUR & HELICAL GEARS: Spur gears- Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of module and face width, check for plastic deformation. Check for dynamic and wear considerations.

UNIT V

DESIGN OF POWER SCREWS: Design of screw, Square ACME, Buttress screws- Efficiency of the screw. compound screw, differential screw, ball screw- possible failures.

DESIGN OF CURVED BEAMS: Introduction, stresses in curved beams,

Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps**.**

Text books:

1. V.B.Bhandari, *Machine Design*. TMH.
2. R.S. Khurmi & J.S.Gupta, *Machine Design.* S.Chand Publications.

Reference books:

1. JE Shingley, *Mech. Engg. Design*.
2. T. Krishna Rao, *Design of Machine Elements-II*. I.K. International
3. T.V. Sundaramoorthy & N.Shanmugam, *Machine Design*.
4. Kanniah, *Machine Design.* Scitech Publishers
5. Data Books: (i) P.S.G. College of Technology
   (ii) Balaveer Swamy and Mahadevan

Tables/Codes: Design data books to be supplied in exam.

Course Outcomes:

- Students are able to design journal bearings, ball bearings and roller bearings and to know the advantages of rolling contact bearings against sliding contact bearings.
- Students are able to know various forces acting on I C engine parts and failure criteria to be adopted for various parts.
- Students are able to design helical sprigs for two wheel vehicle and laminated springs for trucks. Further students are able to design various belt drives.
- Students are able to design spur and helical gears for different input conditions.
- Students are able to design crane hooks, C-clamps. Also students can apply design concepts in designing power screws.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G566) INDUSTRIAL MANAGEMENT

Course objectives:

- To introduce the engineer to the ways in which management principles are applied in the kinds of work in which they are most likely to be involved.
- To provide students with knowledge of approaches in designing and improving processes.
- To make the student aware of various functional operations and their inter relationships of business such as procurement, financing, marketing and information systems.
- To ensure that the students can apply/analyze relevant quantitative models to solve real world problems.
- To make the students capable of appraising real life business situations and suggest solution alternatives as related to operations management techniques.

UNIT I: Concepts of Management and Organization – Functions of Management – Evolution of Management Thought: Taylor's Scientific Management, Fayol's Principles of Management - Systems Approach to Management.
DESIGNING ORGANIZATIONAL STRUCTURES Basic concepts related to Organization - Departmentation and Decentralisation, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization and their merits and demerits.

UNIT II: Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.
PERT & CPM Project management, network modeling-probabilistic model, various types of activity times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method -critical path calculation-crashing of simple of networks.

UNIT III: WORK STUDY: Definition, objectives, Method study - definition, objectives, steps involved- various types of associated charts- difference between micro-motion and memo-motion studies. Work measurement- definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation. Work Sampling – definition, steps involved, standard time calculations, differences with time study- Applications.

UNIT IV MATERIALS MANAGEMENT: Objectives, Inventory – functions, types, associated costs, inventory classification techniques. StoresManagement and Stores Records. Purchase management, duties of purchase manager, associated forms.
INSPECTION AND QUALITY CONTROL types of inspections – Difference between inspection & quality control. Statistical Quality Control- techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans- OC curves. Introduction to TQM- Quality Circles, ISO 9000 series procedures.

UNIT V: HUMAN RESOURCE MANAGEMENT: Functions of HRM, Job Evaluation, different types of evaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs selling, marketing mix, product life cycle.

Text books:

1. Amrine, *Manufacturing Organization and Management.* Pearson, 2004, 2nd Ed.
2. O.P. Khanna, *Industrial Engineering and Management*. Dhanpat Rai.

Reference books:

1. Stoner, Freeman, Gilbert, *Management*, Pearson Edu., 2005, 6th Ed.
2. Panneer Selvam, *Production and Operations Management*. PHI, 2004.
3. Dr.C. Nadhamuni Reddy and Dr. K. Vijaya Kumar Reddy, *Reliability Engineering & Quality Engineering*. Galgotia Publ. Pvt. Ltd.
4. Ralph M Barnes, *Motion and Time Studies*. John Wiley and Sons, 2004.
5. Chase, Jacobs, Aquilano, *Operations Management*. TMH, 2003, 10th Ed.
6. L.S. Srinath, *PERT/CPM*. East-West Press, 2000.

Course outcomes:

- Understand the basic concepts of management, organization and concepts related to organization structures, types, merits and demerits.
- Understand the importance of plant locations and factors affecting plant locations, the plant layouts, types and its production types, the various data analyzing forms-travel chart, concepts of PERT,CPM and their networks.
- Understand the concept of work study, method study and types of associated charts, the work measurement, work sampling and their steps.
- Understand the concepts of material management and their objectives, the concept of inventories functions, types and their classification techniques. Understand the concepts of inspection, quality control and their types, the variable control charts and types of acceptance sampling plan, the concept of TQM.
- Understand the functions of HRM, Job description, Job Evaluation, different types of evaluation methods, the Marketing, marketing Vs selling, marketing mix Product life cycle.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4G567) METROLOGY AND MACHINE TOOLS LAB

SECTION A:

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

SECTION B:

1. Demonstration of construction & operations of general purpose machines: Lathe, Drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.
2. Job on Step turning and taper turning on lathe machine
3. Job on Thread cutting and knurling on -lathe machine.
4. Job on Drilling and Tapping
5. Job on Shaping and Planning
6. Job on Slotting
7. Job on Milling Job on Cylindrical Surface Grinding
8. Job on Grinding of Tool angles.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
III Year B. Tech. ME – II Semester

(4GC61) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Objectives:

- To sensitize the student with the significance of the language skills required in his professional career
- To improve reading and listening comprehension and communication skills of the student
- To enable the student discuss ideas, and face interviews with confidence
- To help the students cultivate the required ability to face computer-based competitive exams such as GRE, TOEFL, CAT, GMAT etc

Syllabus:

- **Résumé Preparation** – structure, formats and styles – planning - defining career objective - projecting one's strengths and skills - creative self-marketing–sample resumes - cover letter
- **Interview Skills**- concept and process - pre-interview planning – preparation - body language - answering strategies – frequently asked questions
- **Group Discussion** –communicating views and opinions – discussing – intervening – agreeing and disagreeing –asking for and giving clarification - substantiating - providing solution on any given topic across a cross-section of individuals - modulation of voice and clarity - body language – case study
- **Oral Presentations(Individual)** – collection of data from various sources –planning, preparation and practice – attention-gathering strategies -transitions – handling questions from audience
- **Oral Presentations (Team)**- appropriate use of visual aids –PowerPoint presentation.
- **Reading Comprehension**- reading for facts – scanning – skimming - guessing meanings from context– speed reading
- **Listening Comprehension** – listening for understanding - responding relevantly

Minimum Requirements:

Advanced English Language Communication Skills Lab is conducted at two places:

- Computer-aided Language Lab with 60 computer machines, one teacher console, LAN facility and Language Learning software for self-study.
- Communication Skills Lab with movable chairs, a discussion room, Public Address System, a Television, a DVD Player, a camcorder, an LCD Projector and a computer machine.
- Manual cum Record, prepared by Faculty Members of English of the college will be used by students.

Suggested Software:

- It's your Job published by Clarity
- Business Writing published by Clarity
- Active Listening published by Clarity
- Active Reading published by Clarity
- Software published by Globarena
- Cambridge Advanced Learner's Dictionary
- Oxford Advanced Learner's Dictionary

Course Outcomes

- The student will be able to express himself fluently in social and professional contexts.
- The student will enhance his skills of making a presentation confidently.
- The student will learn how to face Interviews confidently, to participate in meetings effectively.
- The student will face CBTs with greater felicity.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G571) OPERATIONS RESEARCH

Course Objective:

- To enable the students to the nature and scope of various decision making situations within business contexts, understand and apply operations research techniques to industrial applications.
- To learn the fundamental techniques of Operations Research and to choose a suitable OR technique to solve problem.

UNIT I: Development – Definition– Characteristics and Phases – Types of operation and Research models– applications.
Linear Programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques -Two–phase method, Big-M method – Duality Principle-Economic interpretation of duality.

UNIT II TRANSPORTATION PROBLEM: Formulation – Optimal solution, unbalanced transportation problem –Degeneracy.
Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem-Traveling Salesman problem, Job Sequencing Models.

UNIT III REPLACEMENT: Introduction – Replacement of items that deteriorate with time – with change in money value - without change in money value – Replacement of items that fail completely, group replacement.
THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – m X 2 & 2 X n games -graphical method. dominance principle.

UNIT IV WAITING LINES: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite queue length models.
INVENTORY: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT V DYNAMIC PROGRAMMING: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.
SIMULATION: Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Simulation Languages.

Text books:

1. S.D.Sharma, Operations Reasearch
2. Taha, *Introduction to Operations Research*. PHI
3. Hiller & Libermann, *Introduction to Operations Research*. TMH.

Reference books:

1. A.M. Natarajan, P.Balasubramani, A. Tamilarasi, *Operations Research.* Pearson Edu.
2. Maurice Saseini, Arhur Yaspan & Lawrence Friedman, *Operations Research: Methods & Problems.*
3. R.Panneerselvam, *Operations Research.* PHI Publ.
4. Wagner, *Operations Research*. PHI Publ.
5. J.K. Sharma, *Operations Research.* Mac Milan.
6. Wayne L. Winston, *Operations Research.* Thomson Brooks/Cole.
7. Veerachari and V. Ravi Kumar, *Operations Research*. I.K. International

Course Outcomes:

- The student will be able to create mathematical models of the real life situations and capable of obtaining best solution using Graphical Method and Simplex Method and the student must be able to implement the theory of duality for simplifying the solution procedure for certain LPPs.
- The student will be able to solve the special cases of LPP such as Transportation and Assignment problems.
- The student will have knowledge of choosing the best strategy out of the available strategies which is an essential skill for any business manager to successfully face the competition.
- The student will be able to understand and will apply the fundamentals of waiting lines and inventory in real life situations.
- The student will be aware of applying Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems.
- The student will be able to simulate inventory and queuing models.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G572) AUTOMOBILE ENGINEERING

Course objective:

- To acquire sufficient knowledge to classify Engines, Chassis, Fuel Supply Systems.
- Ability to understand methods of Cooling, Lubrication and Ignition Systems in Automobiles.
- To get the awareness on Generating Systems, Suspension Systems, transmission system, steering mechanism and braking methods in various Automobiles.
- The students get the working knowledge of assembly of various components of layout and of various electrical equipment of an automobile.

UNIT I INTRODUCTION: Components of a four wheeler automobile – chassis and body – power unit –power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – oil filters, oil pumps – crank case ventilation.
ELECTRICAL SYSTEM : Charging circuit, generator, current – voltage regulator – starting system, Bendix drive, mechanism of Solenoid switch, Lighting systems, Horn, wiper, Fuel gauge – oil pressure gauge, Engine température indicator.

UNIT II FUEL SYSTEM: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters– carburetor – types – air filters – Gasoline injection.
C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle spray formation, injection timing, testing of fuel pumps.
EMISSIONS FROM AUTOMOBILES: Pollution standards National and international – Pollution Control– Techniques – Multipoint fuel injection for SI Engines- Common rail diesel injection Emissions from alternative energy sources– hydrogen, Biomass, alcohols, LPG, CNG - their merits and demerits

UNIT III COOLING SYSTEM: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.
IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT IV TRANSMISSION SYSTEM: Clutches- Principle- types: cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear box- types: sliding mesh, constant mesh, synchromesh, epi-cyclic, over drive, torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential, rear axles.

UNIT V STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toe-in, center point steering. Steering gears – types, steering linkages.
SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, Pneumatic and vacuum brake systems, Antilock braking system and Traction control.

Text books:
1. Kirpal Singh, *Automotive Mechanics –Vol.1&Vol.2.*
2. William Crouse, *Automobile Engineering.*

Reference books:
1. R.K.Rajput, *Automobile Engineering.* Lakshmi Publ.
2. K.K. Ramalingam, *Automobile Engineering*. SciTech Publ.
3. Newton, Steeds & Garret, *Automotive Engines*.
4. Thipse, *Alternate Fuels.* Jaico Publ. House

Course outcomes:

- To understand the function of each and every component of an automobile and student can understand the use of turbo charging and super charging.
- Able to understand the knowledge on emission standards, emission control techniques and Electrical systems.
- To get broad knowledge on each and every component of transmission system of an automobile.
- Able to understand purpose and methods of steering systems and their applications.
- An ample knowledge on suspension system and braking system of an automobile.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G573) FINITE ELEMENT METHODS

Course objective:

The subject should enable the students to learn the principles involved in discretization in finite element methods, forming of stiffness matrices and force vectors for simple elements, to know the various approaches followed in finite element analysis, usage of the various elements for discretization and to learn about shape functions. To learn the application of FEM in various structural problems incorporating temperature and boundary conditions and heat transfer problems.

UNIT I: Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain - Displacement relations. Stress - strain relations.
ONE-DIMENSIONAL FINITE ELEMENT METHODS: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element.

UNIT II TRUSSES: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, and temperature effects.
BEAMS: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT III TWO DIMENSIONAL PROBLEMS: Basic concepts of plane stress and plane strain, stiffness matrix of CST element, finite element solution of plane stress problems.
AXI-SYMMETRIC MODEL: Finite element modelling of axi-symmetric solids subjected to axi-symmetric loading with triangular elements.

UNIT IV ISO-PARAMETRIC FORMULATION: Concepts, sub parametric, super parametric elements, 2 dimensional 4 noded iso-parametric elements, and numerical integration. **Heat transfer problems:** Heat transfer with conduction, convection, Heat transfer through fins**.**

UNIT V DYNAMIC ANALYSIS: Dynamic equations, Eigen value problems and their solution methods, simple problems.

Text books:

1. Tirupathi.R. Chandrupatla and Ashok D. Belegundu, *Introduction to Finite elements in Engineering.* PHI.
2. S Senthil, *Introduction of Finite Element Analysis*. Laxmi Publications.
3. SMD Jalaluddin, *Introduction of Finite Element Analysis.* Anuradha Publications.

Reference books:

1. K. J. Bathe, *Finite element procedures.* PHI.
2. SS Rao, *The finite element method in engineering*. Butterworth Heinemann.
3. J.N. Reddy, *An introduction to the Finite element method.* TMH.
4. Chennakesava, R Alavala, *Finite element methods: Basic concepts and applications*. PHI.

Course outcomes:

- An ability to understand introductory basic principles and approaches for solving FEM problems in different fields.
- An ability to formulate FEM model for simple problems like one dimensional bar element.
- An ability to understand and derive element matrices to find stresses in beams and trusses.
- An ability to understand basic concepts of plane stress and plane strain, stiffness matrix of CST element and axi-symmetric elements.
- An ability to write interpolation functions to higher order isoparametric elements and can solve the problems heat transfer problems using FEM and also to apply boundary conditions in realistic problems.
- An ability to solve dynamic analysis problems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

IV Year B. Tech. ME – I Semester

(4G574) AUTOMATION AND ROBOTICS

Course objective:

- To become familiar with the different types automation and study both technological and economic issues involved in automatic manufacturing of products.
- To develop an understanding of programmable or flexible manufacturing and its suitability for various manufacturing environments.
- Learn about the modern techniques and ways to improve the assembly line balancing.
- To study the cross the traditional boundaries between mechanical systems, machines, computer hardware and software, control and electronic design.
- To get an idea about various applications of industrial robot

UNIT I: INTRODUCTION TO AUTOMATION: Need , Types, Basic elements of an automated system, levels of automation, hardware components for automation and process control, automation principles.
Automated Flow Lines: Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage.

UNIT II: ASSEMBLY LINE BALANCING: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT III: INTRODUCTION TO INDUSTRIAL ROBOTS: Classification. Robot configurations, Functional line diagram, Degrees of Freedom. Components, common types of arms, joints, grippers.

UNIT IV: MANIPULATOR KINEMATICS: Homogeneous transformations as applicable to rotation and translation - D-H notation, Forward and inverse kinematics.
Manipulator Dynamics: Differential transformation, Jacobians. Lagrange – Euler
Trajectory Planning: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion.

UNIT V: ROBOT ACTUATORS AND FEEDBACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison Position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile sensors, Proximity sensors.

Robot programming: Types – features of languages and software packages.

Robot Application In Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text books:

1. M.P.Groover, *Automation, Production systems and CIM*. Pearson Edu.
2. M.P. Groover, *Industrial Robotics*. TMH.

Reference books:

1. Fu KS, *Robotics*. McGraw Hill.
2. P. Coiffet and M.Chaironze, *An Introduction to Robot Technology*. Kogam Page Ltd. London, 1983.
3. Richard D.Klafter, *Robotics Engineering*. Prentice Hall.
4. Ashitave Ghosal, *Robotics, fundamental Concepts and analysis.* Oxford Press, 2006.
5. Mittal RK & Nagrath IJ, *Robotics and Control.* TMH.
6. John J. Craig, *Introduction to Robotics.* Pearson Edu.

Course outcomes:

- An ability to demonstrate basic knowledge in mathematics, science and engineering.
- An ability to design and conduct experiments, interprets, analyze and report results.
- An ability to design a mechanical system or a thermal system or a process that meets desired specifications and requirements.
- An ability to function on engineering and science laboratory teams, as well as on multidisciplinary design team.
- An ability to identify, formulate and solve mechanical engineering problems.
- An ability to understand of their professional and ethical responsibilities.
- Confidence to apply engineering solutions in global and societal contexts.
- An ability to function on multi-disciplinary teams.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G575) TRIBOLOGY
(ELECTIVE – I)

Course Objective:

1. Students should be able to understand the effect and importance of friction between different surfaces and should know to calculate the friction.
2. Students must be able to know the phenomenon of wear between surfaces in contact and its implications.
3. Students should be able to understand the principles, methods, purpose and selection of lubricants for the reduction of friction.
4. Students should be able to understand the lubrication theory and the flow of lubricants with different applications.
5. Students should know the material selection for different types of bearings could be understand

UNIT I STUDY OF VARIOUS PARAMETERS: Viscosity, flow of fluids, viscosity and its variation -absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used.

BEARING MATERIALS: General requirements of bearing materials, types of bearing materials, Selection of Bearing materials for various applications, Applications of Bearing materials.

UNIT II HYDROSTATIC LUBRICATION: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.
Study of current concepts of boundary friction and dry friction. Columb's laws of friction, theories of friction

UNIT III HYDRODYNAMIC THEORY OF LUBRICATION: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti - friction bearing

UNIT IV FRICTION AND POWER LOSSES IN JOURNAL BEARINGS: Calibration of friction loss friction in concentric bearings, bearing modulus, Sommerfield number, heat balance, practical consideration of journal bearing design considerations.

UNIT V AIR LUBRICATED BEARING: Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect.

TYPES OF BEARING OIL PADS: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings - externally pressurized bearings.

Text book:

1. Suhas V. Patankar, *Numerical heat transfer and fluid flow*. Butter-Worth Publ.
2. John. D. Anderson, *Computational fluid dynamics, Basics with applications*. Mc Graw Hill.

Reference books:

1. Niyogi, *Computational Fluid Flow and Heat Transfer*. Pearson Publ.
2. Tapan K. Sengupta, *Fundamentals of Computational Fluid Dynamics*. Universities Press.
3. Jiyuan and Others, *Computational Fluid Dynamics*. Elsevier, 2008.

Course Outcomes:

1. Understand the characteristics of engineering surfaces, sources of friction, friction
2. Characteristics of metals and non metals and friction measurements.
3. Students can understand the properties of different lubricants used for various applications
4. Students are able to identify the lubrication modes such as hydrodynamic lubrication and hydrostatic lubrication
5. Students are able to know the selection of materials for various applications

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G576) ADVANCED MANUFACTURING SYSTEMS (ELECTIVE – I)

Course Objective:

1. To enable the students to the nature and scope of various advanced manufacturing systems which are in present manufacturing scenario.
2. To learn the fundamental techniques of integrating the manufacturing system with automation simultaneously reducing the effort of human intervention.

UNIT I: Definition and broad characteristics of Flexible Manufacturing Cells, Systems, Islands and Flexible transfer lines - Place of flexible manufacturing systems in CIM - The FMS Design, implementation and operational issues.

UNIT II: Design & Planning: The role of associated technologies such as GT, JIT and simulation - Installation, Operation and evaluation - Scheduling problems.

UNIT III: FMS hardware CNC machines tools, robots, AGVs, ASRs, Inspection and cleaning stations - Control aspects of FMS.
DNC of machine tools, cutting tools, robots, quality control and inventories - Personnel and infrastructural aspects - Flexible machining cells and islands- Transfer lines.

UNIT IV: Flexible assembly Systems; structure, control and applications - FMS in action: Understanding Flexibility, Types of Flexibility in FMS, Flexible and Dynamic Manufacturing Systems, IT facilitated flexibility, integration and automation.

UNIT V: Role of Integrated and automated material handling systems, Typical FMS operation, Computer simulation and AI for FMS.
Role of Information Technology, Overview of Multi model and mixed model flexible lines, Typical case studies. Future prospects.

Decision Support Systems, Real time control strategies, Economical Justification for FMS

Text books:

1. M.P. Groover, *Automation, Production systems & Computer Integrated Manufacturing*, PHI.

2. P. Radhakrishna and V. Raju, *CAD, CAM & CIM*, New Age, International Publisher.

Course Outcomes:

1. The student will be able to analyze the difference for conventional manufacturing system to advanced manufacturing system. The role of Computer integrated manufacturing, business functions integration etc., can be learned.
2. The student will be aware of applying the automation to the normal conventional system; therefore he can implement it on to the large scale sectors.
3. The student will be aware of role of integrated and automated material handling system and how effectively it functions.
4. The student will be able integrate the intelligent software techniques in scheduling the machines in the flexible manufacturing environment.
5. The student will have knowledge of economically justifying the FMS system.
6. The student will be able to understand various case studies involved in the past and present manufacturing systems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G577) MECHATRONICS
(ELECTIVE – I)

Course Objective:
To make the students to learn about the Basic electronics, electrical and mechanical components used to control the machines and industries. Various types of sensors, signal conditioning systems and various pneumatic and hydraulic components used in control systems. Micro controllers, PLCS and PLC program and programmable motion control systems.

UNIT I INTRODUCTION: Definition – Trends - Control Methods: Stand alone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

UNIT II A) SIGNAL CONDITIONING: Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , speed channels Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass, high pass, notch filtering

B) ELECTRONIC INTERFACE SUBSYSTEMS: TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids, motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers, over current sensing, resetable fuses, thermal dissipation - Power Supply - Bipolar transistors/ mosfets.

UNIT III A) PRECISION MECHANICAL SYSTEMS: Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts – Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

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

UNIT IV A) MICROCONTROLLERS OVERVIEW: 8051 Microcontroller, micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors -

Applications. Programming –Assembly, C (LED Blinking, Voltage measurement using ADC).

B) PROGRAMMABLE LOGIC CONTROLLERS: Basic Structure - Programming: Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input / output - PLC Selection -Applications.

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

Text books:

1. W Bolton, *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering.* Pearson Edu. Press, 2005, 3rd Ed.
2. Mechatronics, M.D.Singh, J.G.Joshi, PHI.

Reference books:

1. Newton C Braga, *Mechatronics Source Book.* Thomson Publ.
2. N. Shanmugam, *Mechatronics.* Anuradha Agencies Publi.
3. Devdas Shetty, Richard, *Mechatronics System Design.* Thomson.
4. A. Smaili & F. Mrad, *Mechatronics.* Oxford H.E., 2008.
5. Ramachandran, *Mechatronics: Integrated Mechanical Electronic Systems*. Wiley India.

Course Outcomes:

- Students can understand the importance of mechatronics subject and controlling the various machines, robots etc. Students may observe CNC machines in CAD/CAM lab to understand the mechatronics concepts.
- Students can understand the importance of signal conditioning in design of mechatronic system and application of signal conditioning in mechatronics. Some of the systems may be observed electrical and electronics labs for better understanding. Students may refer the following website www.nptel.iitm.ac.in/ECE/mechatronics.www.ustudy.in/mech/mechsen. wikipedia.org/wiki/mechatronics for better understanding of this topic. how to convert the analog signals into useful required form. These signal condition systems may be observed in electronics and communication engineering department labs.
- Students can understand the concept of Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering. Students may refer the following website www.nptel.iitm.ac.in/ECE/mechatronics. www.saylor.org/corses/me302 for better understanding of this topic.
- Student learns about the pneumatic and hydraulic systems and about some precisions mechanical component which are useful in the field of automation. This automation system can be observed in many processing industries and manufacturing industries to handle the materials and control the machines (or) process. Student may refer text book - Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Chapter-5, 6 & 7 by the authors - W .Bolton, publishers - Pearson Education Press, 3rd edition, 2005.Students may refer the following website www.pic-design.com, www.sdp-si.com, www.csio.res.in,
- Student gets awareness on electronic systems, electromechanical drives used in automation. Some of the systems may be observed electrical and electronics labs for better understanding. Student may refer text book - Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Chapter- 7 by the authors – W. Bolton, publishers- Pearson Education Press, 3rd edition, 2005. Students may refer the following website www.pic-design.com, www.sdp-si.com,
- www.csio.res.info better understanding of this topic.
- Student to know about microcontrollers, programming of programmable logic controls and to see its applications of programmable motion controls. Students may visit pharmaceutical industries, thermal power plants etc. To observe the PLC based control systems. to know about the interface between processing equipment and central system.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G578) UNCONVENTIONAL MACHINING PROCESSES (ELECTIVE – II)

Course Objective:

The main objective of this subject is to provide students with an understanding of the latest technologies being used in manufacturing industries as part of modernization of industries. The students shall also understand and appreciate the importance of basic principles of Manufacturing Systems and also they will know about the differences between conventional and un-conventional machining process with the help of various advanced manufacturing techniques like USM, AJM, ECM, CM, EDM, PAM, EBM & LSB.

UNIT I: INTRODUCTION

Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications. Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development

UNIT II: MECHANICAL PROCESSES

Abrasive jet machining, Water jet machining and abrasive water jet machining Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations. Ultrasonic Machining. (AJM, WJM and USM). Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications

UNIT III: ELECTRO – CHEMICAL PROCESSES

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

UNIT IV: THERMAL METAL REMOVAL PROCESSES - I

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT V: THERMAL METAL REMOVAL PROCESSES -II

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut. Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining-principle- maskants –etchants- applications. Magnetic abrasive finishing, Abrasive flow finishing.

Text books:

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi
(2002) ISBN 81-7764-294-4.

References:

1. Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York (1987)
2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (1980).
3. Mc Geough, “Advanced Methods of Machining” Chapman and Hall, London (1998) 42 INDUSTRIAL ROBOTICS 3 0

Course Outcomes:

- An ability to design differences between conventional and unconventional machining process.
- An ability to design classifications of unconventional machining process.
- An ability to design mechanical process of Ultrasonic Machining process.
- An ability to design mechanical process of AJM, WJM, AWJM.
- An ability to design Electro chemical machining process and process parameters.
- An ability to design **THERMAL METAL REMOVAL PROCESSES like EDM, LBM,PAM**.
- An ability to design Magnetic abrasive finishing, Abrasive flow finishing.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G579) TOOL DESIGN
(ELECTIVE-II)

Course Objective:

- Students will be able to get the knowledge on basic features of tool materials, design of gauges, limits and fits.
- Students shall also get the basic knowledge on design of single point cutting tools and multi point cutting tools, its specifications and geometry in machining processes.
- To study the concepts of design of jigs and fixtures, types, construction.
- Students will be able to understand Design blanking, piercing (various metal forming processes) die design, construction.
- Students will be able to understand tool life and tool wear during machining processes.

UNIT I TOOLING MATERIALS AND HEAT TREATMENT: Properties of materials, ferrous, nonferrous, non metallic, tooling materials, heat treating, Limits, tolerances and fits, Gauges and gauge design coated tools, ceramic tools.

TOOL LIFE AND TOOL WEAR: theories of tool wear-adhesion, abrasive and diffusion wear mechanisms forms of wear, tool life criteria and Mach inability index, tool wear criterion, measurement of tool wear.

UNIT II DESIGN OF SINGLE POINT CUTTING TOOLS: Single point, cutting tools-various systems of specifications, geometry and their inter relation, theories of formation of chip and their effect, design of broach.

DESIGN OF MULTIPOINT CUTTING TOOLS: Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, Milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

UNIT III DESIGN OF JIGS AND FIXTURES: Basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

UNIT IV DESIGN OF SHEET METAL BENDING, FORMING AND DRAWINGS DIE: Bending dies, drawing dies, forming dies, drawing operations, variables that effect metal flow during drawing. Determination of blank size, drawing force, single and double action draw dies.

DESIGN OF SHEET METAL BLANKING AND PIERCING: Fundamentals of die cutting operating, power press types, General press information, Material handling equipment, cutting action in punch and die operation. Die clearance, and types of Die construction. Die design fundamentals-blanking and piercing die construction, pilots, striper and pressure pads presswork material, strip layout, short run tooling for piercing.

UNIT V: Using plastics as tooling materials: introduction, plastics commonly used as tooling material application of epoxy plastic tools construction methods of plastic tooling metal forming operations with Urethane dies. Calculating forces for urethane pressure pads, and economics of tooling.

Text books:

1. Donaldson, Lecain and Goold, *Tool Design*. TMH.
2. A Bhattacharya, *Principles of Metal cutting*. New Central Book Agency, Calcutta.

Reference books:

1. Surendra Kenav and Umesh Chandra, *Production Engineering Design (Tool Design).* Satyaprakashan, New Delhi 1994.
2. Amitabh Battacharya and Inyong Ham, *Design of Cutting Tools. Use of Metal Cutting Theory.* ASTME publication Michigan USA, 1969.
3. RK Singal and Others, *Fundamentals of Machining and Machine Tools.* I.K. International, 2008.
4. Shaw, *Metal Cutting Principles.* Oxford Univ. Press.

Course Outcomes:

- The student will be aware of applying tooling materials for making of various types of tool, with its terminology.
- The student will be aware of design of single point cutting tools and multi-point cutting tools, selection of tools, characteristics, tooling parameters and its relationship with respect to metal removing process (speed, feed, depth of cut), tool life and tool wear during machining processes.
- The student will be aware of design of JIGS and fixtures, applications for various machines.
- The student will be aware of design of various metal forming processes and die design, applications.
- The student will be aware of using of various plastics as tooling materials, applications, design of plastic tools.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G57A) RAPID PROTOTYPING
(ELECTIVE II)

COURSE OBJECTIVE:

- Generating a good understanding of RP history, its development and applications.
- To impart knowledge on different types of RP systems, i.e., the process, advantages, limitations and applications.
- To expose the students to different types of materials used in RP systems to make best use of various RP machines.

UNIT I INTRODUCTION: Need for the compression in product development, History of RP system, Applications, Growth of RP industry and classification of RP system.

UNIT II STEREO LITHOGRAPHY SYSTEM: Principle, Process details, machine details, Applications.
FUSION DECOMPOSITION MODELING: Principle, Process details, Applications.

UNIT III SOLID GROUND CURING: Principle of operation, Machine details, Applications.
LAMINATED OBJECT MANUFACTURING: Principle of Operation, LOM materials, Process details, Applications.

UNIT IV LASER SINTERING: Introduction to LASER, LASER Sintering process, process details, Applications.
CONCEPTS MODELERS: Principle, Thermal jet printer, Sander's model maker, 3-D printer.

UNIT V LASER ENGINEERING NET SHAPING (LENS):
Rapid Tooling: Indirect Rapid tooling, Silicon rubber tooling, Direct Rapid Tooling

Text books:

1. Rapid Prototyping Technology, Kenneth G. Cooper, Marcel Dekker,INC.
2. Rapid Manufacturing, Flham D.T & Dinjoy S.S, Verlog London 2001.
3. Frank W. Liou, Rapid Prototyping & engineering applications, CRC Press, ISBN 978-0-8493-3409-2.
4. Rapid Prototyping theory & practice, Manufacturing System Engineering Series, Ali K.Kamarani, Springer Verlag.

References:

1. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003.
2. Rapid Prototyping and Engineering applications: A tool box for prototype development, Liou W.Liou, Frank W.Liou, CRC Press, 2007.

COURSE OUTCOMES:

- Good knowledge in advanced manufacturing techniques and it's applications
- Good knowledge on different types of materials used in advanced manufacturing techniques
- How these techniques are used in different applications which is not possible with conventional process

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – I Semester

(4G57B) INSTRUMENTATION LAB AND OPTIMIZATION LAB WITH MATLAB SOFTWARE

INSTRUMENTATION LAB

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

OPTIMIZATION LAB WITH MAT LAB SOFTWARE

Ex 1. Consider the two matrices

$A=\begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ -1 & 6 & 7 \end{bmatrix}$ and $B=\begin{bmatrix} 13 & -15 & 8 \\ 1 & 51 & 9 \\ 8 & 70 & 6 \end{bmatrix}$

Using MATLAB, determine

a) A+B b) A^2 c) $A^2 + B^2 - 2AB$

Ex 2. Write M file and Solve following Linear Programming Problem

Minimize $y = 2x_1^2+2x_1x_2+x_2^2-20x_1-14x_2$

Sub to: $x_1^2+x_2^2 \le 25$;

$X_1^2-x_2^2 \le 7$

Range $0 \le x_1 \le 10$, $0 \le x_2 \le 5$,

Ex 3. Rastrigin's function has many local minima, with a global minimum at (0,0):

$Ras(x)=20+x_1^2+x_2^2-10(\cos 2\pi x_1+\cos 2\pi x_2)$

Use "fminunc" and "patternsearch" and solve the problem by taking starting point as [20,30], which is far from the global minimum.

Ex 4. Rastrigin's function has many local minima, with a global minimum at (0,0):

$Ras(x)=20+x_1^2+x_2^2-10(\cos 2\pi x_1+\cos 2\pi x_2)$

Use "GA" and solve the problem by taking starting point as [20,30], which is far from the global minimum.

Ex 5. Solve the following problem and find the optimum value using simulated annealing on MATLAB.

Minimize $y=(x_1^2+x_2-11)^2+(x_1+x_2^2-7)^2$

Range $0 \le x_1 \le 6$; $0 \le x_2 \le 6$

Ex 6. Solve the above problem using Neural Networks on MATLAB.

Ex 7. Using fuzzy membership functions (at least two) solve a data set (e.g: Selection of a customer, selection of a ROBOT, and selection of a supplier, etc.) problem to find the best?

Note: Use Matlab online Help Manual to solve the above problems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

IV Year B. Tech. ME – I Semester

(4G57C) CAD / CAM LAB

1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.

2. **PART MODELING:** Generation of various 3D Models through Protrusion, revolve, and shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.

3.
   a) Determination of deflection and stresses in 2D and 3D trusses and beams.
   b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
   c) Determination of stresses in 3D and shell structures (at least one example in each case)
   d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
   e) Steady state heat transfer Analysis of plane and Axi-symmetric components.

4.
   a) Development of process sheets for various components based on tooling Machines.
   b) Development of manufacturing and tool management systems.
   c) Study of various post processors used in NC Machines.
   d) Development of NC code for free form and sculptured surfaces using CAM packages.
   e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
   f) Quality Control and inspection.

Any Six Software Packages from the following:
Use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G581) PRODUCTION AND OPERATIONS MANAGEMENT

COURSE OBJECTIVE:

- To make the students understand the functions of production planning & control, generating of new products, issues in product design and strategies of aggregate planning.
- To provide the knowledge on principles of forecasting, forecasting methods, types and its accuracy.
- To provide the knowledge on facilities location, various types layouts and assembly line balancing.
- To provide the knowledge on lean management, concepts of JIT, six sigma, quality control, MRP,ERP and LOB.
- To make the students understand the inventory management and scheduling techniques.

UNIT I: Production – Products – types – design of goods & services – Functions of Production & Operations Management – Production Vs Productivity – Productivity measurement – Product design & analysis – new product development and its concepts.

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

UNIT II: Factors affecting facilities location, mathematical models for facilities, location, Types of facilities- layout: product layout, process layout, group technology layout, Assembly line balancing, computerized layout algorithms: ALDEP, CRAFT, CORELAP.

UNIT III: Aggregates planning - Strategies for aggregates planning, aggregate planning using O.R. Models, Chase planning, Expediting, controlling aspects.

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P– Systems and Q-Systems-(S, s) Policy.

UNIT IV: Scheduling Policies – Techniques, flow shop and job shop Scheduling techniques.
MRP, – lot sizing techniques in MRP, introduction to ERP and types, LOB (Line of Balance).

UNIT V: Lean Management, philosophy and creation of lean enterprise, JIT concepts-Kanban System-Elements of total quality management – 14 principles, Six Sigma Quality Control.

Text books:

1. Baffa & Rakesh Sarin, *Modern Production, Operations Management.*
2. B. Mahadevan, *Operation Management.* Pearson Edu.
3. Adam & Ebert, *Production & Operations Management: Concepts, Models and Behavior*. PHI, 5th Ed.

Reference books:

1. S.N. Chary, *Operations Management.* TMH.
2. Martin K. Starr and David W. Miller. *Inventory Control Theory and practice.*
3. John E. Biegel, *Production Control A Quantitative Approach.*
4. Kanishka Bedi, *Production & Operations Management.* Oxford Univ Press.

Course outcomes:

- Students can get the concepts on Production planning & control operations and its functions, productivity and productivity measurements, design of goods and services.
- Student will be able to understand where the plant is to be located based on facilities available and what are the important factors affecting the facilities location of a plant, and plant layout. And also able to understand plant layout design to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time.
- Student will be able to understand the aggregate planning and various aggregate planning strategies using OR models. And also students will know about the inventory management and its types, then the control systems.
- student will be able to understand the scheduling policies, flow shop and job shop scheduling techniques and concepts of Inventory, Classification, Functions, its associated costs etc., and also able to recognize the importance of Inventory control to ensure their availability with minimum capital lock up. Student will also know about the material requirement planning and its types, enterprise resource planning and line of balance.
- Students can understand the how philosophy of lean management applied to develop lean enterprise and basic concepts JIT, Six sigma control etc.,

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G582) POWER PLANT ENGINEERING

COURSE OBJECTIVE:

- To understand the student present day energy demand.
- To make the student to aware of components of power plants that run using conventional and nonconventional methods, factors affecting the site selection for a power plant and concept of base load plant and peak load plant.
- To enable the student to recognize the importance of secondary energy source.

UNIT –I

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

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

UNIT –II

STEAM POWER PLANT -COMBUSTION PROCESS:

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

UNIT –III

INTERNAL COMBUSTION ENGINE PLANT-DIESEL

POWER PLANT: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

GAS TURBINE PLANT: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT –IV

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

Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.
NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation- radioactive waste disposal.

UNIT –V
POWER FROM NON-CONVENTIONAL SOURCES:
Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.
POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

Text book:
1. Rajput. R.K., *A Text Book of Power Plant Engineering*. LaxmiPubl, 2007, 4th Ed.
2. P.C.Sharma ,*Power Plant Engineering*. S.K.Kataria Publ.

Reference books:
1. P.K.Nag, *Power Plant Engineering.* TMH, 2nd Ed.
2. Ram lingam, *Power plant Engineering*. Scietech Publ.
3. Arora and S. Domkundwar.*A Course in Power Plant Engineering*.
4. C. Elanchezian and others, *Power Plant Engineering.* I.K. International, 2010.

Course Outcomes:

- Student can recognize the importance of power production suited to the demand. Student can have an idea of various power plants. Student can know the impact of power plants on the environment.

- Student is able to understand the latest high pressure boilers, concept of fluidized bed combustion and importance of handling and storage. Student can able to learn the waste heat recovery methods. In addition, student can know various cooling towers and its application.

- Student can grasp concepts of diesel power plant and gas turbine plants. Student can distinguish open cycle and closed cycle gas turbine cycles.

- Student can have knowledge on water power. Student can able to understand the methods of storing water and can have an idea over constructions of dams and spill ways. Student can enable to draw the layout of hydel power plant.

- Student can understand about the power plant economics.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G583) REFRIGERATION & AIR CONDITIONING
(Elective-III)

COURSE OBJECTIVES:

- This subject provides insights in how thermodynamic principles are applied within the refrigeration and air conditioning industry.
- Students will learn how real systems used in commercial, industrial refrigeration and air conditioning industries are built-up.
- The objective in this subject is to make the student to have complete knowledge on various refrigeration methods like VCR, VAR and latest developments, knowledge on various air conditioning methods like summer, winter and year round air conditioning and to make the student to understand the practical applications of refrigeration and air conditioning systems.

UNIT I INTRODUCTION TO REFRIGERATION: Necessity and applications – Unit of refrigeration and C.O.P. – Different refrigeration methods - Air Refrigeration: Ideal and Actual cycles, Open and Dense air systems –- problems – Refrigeration needs of Aircrafts.

UNIT II VAPOUR COMPRESSION REFRIGERATION: Basic cycle - working principle and essential components of the plant – COP – Representation η of cycle on T-S and P-h charts – Expander vs. Throttling, effect of sub cooling and super heating – cycle analysis – Actual cycle- Influence of various parameters on system performance – Construction and Use of P-h charts – numerical Problems.
Refrigerants – Desirable Properties – Common refrigerants used – Nomenclature.

UNIT III VAPOR ABSORPTION REFRIGERATION SYSTEM: Description and working of NH_3 – water system and Li Br –water (Two shell & Four shell) System -Calculation of max COP. Principle of operation of three Fluid absorption systems.
Steam Jet Refrigeration System – Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT IV INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes – Characterization of Sensible and latent heat loads — Need for Ventilation, Consideration of Infiltrated air – Heat Load concepts:

RSHF, GSHF- Problems.
Requirements of human comfort and concept of Effective Temperature- Comfort chart –Comfort Air Conditioning- Summer, winter & year round air conditioning- simple problems.

UNIT V AIR CONDITIONING EQUIPMENT: humidifiers – dehumidifiers – air filters, fans and blowers.
Heat Pump – Heat sources – different heat pump circuits.

Text books:

1. CP Arora, *Refrigeration and Air Conditioning.* TMH, 2008, 3rd Ed.
2. SC Arora & Domkundwar, *A Course in Refrigeration and Air conditioning*. Dhanpatrai.

Reference books:

1. Manohar Prasad, *Refrigeration and Air Conditioning*. New Age, 2nd Ed.
2. Dossat, *Principles of Refrigeration.* Pearson Edu., 4th Ed.
3. P.L.Ballaney, *Refrigeration and Air Conditioning*. Khanna Publ.
4. R.C.Arora, *Refrigeration and Air Conditioning*. PHI, 2010.

Tables/Codes: Thermal Engineering Data Book containing Refrigerant and Psychrometric property Tables and charts.

COURSE OUTCOMES:

- Understand fundamental refrigeration principles and understand the p-h chart and basic principle of vapour compression cycle.
- Able to determine the coefficient of performance of vapor compression system, Absorption system.
- Understand the various modifications of the basic refrigeration cycles in order to improve their efficiency.
- Understand the principles of air-conditioning and basic design considerations and explain types of air-conditioning systems.
- Understand the concepts of indoor environmental comfort Perform psychrometric calculations, humidity control and analysis of air-conditioning processes.
- Ability to understand the components of air conditioning system and describe the cooling equipment combinations. Student can describe the concept of human comfort chart and the processes by which the body produces and rejects heat.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G584) COMPUTATIONAL FLUID DYNAMICS
(ELECTIVE- III)

COURSE OBJECTIVES:

To develop an understanding of introductory concepts in computational fluid dynamics with emphasis on the numerical solution of ordinary and partial differential equations; solution of ODEs by numerical integration; finite difference and finite volume methods for parabolic, elliptic, and hyperbolic PDEs (techniques for single and multi-dimensional problems); numerical linear algebra. Ability to implement and utilize various numerical methods and basic mathematical analysis for canonical problems in fluid mechanics. To develop methodologies which facilitate the application of the subject to practical problems.

UNIT-I

GOVERNING EQUATIONS: Introduction – Various applications, Governing equations, continuity, momentum, energy equations, boundary conditions – Conservation and Non conservation form.

UNIT-II

MATHEMATICAL BEHAVIOUR OF PARTIAL DIFFERENTIAL EQUATIONS:

Mathematical Behaviour of Partial differential equations – Hyperbolic, Parabolic, Elliptic equations, Well posed problems, Difference equations, Explicit and Implicit approach, Errors and analysis of stability.

UNIT-III

GRID GENERATION:

Grid generation: general transformation of the equations, Matrices and Jacobians - Stretched and compressed grids - Boundary fitted coordinate systems - Modern developments in grid generation – Finite volume mesh generation, unstructured meshes and Cartesian meshes.

UNIT-IV

SOLUTION TECHNIQUES: Simple CFD Techniques: The Lax-Wendroff Technique - MacCormmack's Techinique - The relaxation technique and its use with low speed invicid flow - Artificial viscosity - Alternating Direction Implicit (ADI) technique - Pressure correction techniques.

UNIT-V

SIMPLE TECHNIQUES: Numerical solutions of quasi-one dimensional nozzle flows, numerical solution of a two-dimensional super-sonic flow: Prandtl-Meyer Expansion wave

Text Book

1. Anderson, J. D., *Computational Fluid Dynamics*, McGraw Hill International, New York, 1995.
2. Flecher,C.A., *Computational Techniques for Fluid Dynamics*, Vol. I to III, Springer-Verlag
publications, Berlin, 1988.

Reference Books

1. Versteeg, H. K. and Malalasekera, W., *An Introduction to Computational Fluid Dynamics and theFinite Volume Method*, Addison Wesley Longmen Limited, 1995.
2. Patankar, S. V., *Numerical Heat Transfer and Fluid Flow*, Hemisphere Publishing Corporation, 1980.
3. Hirsch and Charles, *Numerical Computation of Internal and External Flow*, Vol. I and II, Wiley, New
York, 1988.

Course Outcomes:

- An ability to identify, formulate, and solve engineering problems by approximating complex physical systems in fluid flow by simplified canonical models.
- A knowledge of fluid mechanics and its mathematical description.
- An ability to apply knowledge of mathematics and science to engineering by describing a continuous fluid-flow phenomena in a discrete numerical sense.
- An ability to use the techniques, skills, & engineering tools necessary for engineering practice by applying numerical methods to a "real-world" fluid-flow problem, integrating various numerical techniques in formulating a numerical solution method for that problem.
- An ability to analyze and interpret data obtained from the numerical solution of fluid flow problems.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G585) NON CONVENTIONAL SOURCES OF ENERGY
(ELECTIVE –III)

COURSE OBJECTIVES:

- To acquire sufficient knowledge on various types of renewable energy sources.
- Obtain basic principles, storage and applications on Solar Energy.
- To get knowledge on Sources and potentials of wind energy.
- To get awareness on bio-mass and bio-gas utilization.
- To get the working knowledge of geothermal energy, ocean energy and tidal & wave energy.
- An ability to get awareness on direct energy conversion.

UNIT I PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNITIII WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.
BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNITIV GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.
OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNITV DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Text books:

1. Tiwari and Ghosal,*Renewable energy resources*.Narosa.
2. G.D. Rai, *Non-ConventionalEnergy Sources*.

Reference books:

1. Twidell& Weir,*RenewableEnergy Sources*.
2. Khan, B.H., *Non-Conventional Sources*. TMH, 2009, 2nd Ed.
3. B.S.Magal Frank Kreith&J.F.Kreith, *Solar Power Engineering.*
4. Solanki, *Renewableenergy sources and emerging Technologies.* PHI.
5. Ashok V Desai, *Non-ConventionalEnergy.*WileyEastern
6. K.M. Mittal, *Non-ConventionalEnergySystems.* Wheeler publishers, New Delhi.

COURSE OUTCOMES:

- To understand the role and potential of new and renewable source.
- Able to understand the principle, storage and applications of solar energy.
- To understand the sources and potentials of wind energy
- To understand the Principles of Bio-Conversion of bio-mass and bio-gas uses.
- To understand the principle, working procedure and types of geothermal energy, ocean energy and tidal & wave energy.
- To know the knowledge on direct energy conversion.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G586) NANO TECHNOLOGY
(ELECTIVE-IV)

COURSE OBJECTIVES:

- To study about physics of the solid states individual and properties of nanoparticles like strength of nano crystalline, small angle neutron scattering
- To investigating and manipulating materials in the nano-scale
- To study in detail about Methods of Measuring Properties - microscopy, spectroscopy
- Nanotechnology in Diagnostics applications and practical usage of nanotechnology

UNIT –I

PHYSICS OF THE SOLID STATES INDIVIDUAL AND NANO PARTICLES:
Structure, energy bands, localized particles. Introduction, metal nanoclusters, semiconducting nano-particles, rare gas and molecular clusters, methods of synthesis

UNIT –II

PROPERTIES OF NANOPARTICLES:
Mechanical and Magnetic Properties: Strength of nano crystalline SiC, mechanical properties, magnetic properties. Super parmagnetism, magnetization of nano particles of magnetite, ESR spectroscopy, small angle neutron scattering

Electrical and Optical Properties: Switching glasses with nanoparticles, Electronic conduction with nano particles. Optical properties, special properties and the colored glasses.

UNIT –III

INVESTIGATING AND MANIPULATING MATERIALS IN THE NANOSCALE:
Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction. Methods of Measuring Properties - microscopy, spectroscopy

UNIT –IV

MICROELECTRONICS, SMARTER COMPUTERS, FASTER INTERNET AND CHEAPER ENERGY:

Introduction, nano manufacturing product strategy considering future impacts, identifying potential synergies, existing technologies, future nano electronic device technologies, photonics. Building a better Digital brain, routing information at the speed of light, nano flying electronics, getting energy and a cleaner environment with nanotech.

UNIT –V

NANOTECHNOLOGY AND YOU:

Developing of Nanomedicens, Nanotechnology in Diagnostics applications. Nanotechnology . The nature of ethics, ethics of individual behaviour, promise of nanotechnology

Text books:

1. C. P. Poole and F. J. Owens, *Introduction to Nanotechnology*. Wiley.
2. K. Bandyopadhyay, *Nano Materials*. New Age International Publishers.
3. Nano Essentials., T. Pradeep, TMH.
4. M. Ratner and D. Ratner, *Nanotechnology: A Gentle Introduction to the Next Big Idea*. Pearson Education.
5. L. E. Foster, *Nanotechnology Science, Innovation, and Opportunity*. Pearson Eduction.
6. Richard Booker and Earl Boysen, *Nanotechnology the fun and easy way to explore the science of mater's smallest particles.* Wiley.
7. Christopher Kelty and Kristen Kulinowski, *Nanotechnology: Content and Context.*

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the basics of nano systems work
- Use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems
- Understand the major issues in producing a sustainable nanotech industry.
- Understand the properties of nano particles, electrical and optical properties of nano partials, nanotechnology.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G48D) NEURAL NETWORKS AND FUZZY LOGIC

(Common for CE & ME)

(ELECTIVE-IV)

COURSE OBJECTIVE:

- To study about basics of neural networks and the importance of present demand in outside.
- To understand the different layers of the feed forward neural networks like adaptive liner neuron etc.
- To study in detail about General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms
- To understand basics of fuzzy technology and classification of fuzzy technology.

UNIT I:

INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS: Structure and functions of biological and artificial neural networks, Neural network architectures, Characteristics of neural networks, types of neuron activation functions, learning methods, Historical Developments, Evaluation of neural networks

UNIT II:

SINGLE LAYER FEED FORWARD NEURAL NETWORKS: McCulloch-Pitts Model, Adaptive Linear Neuron, Perceptron Model, Deltarule, Perceptron Convergence theorem.

MULTILAYER FEED FORWARD NEURAL NETWORKS: Generalized Delta Rule, Backpropogation Network, Learning Difficulties and Improvements,Counter Propagation Networks.

UNIT III: ASSOCIATIVE MEMORIES: Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm,

HOPFIELD NETWORKS: Architecture, Discrete and Continuous versions, Stability Analysis, Adaptive Resonance Theory Networks.

UNIT IV: CLASSICAL & FUZZY SETS: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions**,** **FUZZY LOGIC SYSTEM COMPONENTS**: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT V: NEURAL NETWORKS APPLICATIONS: Process identification, control, fault diagnosis and load forecasting.

FUZZY LOGIC APPLICATIONS: Fuzzy logic control and Fuzzy classification

Text books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S. N. Sivanandam, S. Sumathi, S. N. Deepa, TMH, 2006

Reference books:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the basics of neural networks
- Know the different layers of neural networks in feed forward.
- Understand the major applications of neural networks and FUZZY technology.
- Understand the different layers associate memories like BAM and BAM algorithms. Classification of FUZZY sets and FUZZY logic system components.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)
IV Year B. Tech. ME – II Semester

(4G587) SUPPLY CHAIN MANAGEMENT
(ELECTIVE-IV)

COURSE OBJECTIVES:

Supply Chain Management involves the flows of materials and information among all of the firms that contribute value to a product, from the source of raw materials to end customers. We will integrate issues from finance (investments in productive assets), marketing (channels of distribution), logistics, and operations management to develop a broad understanding of a supply chain. By taking a strategic perspective, we will focus on relatively long term decisions involving the investment in productive resources, configuration of processes, product designs, and development of partnerships with suppliers and channels of distribution**.**

UNIT I:

BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS and DESIGNING THE SUPPLY CHAIN NETWORK: Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

UNIT II:

FACILITY LOCATION AND CAPACITY ALLOCATION: Models for facility location and capacity allocation. Analytical problems

PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Managing multi-echelon cycle inventory, safety inventory determination. Optimum level of product availability. Managerial levers to improve supply chain profitability.

UNIT III:

SOURCING, TRANSPORTATION AND PRICING OF PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. International transportation. Analytical problems. Role Revenue Management in the supply chain.

UNIT IV:

MANAGING BULLWHIP EFFECT: Co-ordination in a supply chain - Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination.

UNIT V:

TECHNOLOGY IN THE SUPPLY CHAIN: The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of E-business in a supply chain.

Text book:

1. Sunil Chopra & Peter Meindl; *Supply Chain Management-Strategy, Planning & Operation*. Pearson Edu. Asia, 2001, ISBN: 81-7808-272-1.

Reference books:

1. Robert B Handfield, Ernest L Nichols, Jr., *Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems*. Pearson Edu. Inc, 2002, ISBN: 81-297-0113-8.
2. Jeremy F Shapiro, Duxbury; *Modelling the Supply Chain.* Thomson Learning, 2002, ISBN 0-534-37363.
3. David Simchi Levi, Philip Kaminsky & Edith Simchi Levi; *Designing & Managing the Supply Chain.* Mc Graw Hill.
4. Dr. Dale S. Rogers, Dr. Ronald S. Tibben-Lembke, *Going Backwards Reverse Logistics Trends and Practices*. University of Nevada, Reno, Center for Logistics Management.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the concepts on supply chain stages and decision phases of supply chain, supply chain flows with different strategies, supply chain network and frame work for design decisions.
- Understand about different models for facility location and capacity allocation with analytical problems.
- Understand how to manage cycle inventory and safety inventory determination, along this student will know about the managerial levers to improve supply chain profitability.
- Understand the role of transportation, factors affecting transportation decisions and international transportation characteristics.
- Understand the bullwhip effect in coordination the supply chain, obstacles to coordinate and managerial levers to achieve coordination.
- Understand the role of IT supply chain, supply chain IT framework, CRM, Internal SCM, SRM and the role of e-business in supply chain.