Academic Regulations
Programme Structure
&
Detailed Syllabus

Bachelor of Technology
(B. Tech)
(Four Year Regular Programme)
(Applicable for Batches admitted from 2020)

Mechanical Engineering

Department of Mechanical Engineering
GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING & TECHNOLOGY
Bachupally, Kukatpally, Hyderabad, Telangana, India
500 090

ACADEMIC REGULATIONS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAMME BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

GR20 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2020 Regulations (GR20 Regulations) are given here under. These regulations govern the programmes offered by the Department of Mechanical Engineering with effect from the students admitted to the programmes in

2020- 21 academic year.

1. **Programme Offered:** The programme offered by the Department is B. Tech in Mechanical Engineering, a four-year regular programme.

2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

3. **Admissions:** Admission to the B. Tech in Mechanical Engineering Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**

   a) Each Academic year of study is divided in to two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   d) The total credits for the Programme is160.
   e) Student is introduced to "Choice Based Credit System (CBCS)".
   f) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
   g) All the registered credits will be considered for the calculation of final CGPA.
   h) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.
   i) **Subject / Course Classification:** All subjects/ courses offered for the under graduate programme in E & T (B.Tech. degree programmes) are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	CourseDescription
1	BS	Basic Science Courses	Basic Science Courses
2	ES	Engineering Science Courses	Includes Engineering subjects
3	HS	Humanities and Social sciences	Includes Management courses
4	PC	Professional Core Courses	Includes core subjects related to the parent discipline/department/ branch of Engineering
5	PE	Professional Elective Courses	Includes elective subjects related to the parent discipline/ department/ branch of Engineering
6	OE	Open Elective Courses	Electives from other technical and/or emerging subjects
7	LC	Laboratory Courses	Laboratory Courses
8	MC	Mandatory Courses	Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge
9	PW	Project Work	Project work, seminar and internship in industry or elsewhere

5. **Award of B. Tech Degree:** A student will be declared eligible for the award of B. Tech Degree if he/she fulfills the following academic requirements:

a) He/She pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.

b) A student has to register for all the 160 credits and secure all credits.

c) A student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the date of admission, shall forfeit his/her seat in B. Tech course.

d) The Degree of B. Tech in Computer Science and Engineering shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. Attendance Requirements:

a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.

d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case becondoned.

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek reregistration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

7. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment:

a) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.

b) Distribution and Weightage of marks

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Practical	30	70	100
3	Engineering Graphics	30	70	100
4	Mini Project	30	70	100
5	Project Work	30	70	100

c) Continuous Internal Evaluation and Semester End Examinations: The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as shown in the following Table.

Assessment Procedure:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	30	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 20 markseach for a durationof 2 hours. Average of the two mid exams shall be considered **i) Subjective - 15marks** **ii) Objective - 5marks** **2) Tutorials - 5marks** **3) Continuous Assessment– 5 marks**
		70	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	30	Internal Examination & Continuous Evaluation	**i) Internal Exam-10marks** **ii) Record - 5marks** **iii) ContinuousAssessment - 15 marks**
		70	Semester end examination	The semester-end examination is for a duration of 3 hours

d) Mini Project with Seminar: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. The supervisor continuously assesses the students for 20 marks (Continuous Assessment – 15 marks, Report – 5 marks). At the end of the semester, Mini Project shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by Mini Project Review Committee for 10 marks. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 70 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

e) Summer Internship: Summer Internship shall be done by the student in the summer break after III B. Tech II Semester and shall be evaluated in IV B. Tech I Semester along with the Project Work (Phase I).

f) Project Work (Phase–I and Phase-II): The project work is evaluated for 100 marks. Out of 100, 30 marks shall be for internal evaluation and 70 marks for the external evaluation. The supervisor assesses the student for 20 marks (Continuous Assessment – 15 marks, Report –5 marks). At the end of the semester, projects shall be displayed in the

road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Project Review Committee for 10 marks. The external evaluation for Project Work is a Viva-Voce Examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 70 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor. These rules are applicable for both Phase I and PhaseII.

Plagiarism check is compulsory for project work report (Phase I and PhaseII) as per the plagiarism policy of GRIET.

g) EngineeringGraphics:

- Two internal examinations, each is of 10 marks. The average of the two internal tests shall be considered for the award ofmarks.
- Submission of day to day work - 15marks.
- Continuous Assessment - 5marks.

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.

9. **Re-evaluation of the End Examination Answer Books:** A student can request for re- evaluation of his/her answer book on payment of a prescribed fee.

10. **Supplementary Examinations:** A student who has failed to secure the required creditscan appear for a supplementary examination, as per the schedule announced by the College.

11. **Malpractices in Examinations:** Disciplinary action shall be taken in case ofmalpractices during Mid / End-examinations as per the rules framed by the Academic Council.

12. **Academic Requirements and PromotionRules:**

a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.

b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	(i) Regular course of study of first year secondsemester. (ii) Must have secured at least 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether thestudent takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year secondsemester (ii) Must have secured at least 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether thestudent takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	(i) Regular course of study of third yearsecond semester. (ii) Must have secured at least 60% credits up to third year second semester fromall the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

13. **Grade Points: A 10 - point grading system with corresponding letter gradesand percentage of marks, as given below, is followed**

Letter Grade	Grade Point	Percentage of marks
O (Outstanding)	10	Marks >= 90
A+ (Excellent)	9	Marks >= 80 and Marks < 90
A (Very Good)	8	Marks >= 70 and Marks < 80
B+ (Good)	7	Marks >= 60 and Marks < 70
B (Average)	6	Marks >= 50 and Marks < 60
C (Pass)	5	Marks >= 40 and Marks < 50
F (Fail)	0	Marks < 40
Ab (Absent)	0	

Earning of Credit:
A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-P. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.
Computation of SGPA and CGPA:
The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i) S_k the SGPA of k^{th} semester(1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

$$\text{SGPA } (S_k) = \sum_{i=1}^{n} (C_i * G_i) / \sum_{i=1}^{n} C_i$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n is the number of courses registered in that semester. ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by student over all the semesters of a programme, i.e., upto and inclusive of S_k, where $k \geq 2$.

$$\text{CGPA} = \sum_{i=1}^{m} (C_i * G_i) / \sum_{i=1}^{m} C_i$$

iii) The SGPA and CGPA shall be rounded off to 2 decimal points.

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the160 credits.

	Class Awarded	CGPA Secured
14.1	First Class With Distinction	CGPA >= 8.00 with no F or below grade/ detention anytime during the programme
14.2	First Class	CGPA >= 8.00 with rest of the clauses of 14.1 not satisfied
14.3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
14.4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
14.5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

15. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be with held and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

16. **Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

17. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Programme, may be considered eligible for readmission/re-registration to the same or equivalent subjects as and when they are offered.

18. **General Rules**

    a) The academic regulations should be read as a whole for the purpose of any interpretation.

    b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

    c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.

    d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Academic Regulations for B.Tech (Lateral Entry) under GR20

(Applicable for Batches Admitted from 2021-2022)

1. All regulations as applicable for B.Tech Four year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules

a) Pursued programme of study for not less than three academic years and not more than six academic years.

b) A student should register for all 123 credits and secure all credits. The marks obtained in all 123 credits shall be considered for the calculation of the final CGPA.

c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. Academic Requirements and Promotion Rules:

a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.

b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester.	Regular course of study of second year first semester.
2	Second year second semester to third year first semester.	(i) Regular course of study of second year second semester. (ii) Must have secured at least 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
3	Third year first semester to third year second semester.	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester.	(i) Regular course of study of third year second semester. (ii) Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

5	**Fourth year first semester to fourth year second semester.**	**Regular course of study of fourth year first semester.**

3. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 123 credits.

	Class Awarded	CGPA Secured
3.1	**First Class With Distinction**	**CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme**
3.2	**First Class**	**CGPA >= 8.00 with rest of the clauses of 3.1 not satisfied**
3.3	**First Class**	**CGPA ≥ 6.50 and CGPA < 8.00**
3.4	**Second Class**	**CGPA ≥ 5.50 and CGPA < 6.50**
3.5	**Pass Class**	**CGPA ≥ 5.00 and CGPA < 5.50**

GOKARAJURANGARAJUINSTITUTE OF ENGINEERINGANDTECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India. (040)65864440

MECHANICAL ENGINERING

B. Tech (ME) – GR20 Course Structure

I B. Tech (ME) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR20A1001	Linear Algebra and Differential Calculus	3	1	0	4	3	1	0	4	30	70	100
2	Physics	BS	GR20A1004	Engineering Physics	3	1	0	4	3	1	0	4	30	70	100
3	English	HS	GR20A1006	English	2	0	0	2	2	0	0	2	30	70	100
4	CSE	ES	GR20A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	30	70	100
5	ME	ES	GR20A1010	Engineering Graphics	1	0	2	3	1	0	4	5	30	70	100
6	Physics	BS	GR20A1013	Engineering Physics Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
7	CSE	ES	GR20A1016	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	English	HS	GR20A1015	English Language and Communication Skills Lab	0	0	1	1	0	0	2	2	30	70	100
		TOTAL			**11**	**3**	**6**	**20**	**11**	**3**	**12**	**26**	**240**	**560**	**800**
9	Mgmt	MC	GR20A1021	Life skills and Personality Development	1	**0**	0	1	**2**	**0**	0	2	30	70	100

I B. Tech (ME) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR20A1002	Differential Equations and Vector Calculus	3	1	0	4	3	1	0	4	30	70	100
2	Chemistry	BS	GR20A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	30	70	100
3	ME	ES	GR20A1009	Engineering Mechanics	3	1	0	4	3	1	0	4	30	70	100
4	CSE	ES	GR20A1011	Data Structures	2	1	0	3	2	1	0	3	30	70	100
5	Chemistry	BS	GR20A1014	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
6	CSE	ES	GR20A1018	Data Structures Lab	0	0	1	1	0	0	2	2	30	70	100
7	ME	ES	GR20A1019	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	30	70	100
		TOTAL			**12**	**4**	**4**	**20**	**12**	**4**	**08**	**24**	**210**	**490**	**700**
8	Mgmt	MC	GR20A1020	Design Thinking	1	0	0	1	2	0	0	2	30	70	100

II B.Tech- I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext.	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC	GR20A2038	Kinematics of Machinery	3	0	0	3	3	0	0	3	30	70	100
2	ME	PC	GR20A2039	Materials Engineering	2	1	0	3	2	1	0	3	30	70	100
3	EEE	ES	GR20A2017	Basic Electrical and Electronics Engineering	3	0	0	3	3	0	0	3	30	70	100
4	ME	PC	GR20A2040	Strength of Materials	3	0	0	3	3	0	0	3	30	70	100
5	ME	PC	GR20A2041	Thermodynamics	3	0	0	3	3	0	0	3	30	70	100
6	ME	PC	GR20A2042	Machine and Production Drawing Lab	0	0	2	2	0	0	4	4	30	70	100
7	ME	PC	GR20A2043	Strength of Materials Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	ME	PC	GR20A2044	Materials Science and Metallurgy Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
Total					**14**	**1**	**5**	**20**	**14**	**1**	**10**	**25**	**240**	**560**	**800**
9	IT	MC	GR20A2007	Java for Engineers	2	0	0	2	2	0	0	2	30	70	100

II B.Tech- II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext.	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC	GR20A2045	Thermal Engineering	3	0	0	3	3	0	0	3	30	70	100
2	ME	PC	GR20A2046	Fluid Mechanics and Fluid Machines	3	0	0	3	3	0	0	3	30	70	100
3	ME	PC	GR20A2047	Dynamics of Machinery	3	0	0	3	3	0	0	3	30	70	100
4	Maths	BS	GR20A2005	Probability and Statistics	3	0	0	3	3	0	0	3	30	70	100
5	ME	PC	GR20A2048	Manufacturing Process	2	1	0	3	2	1	0	3	30	70	100
6	ME	PC	GR20A2049	Thermal Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
7	ME	PC	GR20A2050	Manufacturing Process Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	ME	PC	GR20A2051	Fluid Mechanics and Fluid Machines Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
Total					**14**	**1**	**5**	**20**	**14**	**1**	**10**	**25**	**240**	**560**	**800**
9	Mgmt	MC	GR20A2003	Constitution of India	2	0	0	2	2	0	0	2	30	70	100
10	CSE	MC	GR20A2006	Data Base for Engineers	2	0	0	2	2	0	0	2	30	70	100

III Year I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC		Machine Design	2	1	0	3	2	1	0	3	30	70	100
2	Mgmt	HS		Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	30	70	100
3	ME	PC		Manufacturing Technology	3	0	0	3	3	0	0	3	30	70	100
4	ME	PC		Applied Thermodynamics	2	0	0	2	3	0	0	3	30	70	100
5	ME	PE		Professional Elective-I	3	0	0	3	3	0	0	3	30	70	100
6	ME	OE		Open Elective-I	3	0	0	3	3	0	0	3	30	70	100
7	ME	PC		Manufacturing Technology Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	ME	PC		Metrology Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
Total					**16**	**1**	**3**	**20**	**14**	**1**	**9**	**24**	**240**	**560**	**800**

PROFESSIONAL ELECTIVE – I				
S. No.	BOS	Group	Course Code	Course
1	ME	PE		Metrology and Surface Engineering
2	ME	PE		Solid Mechanics
3	ME	PE		IC Engines
4	ME	PE		Intelligent Manufacturing Systems

III B.Tech-II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC		Design of Machine Elements	3	0	0	3	3	0	0	3	30	70	100
2	ME	PC		Heat Transfer	2	1	0	3	2	1	0	3	30	70	100
3	Mgmt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	30	70	100
4	ME	PE		Professional Elective-II	3	0	0	3	3	0	0	3	30	70	100
5	ME	OE		Open Elective-II	3	0	0	3	3	0	0	3	30	70	100
6	ME	PC		Computer aided Modeling and 3D Printing Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
7	ME	PC		Heat Transfer Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	ME	PW		Mini Project and Seminar	0	0	2	2	0	0	4	4	30	70	100
Total					**14**	**1**	**5**	**20**	**14**	**1**	**10**	**25**	**240**	**560**	**800**
9	Mgmt	MC		Value Ethics and Gender Culture	2	0	0	2	2	0	0	2	30	70	100

PROFESSIONAL ELECTIVE – II				
S. No.	BOS	Group	Course Code	Course
1	ME	PE		Composite Materials
2	ME	PE		Design for Manufacturing
3	ME	PE		Non-Conventional Energy Sources
4	ME	PE		Microprocessor in Automation

IV B.Tech-I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext.	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC		CAD/CAM	3	0	0	3	3	0	0	3	30	70	100
2	ME	PC		Instrumentation and Control Systems	3	0	0	3	3	0	0	3	30	70	100
3	ME	PE		Professional Elective-III	3	0	0	3	3	0	0	3	30	70	100
4	ME	PE		Professional Elective-IV	3	0	0	3	3	0	0	3	30	70	100
5	ME	OE		Open Elective-III	3	0	0	3	3	0	0	3	30	70	100
6	ME	PC		Instrumentation and Control Systems Lab	0	0	2	2	0	0	3	3	30	70	100
7	ME	PC		Computer Aided Analysis and Manufacturing Lab	0	0	2	2	0	0	3	3	30	70	100
8	ME	PW		Project Work-Phase I	0	0	6	6	0	0	12	12	30	70	100
Total					**15**	**0**	**10**	**25**	**15**	**0**	**18**	**33**	**240**	**560**	**800**
9	Chemistry	MC		Environmental Science	2	0	0	2	2	0	0	2	30	70	100

PROFESSIONAL ELECTIVE – III				
S. No.	BOS	Group	Course Code	Course
1	ME	PE		Finite Element Analysis
2	ME	PE		Tribology
3	ME	PE		Refrigeration and Air Conditioning
4	IT/CSE	PE		Internet of Things for Engineers

PROFESSIONAL ELECTIVE – IV				
S. No.	BOS	Group	Course Code	Course
1	IT/CSE	PE		Artificial Intelligence for Engineers
2	ME	PE		Automobile Engineering
3	ME	PE		Computational Fluid Dynamics
4	ME	PE		Automation in Manufacturing

IV B.Tech-II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC		Rapid prototyping and Tooling	3	0	0	3	3	0	0	3	30	70	100
2	ME	PE		Professional Elective-V	3	0	0	3	3	0	0	3	30	70	100
3	ME	PE		Professional Elective-VI	3	0	0	3	3	0	0	3	30	70	100
4	ME	PW		Project Work-Phase II	0	0	6	6	0	0	12	12	30	70	100
Total					9	0	6	**15**	**9**	**0**	**12**	**21**	**120**	**280**	**400**

PROFESSIONAL ELECTIVE – V				
S. No.	BOS	Group	Course Code	Course
1	ME	PE		Sustainable Manufacturing
2	IT/CSE	PE		Virtual and Augmented Reality for Engineers
3	ME	PE		Gas Dynamics and Jet Propulsions
4	ME	PE		Un-Conventional Machining Processes

PROFESSIONAL ELECTIVE – VI				
S. No.	BOS	Group	Course Code	Course
1	ME	PE		Production Planning and Control
2	ME	PE		Mechanical Vibrations
3	ME	PE		Power plant Engineering
4	IT/CSE	PE		Block Chain Technology for Engineers

PROFESSIONAL ELECTIVES			
MANUFACTURING	**DESIGN**	**THERMAL**	**AUTOMATION**
Metrology and surface Engineering	Solid Mechanics	IC Engines	Intelligent Manufacturing Systems
Composite Materials	Design for Manufacturing	Non-Conventional Energy Sources	Microprocessor In Automation
Finite Element Analysis	Tribology	Refrigeration And Air Conditioning	Internet of Things for Engineers
Artificial Intelligence for Engineers	Automobile Engineering	Computational Fluid Dynamics	Automation in Manufacturing
Sustainable Manufacturing	Virtual and Augmented Reality for Engineers	Gas Dynamics and Jet Propulsions	Un-Conventional Machining Processes
Production Planning And Control	Mechanical Vibrations	Power plant Engineering	Block Chain Technology for Engineers

OPEN ELECTIVES FOR GR20 REGULATIONS:

THREAD 1	THREAD 2	OFFERED BY
1.Soft Skills and Interpersonal Communication 2.Human Resource Development and Organizational Behaviour 3.Cyber Law and Ethics 4.Economic Policies in India	1. Principles of E-Commerce 2. Business Analytics 3. Augmented Reality & Virtual Reality	**CSE**
	1.Internet of Things 2.Augmented Reality & Virtual Reality 3.Human Computer Interaction	**CSE (AIML)**
	1. Augmented Reality & Virtual Reality 2.Internet of Things 3.Human Computer Interaction	**CSE (DS)**
	1. Artificial Intelligence 2. Human Computer Interaction 3. Data Science	**IT**
	1. Non-Conventional Energy Sources 2. Machine Learning 3. Artificial Intelligence Techniques	**EEE**
	1. Artificial Neural Networks 2. Software Defined Radio and Cognitive Radio 3. Fundamentals of Mimo Wireless Communications	**ECE**
	1. Operations Research 2. Robotics 3. Mechatronic Systems	**ME**
	1. Engineering Materials for Sustainability 2. Geographic Information Systems and Science 3. Environmental Impact Assessment and Life Cycle Analyses	**CE**

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS

Course Code: GR20A1001 **L/T/P/C: 3/1/0/4**

I Year I Semester

Course Objectives:

1. Apply ideas to solve linear systems, at the core of many engineering concepts.
2. Apply concept of latent values of a matrix which is critical in many engineering applications.
3. Take part in, function approximation using the tools of mean value theorems.
4. Compose optimal values of multi-variable functions.
5. Utilize definite integral concept for various geometrical applications.

Course Outcomes:

At the end of the course, the student will be able to:

1. Compile the rank of a matrix to determine the existence of solutions of a linear algebraic system
2. Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
3. Determine approximate solution of over determined systems using the pseudo inverse.
4. Develop the skill of determining optimal values of multivariable functions using classical method**s.**
5. Apply the definite integral concept for various computational problems in geometry.

UNIT I

VECTOR AND MATRIX ALGEBRA

Vector space (definition and examples), linear independence of vectors, orthogonality of vectors, projection of vectors Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices; Rank of a matrix by echelon reduction, Solution of a linear algebraic system of equations (homogeneous and non-homogeneous)

UNIT II

MATRIX EIGENVALUE PROBLEM AND QUADRATIC FORMS

Determination of eigen values and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof), diagonalization of a matrix, orthogonal diagonalization of symmetric matrices, Similarity of matrices

Quadratic Forms: Definiteness and nature of a quadratic form, reduction of quadratic form to canonical form by orthogonal transformation

UNIT III

MATRIX DECOMPOSITION AND PSEUDO INVERSE OF A MATRIX

Spectral decomposition of a symmetric matrix, L-U decomposition,Gram-Schmidt orthonormalization of vectors, Q-R factorization, Singular value decomposition

Moore-Penrose pseudo inverse of a matrix, least squares solution of an over determined system of equations using pseudo inverse

UNIT IV

MULTIVARIABLE DIFFERENTIAL CALCULUS AND FUNCTION OPTIMIZATION:

Partial Differentiation: Total derivative. Jacobian; Functional dependence

Unconstrained optimization of functions using the Hessian matrix, constrained optimization using Lagrange multiplier method

UNIT V

SINGLE VARIABLE CALCULUS

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem and Taylor's theorem (without proof), their geometrical interpretation, approximation of a function by Taylor's series

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (for Cartesian coordinates)

TEXTBOOKS

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thedition,Pearson, Reprint.

REFERENCES:

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS

Course Code: GR20A1004 **L/T/P/C: 3/1/0/4**

I Year I Semester

Course Objectives:

1. Understand interaction of light with matter through interference and diffraction phenomena.
2. Discuss the use of lasers as light sources in optical fiber applications.
3. Outline the behavior of free electrons in materials.
4. Study the properties and fabrication methods of nanomaterials.
5. Recognize the basic concepts of Acoustics and ultrasonic.

Course Outcomes:

At the completion of this course, students will be able to:

1. Apply the principles of interference and diffraction of light in engineering applications.
2. Analyze the properties of Laser and its propagation in different types of optical fibers.
3. Classify materials based on the theory of Kronig Penny model.
4. Understand the nature and characterization of nanomaterials and its applications.
5. Comprehend the concepts of Acoustics and Non-destructive testing in solving engineering problems.

UNIT I

Wave Optics: Superposition of waves and interference of light by wave front splitting and amplitude splitting, Young's double slit experiment, Interference in thin films by reflection, Newton's rings, Difference between interference and diffraction, Fraunhofer diffraction from a single slit, Diffraction grating, Grating spectrum and resolving power, Determination of wavelength of light using diffraction grating.

UNIT II

Lasers: Interaction of radiation with matter: Absorption, Spontaneous emission and Stimulated emission, Characteristics of lasers, Einstein coefficients, Resonating cavity, Active medium-Meta stable state, Pumping, Population inversion, Construction and working of Ruby laser and He-Ne laser, Applications of lasers.

Fiber Optics: Introduction, Principle and Structure of an optical fiber, Basic components in optical fiber communication system, Comparison of optical fibers over conventional cables, Acceptance angle-Numerical aperture, Types of fibers, Losses associated with optical fibers, Applications of optical fibers.

UNIT III

Introduction to solids: Fermi Energy level, Fermi distribution function, Bloch's theorem, Kronig – Penny model (Qualitative), E-K diagram, Brillouin Zones, Effective mass of electron, Origin of energy bands, Classification of materials on the basis of energy bands, Intrinsic and extrinsic semiconductors (Qualitative), Direct and Indirect band gap semiconductors.

UNIT IV

Engineered semiconductor materials: Nanomaterials, Introduction, Quantum confinement, Surface to volume ratio, Classification of nanomaterials as 0D, 1D, 2D and 3D (qualitative), Examples of low-dimensional systems such as quantum wells, wires and dots, Fabrication: Top-Down technique by CVD method, Bottom–Up technique by Sol-Gel method, Characterization techniques: SEM, TEM and EDAX.

UNIT V

Acoustics: Basic requirements of acoustically good hall, Reverberation and Reverberation time, Sabine's formula for Reverberation time (Qualitative), Measurement of absorption coefficient of a material, Factors affecting the architectural acoustics and their remedies.

Ultrasonic: Introduction, Classification of ultrasonic waves: Longitudinal waves, Transverse waves, Surface waves and Plate waves, Production of ultrasonic waves: Piezoelectric method and Magnetostriction method, Properties of ultrasonic waves, Applications of ultrasonic: SONAR and NDT (Pulse echo method).

Teaching methodologies:

- White board and marker
- Power Point Presentations
- Video lectures

Text Books:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. Mechanics, D S Mathur and P S Hemne, S Chand
3. I. G. Main, "Vibrations and waves in physics', 3rd Edn, Cambridge University Press, 2018
4. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
5. Engineering Physics, P.K Palanisamy, Scitech Publishers.
6. AjoyGhatak, "Optics", McGraw Hill Education, 2012

References:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006
2. O. Svelto, "Principles of Lasers"
3. "Introduction to Mechanics", M.K.Verma, Universities Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

Course Code: GR20A1006 **L/T/P/C: 2/0/0/2**

I Year I Semester

Course Objectives:

The course will help to

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop study skills and communication skills in formal and informal situations.
4. Understand the importance of defining, classifying and practice the unique qualities of professional writing style.
5. Employ the acquired knowledge in classroom with reference to various social and professional spheres thus leading to a life-long learning process

Course Outcomes:

Students will be able to

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view

UNIT I

Where the Mind is without Fear poem by Rabindranath Tagore

Vocabulary Building: The Concept of Word Formation-- The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading
Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II

The Last Leaf by O. Henry

Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-skills of Reading- Skimming and Scanning
Writing: Note Making, PrécisWriting, Writing an Abstract, Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence

UNIT III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary:Acquaintance with Prefixes and Suffixes from Foreign Languages in English toform Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers- Verbs and Tenses.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-Writing Formal LettersE.g. Letter of Complaint,Letter of Requisition, Use of phrases for formal and informal letter writing.

UNIT IV
'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: Standard Abbreviations in English and Phrasal Verbs
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Introduction and Conclusion -Essay Writing-Types of Essays- Picture Composition

UNIT V
'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Technical Vocabulary and their usage
Vocabulary: One Word Substitutes, Technical vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice
Writing:Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text Books:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR20A1007 **L/T/P/C: 2/1/0/3**

I Year I Semester

Course Objectives:

1. To interpret the various steps in program development.
2. To recall and recite the fundamentals, syntax and semantics of C programming language.
3. To illustrate problem solving using arrays, strings, structures and pointers.
4. To demonstrate using of structured and modular programming approach in solving problems.
5. To code, Interpret and debug the given program using files.

Course Outcomes:

1. To write algorithms and to draw flowcharts and remember and reuse the fundamentals of C language.
2. To apply decision making statements and arrays to solve problems.
3. To illustrate the need for strings and functions in problem solving.
4. To implement pointers and structures in writing programs.
5. To illustrate working with files and preprocessor directives in c.

UNIT I

Introduction to Programming: Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, Compiling &executing program, Syntax and logical errors.

Introduction to C Programming Language: Structure of c program,Variables, Data types, Constants,Operators, Expressions and precedence, Expression evaluation,Type conversion.

I/O: Simple input and output with formatted I/O and unformatted I/O.

UNIT II

Decision Making and Arrays: Conditional Branching and Loops: Conditional branching with if, if-else, nestedifelse, else if ladder, switch-case, Loops: for, while, do-while, Jumping statements: goto, break,continue.

Arrays: One and Two dimensional arrays, creating, Accessing and manipulating elements of arrays

Searching: Basic searching in an array of elements, Linear and Binary search.

UNIT III

Strings and Functions: Strings: Introduction to strings, Operations on characters, Basic string functions available in C (strlen, strcat, strcpy, strrev,strcmp), String operations without string handling functions, Arrays of strings.

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function(categories of functions), call by value,call by reference, passing arrays to functions, recursion, merits and demerits of recursive functions, Storage classes.

UNIT IV

Pointers and Structures: Pointers: Idea of pointers, Defining pointers, Pointer to pointer, void pointer, Null pointer, Pointers to Arrays and Structures, Function pointer.

Structures and unions: Defining structures, Initializing Structures, Array of structures, Arrays within structures, Nested structures, Passing structures to functions, Unions, typedef.

UNIT V

File handling and Preprocessor in C:

Files: Text and Binary files, Creating and Reading and writing text and binary files, Random access to files, Error Handling in files, Command line arguments, Enumeration data type.

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef,elif.

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3^{rd} Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16^{th} Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4^{th} Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GRAPHICS

Course Code: GR20A1010 **L/T/P/C: 1/0/4/3**

I Year I Semester

Course Objectives:

1. Provide basic conventions and standards used in Engineering Graphics.
2. Impart knowledge on various Engineering curves and their significance.
3. To draw orthographic, sectional and pictorial views of a given solid.
4. To develop skills in three dimensional visualization of engineering components.
5. To inculcate CAD packages on modelling and drafting.

Course Outcomes:

1. Familiarize with BIS standards and conventions used in engineering graphics.
2. Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g., plain, diagonal and Vernier scales.
3. Differentiate between first angle and third angle methods of projection and distinguish parallel and perspective projection.
4. Visualize different views like elevation and plan for a given line, plane figures or solid objects.
5. Apply drafting techniques and use 2D software e.g., AutoCAD to sketch 2D plane figures.

UNIT I

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance; **Conic Sections-** ellipse, parabola and hyperbola – General method only. **Cycloidal curves** –cycloid**,** epi-cycloid and hypo-cycloid; **Scales**– plain and diagonal.

UNIT II

Projections of Points, Lines and Planes: Introduction to principal planes of projections, **Projections of the points** located in same quadrant and different quadrants, **Projections of line** with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes. **Projections of regular planes** (polygons, circle and Square etc.,) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.

UNIT III

Projections of solids (regular and right solids only) - Classification of solids, Projections of solids (Cylinder, Cone, Pyramid and Prism) **Intersection of solids** – concept of lines of intersection and curves of intersection, intersection of solids (Prism Vs Prism and Cylinder Vs Cylinder) with their axes perpendicular to each other.

UNIT IV

Section of solids – Sectional views of solids (Cylinder, Cone, Pyramid and Prism) and the true shape of the section, **Development of surfaces-** Development of surfaces of solids (Cylinder, Cone, Pyramid and Prism).

UNIT V

Orthographic Projections: Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method;

Isometric Projections and Isometric View: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts, Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Introduction to CAD: (**For Internal Evaluation Weightage only**): Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

Text /Reference Books:

1. Engineering Drawing by N.D.BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD
2. Engineering Drawing by Basanth Agrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K.Venu Gopal/New Age Publications.
4. Engineering Graphics Essentials with AutoCAD 2018 Instruction by Kirstie Platenberg/SDC publications.
5. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers
6. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS LAB

Course Code: GR20A1013 **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Objectives:

1. Experiment with resonance phenomena using mechanical and electrical sources.
2. Analyze the mechanical properties of solid materials.
3. Recall the basic properties of light through hands on experience.
4. Apply the theoretical concepts of Lasers and optical fibers in practical applications.
5. Outline the characteristics of various semiconducting materials.

Course Outcomes: At the completion of this course, students will be able to:

1. Evaluate the frequency of tuning fork, spring constant through coupled oscillation and analyze the resonance phenomena in LCR circuit.
2. Compare the rigidity modulus of wires of different materials using Torsional pendulum.
3. Interpret the properties of light like interference and diffraction through experimentation.
4. Asses the characteristics of Lasers and infer the losses in optical fibers.
5. Identify the type of semiconductor by measuring energy gap.

LIST OF EXPERIMENTS:

1. Melde's experiment: To determine the frequency of a turning fork usingMelde's arrangement.

2. Torsional pendulum: To determine the rigidity modulus of the given wire using Torsional pendulum.

3. Newton's rings: To determine the radius of curvature of the lens by forming Newton's rings.

4. Diffraction grating: To determine the wavelength of the light source by using diffraction grating.

5. Dispersive power: To determine the dispersive power of prism by using spectrometer.

6. Coupled Oscillator: To determine the spring constant by single coupled oscillator.

7. LCR Circuit: To determine the resonant frequency and quality factor of LCR circuit in series and parallel.

8. LASER: To study the V-I and P-I characteristics of LASER sources.

9. Optical fiber: To determine the Numerical aperture and bending losses of Optical fibers.

10. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.

Note: Any 8 experiments are to be performed.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR20A1016 **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Objectives:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To write programs to create, read from and write to text and binary files.

Course Outcomes:

1. Formulate the algorithms for simple problems and translate algorithms to a working and correct program.
2. Identify, analyse and correct syntax and logical errors encountered during coding.
3. Interpret and implement programs using branching and looping statements.
4. Represent and manipulate data with arrays, strings and structures and use pointers.
5. Create, read and write to and from simple text and binary files and modularize the code with functions so that they can be reused.

TASK 1

a. Write a C program to implement operators in c?
b. Write a C program to find greatest and smallest among three numbers using conditional operator.
c. Write a C program to implicit and explicit type conversion in c?

TASK 2

a. Write a C program to swap two numbers using the following .
   i. Using third variable
   ii. Without using third variable
   iii. Using bitwise operators
b. Write a C program to add two numbers without using arithmetic operators in c?

TASK 3

a. Write a C program to find the roots of a quadratic equation using if-else.
b. The program should request the user to input two numbers and display one of the following as per the desire of user. (a). Sum of numbers (b) difference of numbers (c) product of the numbers (d)division of the numbers. Write a C program using switch statement to accomplish the above task.

TASK 4

a. Write a C Program check whether a given number is perfect number or not.
b. Write a C Program check whether a given number is palindrome number or not.
c. Write a C Program check whether a given number is Armstrong numberor not.

. **TASK 5**

a. Write a C program to display the following patterns.

i)
```
1
2 3
4 5 6
7 8 9 10
```

ii.
```
1
2 3
4 5 6
7 8 9 10
```

b. Write a C program to generate the prime numbers between x and y where x and y are starting and ending values to be supplied by the user.
c. Write a C program to calculate the following Sum:
    a. Sum=1+x/1!-x2/2!+x3/3!-x4/4!+…..xn/n!

TASK 6

1) Write a C program to find sum, average and minimum and maximum in a list of numbers.
2) Write a C program to implement linear search.
3) Write a C program to implement binary search.

TASK 7

a. Write a C program to implement matrix addition
b. Write a C program to implement matrix multiplication.

TASK 8

a. Write a C program to implement the following string handling functions.
    i.strlen() ii.strcpy() iii.strcmp() iv.strcat()
b. Write a C program to read first name , middle name and last name of a student and display a string full name without using string handling functions.

TASK 9

a. Write a C program to determine if a String is Palindrome or not.
b. Write a C program to sort the names of n students in the alphabetical order.

TASK 10

a. Write a C program to implement the following using recursive and non-recursive functions to find the factorial of a given integer.
b. Write a C program to implement the following using recursive and non-recursive functions to find the GCD (greatest common divisor) of two given integers

TASK 11

a. Write a C program to implement transpose of a matrix using functions.
b. Write a C program to display binary equivalent of a given decimal number.

TASK 12

a. Create astructure student with name ,rollno,marks of 3 subjects as members . Write a c program to sort student details based on total using structures and functions .
b. Write a C program that uses structures and functions to perform the following operations:
    i. Addition of two complex numbers
    ii. Subtraction of two complex numbers
    iii. Multiplication of two complex numbers

TASK 13

a. Write a C program using functions and pointers that compares two strings to see whether they are identical. The function returns 1 if they are identical, 0 otherwise.
b. Write a C program to sort list of numbers using pointers.

TASK 14

a. Write a C program to implement following pre-processor directives.
    i. define ii. ifdef iii. undef iv. ifndef.
b. Write a C program to create a user defined header file to find sum, product and greatest of two numbers ?

TASK 15

a. Write a C program to merge two files into a third file.
b. Write a C program to find some of n numbers using command line arguments.

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3^{rd} Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16^{th} Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. HerbertSchildt, C: The Complete Reference, McGraw Hill, 4^{th} Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course Code: GR20A1015 **L/T/P/C: 0/0/2/1**
I Year I Semester

Course Objectives:
The course will help to

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. Sensitize students to the nuances of English speech sounds, word accent, intonation rhythm and Neutralization of accent for intelligibility
3. Bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. Improve the fluency of students in spoken English and neutralize their mother tongue influence
5. Train students to use language appropriately for public speaking and interviews

Course Outcomes:
Students will be able to

1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. Evaluate and use a neutral and correct form of English.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Exercise I
CALL Lab:
Understand: Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.
Practice: Introduction to Phonetics– Speech Sounds – Vowels and Consonants.
ICS Lab:
Understand: Ice Breaking and JAM.
Practice: Ice-Breaking Activity and JAM Session. Introducing oneself and others

Exercise II
CALL Lab:
Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.
ICS Lab:
Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions- Telephone Etiquette

Exercise III
CALL Lab: -Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Understand: Intonation--Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
ICS Lab:
Understand: Debates- argumentative vs persuasive - Public Speaking – Exposure to Structured Talks.
Practice: Debates- Making a Short Speech – Extempore.

Exercise IV
CALL Lab:
Understand: Listening Skills and its importance-– Purpose- Process- Types- Barriers of Listening.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: How to make informal and Formal Presentations
Practice: Collages / Poster Presentations-Power point presentations

Exercise V
CALL Lab:
Understand: Listening for General/Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Story Telling – Narrating a story – Using appropriate language elements
Practice: Weaving Stories

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab**
2. **Interactive Communication Skills (ICS) Lab**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
LIFE SKILLS AND PERSONALITY DEVELOPMENT (LSPD)

Course Code: GR20A1021 **L/T/P/C: 2/0/0/1**

I Year I Semester

Course Objectives:

1. Understand the concepts such as "Time Management", "Managing Information Overload" and "How to cope with Peer pressure".
2. Become familiar with concepts like how to master "English Language Skills" and "Communication skills".
3. Be thorough with the '"science behind personal health management and addictions" and stress management.
4. Appreciate the importance of cultivating good hobbies, need for forming good habits and discarding bad habits and how to hold difficult conversations in crisis situations.
5. Understand the importance of creative thinking, continuous and lifelong learning and cross culture sensitization. They will know what is meant by collaboration and team working.

Course Outcomes:

At the end of the course, student should be able to

1. Apply the concept of Time Management to his own day to day life. They will also learn to cope with Information Overload, which has become a serious problem for the digital generation. They will be in a position to withstand harmful peer pressure, and steer themselves towards attaining their own objectives in the four years time they spend in the college.
2. Apart from understanding the importance of English language skills in a globalized world, they will leart the methodologies as to how they can master English Language skills. They will become familiar with the communication skills and etiquette, body language, non-verbal communication and they will start applying these concepts in their day to day life. This will help them to become thorough professionals in their career.
3. Large number of students are ignorant about the need for personal health management and the need to stay away from addictions. After this course, they will get a complete understanding of the biological basis behind these concepts. This will help them to maintain a robust health trough out their life and it will also keep them away from addictions like drug addiction, alcohol addiction & video games addiction. They will learn the techniques of stress management as well.
4. They would start cultivating some good hobbies which will help them to maintain ideal work-life balance throughout their life. The students would start discarding bad habits & will start picking up good habits. Further, they will learn the techniques of holding difficult conversations and negotiations, which is an important skill set in the 21st century world.
5. They will develop the aptitude for finding creative solutions to problems and they will come to realize the importance of continuous and lifelong learning in a fast changing technological landscape. They will appreciate why collaboration and team working skills are important for success in a modern world.

UNIT I

Introduction to life skills: Why life skills are important for students. Highly competitive job market; companies test not only Engineering knowledge but also life skills; Fast paced changes in technologies; proliferation of electronic gadgets and harmful online content; Even to perform well in B.Tech, students need basic life skills.

Time management: What is meant by time management; Impulsive behaviorVs goal directive behavior; The concept of time log; What are the usual time wasters for students; How to minimize time wasters.

Information overload and how to cope with it: ICT revolution; proliferation of electronic media; Exponential growth in online content; Impact of information overload on human brain; How information overload interferes with student learning.

UNIT II

How to master English Language Skills: Importance of English in a globalized world; For any engineer, the whole world is his job market; Companies conduct exams, interviews & group discussions in English; Interdependence of communication skills & language skills; Entrance exams to foreign universities test English language skills; What are the various language skills; Practical strategies to improve one's English language skills.

Communication Skills: What is communication; Various types of communication's; Why communication skills are important in the modern world; Importance given to communication by companies during recruitment; Barriers to effective communication; Practical strategies to improve one's communication skills.

Body language, Etiquette and Non-Verbal communication: What is etiquette, grooming, attire & body language? Why these are important in the modern world; What kind of etiquette is expected by companies; How success in career & life is interlinked to etiquette, grooming, attire & body language; practical steps to improve one's etiquette, grooming, attire & body language.

UNIT III

Science behind personal health management: Widespread ignorance in society on health issues; WHO definition of Health; Human evolution; Hunting & Gathering lifestyle; Importance of physical work for human body & mind; Dangers of sedentary lifestyle; Germ diseases Vs Lifestyle diseases; How to integrate physical exercise into daily life.

Science behind Addictions: What is an addiction? Neurology and hormonal basics of addictive behavior; How addictions are formed; Harmful effects of addictions on physical health & mental health; How to recognize the addictions in oneself; How to come out of addictions.

Stress management: What is stress; Various stressors faced by a student; Fight & Flight response of humans; Harmful effects of chronic stress; Symptoms of poor coping skills of stress; Stress & Psychiatric problems; Easy coping strategies for stress.

UNIT IV

Need for cultivating good hobbies: Why hobbies are important for maintaining work-life balance; how hobbies help in maintaining good physical and mental health, what are various hobbies.

What is habit? Why it is so important. How to cultivate good habits & discard bad habits: Why habits are critical for successful life; How habits forms; How to analyze one's own habits; How to recognize useless & harmful habits; How to cultivate & Sustain useful habits; Difference between hobby & habit.

Peer pressure and how to cope with it: Human being is a social animal; Physical pain & social pain; How to be aware of harmful social pressure; Role of prefrontal cortex in judgment and decision making; why teenagers are vulnerable to peer pressure; strategies to overcome harmful peer pressure.

UNIT V

Continuous & lifelong learning: Accelerated change in technology landscape; shorter & shorter life cycles of technologies; Need for continuous learning ; Engineering knowledge alone is not enough to solve the real-life problems.

Cross culture sensitization: What is culture; why there are different cultures; How to understand culture; Today all workplaces are multi-cultural; How stereotypes develop in the mind about other cultures; Dangersof stereotypes & culture hatred prevailing society; How to overcome the culture prejudices.

Collaboration & team working skills. Why collaboration is important to succeed in one's own career, Today's workplace is all about teams, what is team working, what are various team working skills, how to be a good team member.

Textbooks:

1. The story of the human body by Daniel E Lieberman, Published by Pantheon Books, 2013
2. Spark by Dr. John J Ratey, *Publisher* Little Brown *Spark* 01-01-2013.
3. Creative thinking by Edward De Bono, Publisher: Penguin UK (25 October 2016).

References:

1. The power of positive confrontation by Barbara Pachter; Publisher: Da Capo Lifelong Books (November 28, 1999) ...
2. Habit by Charles Duhigg, Publisher: Random House Trade Paperbacks,2012
3. Communication skills for engineers and scientists by Sangeetha Sharma and Binod Mishra, PHI Learning, 2009.
4. Time management by Brian Tracy, Publisher: AMACOM, 2014

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code: GR20A1002 **L/T/P/C: 3/1/0/4**

I Year II Semester

Course Objectives:

1. Knowledge to solve engineering problems governed by differential equations
2. The skill of evaluating multiple integrals needed for applications in mechanics and electro-magnetic field theory
3. The knowledge to interpret the functions arising in vector field theory and utilize mathematical tools for some computations
4. The skill of evaluating work done by a field and flux across a surface
5. The skill of utilizing specialized theorems for fast evaluation of work and flux

Course Outcomes:

After learning the contents of this paper the student must be able to

1. Classify the differential equations of first order and solve them analytically by suggested methods
2. Solve linear differential equations of higher order under various forcing functions
3. Evaluate double and triple integrals and apply them to some problems in geometry and mechanics
4. Apply vector differential operators on scalar and vector fields and apply them to solve some field related problems
5. Apply classical vector integral theorems for fast evaluation of work done around closed curves and flux across closed surfaces

UNIT I

ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER

LDE of the first order:Solution of Exact, Linear and Bernoulli equations, modeling Newton's law of cooling, growth and decay models, modeling of R-L circuit

UNIT II

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

LDE with constant coefficients: Complementary function, over damping, under damping and critical damping of a system, Particular integrals for *f(x)* of the form $e^{ax}, x^n, cosax, sinax, e^{ax}V(x)\ and\ x\,V(x)$where $V(x) \equiv cosax\ and\ sinax,$ the method of variation of parameters

LDE with variable coefficients: Cauchy's homogeneous equation, Legendre's homogeneous equations

UNIT III

MULTIPLE INTEGRALS

Double integrals:Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates)

Triple Integrals:Evaluation of triple integrals, Change of variables (Cartesian to Spherical and Cylindrical polar coordinates)

Applications: Area using the double integral –Volume of a solid using the double and triple integral- Mass, Center of mass and Center of gravity using double and triple integrals

UNIT IV

VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in cartesian framework, solenoidal field, irrotational field, scalar potential

Vector line integration: Evaluation of the line integral, concept of work done by a force field, Conservative fields

UNIT V

SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

Surface integration: Evaluation of surface and volume integrals, flux across a surface

Vector integral theorems: Green's, Gauss and Stokes theorems (without proof) and their applications

TEXT BOOKS

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
4. 4.. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES:

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR20A1005 **L/T/P/C: 3/1/0/4**

I Year II Semester

Course Objectives:

1. To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
2. To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
3. To identify and apply various principles of electrochemistry, corrosion and water treatment which are essential for an engineer in industry
4. To acquire knowledge of existence of different organic molecules in different stereo chemical orientations useful for understanding reaction pathways.
5. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.

Course Outcomes:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
3. Recognize various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and Interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

UNIT I

Atomic and Molecular Structure: (8 Lectures)

Atomic and molecularorbitals, Linear Combination of AtomicOrbitals (LCAO), Molecularorbitals of homo-nuclear diatomic molecules, MO energy diagrams of N_2, and O_2.

Metallic bonding, Valence Bond Theory, Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in tetrahedral, octahedral, and square planar geometries.

UNIT II

Spectroscopic Techniques and Applications: (10 Lectures)

Regions of electromagnetic spectrum, Molecular spectroscopy Rotational Spectroscopy: Rotation of molecules, rotational spectra of rigid diatomic molecules, selection rules.

Vibrational Spectroscopy: The vibrating diatomic molecule, simple and an harmonic oscillators of a diatomic molecule, selection rules, applications of IR spectroscopy.

NMR Spectroscopy: criteria for NMR activity (Magnetic and nonmagnetic nuclei), basic concepts and principle of 1H NMR spectroscopy, Chemical shift, Magnetic Resonance Imaging.

UNIT III

Electrochemistry and Corrosion: (12 Lectures)

Electrochemistry: Electrode potential, types of electrodes: calomel and glass electrodes-construction and working, electrochemical series and applications, electrochemical cells: Galvanic & electrolytic cells, Nernst equation- applications, numerical problems, Batteries: primary and secondary types, lithium metal, lithium ion and lead acid batteries. Types of Fuel cells: hydrogen-oxygen fuel cell - applications and advantages, microbial fuel cell.

Corrosion: Definition ,causes and effects of corrosion, The ories of chemical and electro chemical corrosion with mechanism, Types of corrosion - Galvanic, concentration cell and pitting corrosions, factors affecting corrosion (Nature of metal & Nature of Environment), corrosion control methods: Proper designing, cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- Galvanization and tinning, electroplating, electroless plating of nickel.

UNIT IV

Engineering Materials and Water Technology: (8 Lectures)

Semiconductors: Si and Ge, preparation, purification and crystal growth by zone refining and Czochralski pulling methods, doping.

Polymeric Materials: plastics-classification, types of polymerization, properties of polymers-crystallinity, Compounding and fabrication by compression moulding and injection moulding, conducting polymers – definition, classification, applications of conducting polymers in mobile phones and displays.

Water: impurities, hardness-causes of hardness, types, Units, Total Dissolved Solids (TDS), Boiler troubles-scales and sludges, caustic embrittlement, water purification by reverse osmosis (RO)method.

UNIT V

Stereochemistry and Energy Resources (8 Lectures)

Stereo chemistry: Representations of 3D structures for organic molecules, stereo isomers: Conformational and Configurational isomers. Conformational isomers: conformational analysis of n-butane. Configurational isomers: geometrical isomers (E, Z isomers) and optical isomers. Optical isomers: symmetry, chirality, enantiomers, diastereomers, optical activity. Structure, synthesis and pharmaceutical applications of aspirin and ibuprofen.

Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Petroleum-its composition-synthetic petrol – Fischer Tropsch's process, cracking - Definition and its significance, knocking and its mechanism in Internal Combustion engine, Octane rating, Composition and Uses of Natural gas, LPG and CNG, biodiesel synthesis, biogas.

Text Books:

1. Engineering chemistry by P.C. Jain and M. Jain; DhanpatRai Publishing Company (P) Ltd., NewDelhi.
2. Textbook of Engineering Chemistry by A. Jayashree, Wiley Publications

References:

1. Organic Chemistry by Morrison, Boyd &Bhattacharjee (Pearson Pubs)
2. Solomons' Organic Chemistry, Wiley pubs
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw HillPublication
4. ATextbookofEngineeringChemistrybyShashiChawla,DhanpatRaiPublishingCompany (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MECHANICS

Course Code: GR20A1009 **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Objectives:

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
4. Determine the forces in the members of the trusses.
5. Explain the concepts of work-energy method, impulse-momentum and its applications to translation, rotation and plane motion.

Course Outcomes:

At the end of the course students will be able to

1. Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and calculate moment of inertia of a given section.
4. Determine the forces in the members of the trusses
5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion of rigid bodies.

UNIT I
INTRODUCTION TO ENGINEERING MECHANICS - FORCE SYSTEMS

Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems ; Static Indeterminacy

UNIT II
FRICTION

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw Centroid and Centre of Gravity-Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications.

UNIT III
AREA MOMENT OF INERTIA

Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem, Mass Moment of Inertia , Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies

UNIT IV

ANALYSIS OF TRUSSES

Introduction, Classification of trusses, Assumptions made in the analysis of perfect truss, Methods of Analysis of Trusses- Method of Joints and Method of Sections. Principle of Virtual Work: Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums.

UNIT V

REVIEW OF PARTICLE DYNAMICS

Rectilinear motion, Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion, Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work- kinetic energy, power, potential energy. Impulse-momentum (linear, angular), Impact (Direct and oblique).

Text/Reference Books:

1. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics
2. A. Nelson, "Engineering Mechanics: Statics & Dynamics", Tata McGraw-Hill Education, 2009.
3. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
4. Andrew Pytel, JaanKiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
5. Beer F.P & Johnston E.R Jr. "Vector Mechanics for Engineers", TMH, 2004.
6. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
7. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
8. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
9. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES

Course Code: GR20A1011 **L/T/P/C: 2/1/0/3**

I Year II Semester

Course Objectives:

1. To impart the basic concepts of data structures, algorithms and various searching and sorting techniques.
2. To demonstrate operations of linear data structures like stacks and queues.
3. To develop algorithms to implement operations on linked lists.
4. To demonstrate operations of non-linear data structures trees and graphs.
5. To realize the merits and demerits and applications of various data structures.

Course Outcomes:

After completion of the course, the student will be able to

1. Analyze basic concepts of data structures, computation complexity and implement various searching and sorting techniques.
2. Apply various operations on linear data structures Stack and Queue and their applications.
3. Develop algorithms for operations on linked lists and convert them to programs.
4. Apply various operations on non-linear data structure tree.
5. Implement various graph traversals techniques and idea of hashing.

UNIT I

Sorting: Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort (Algorithms and implementation)

Algorithms: Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, Little oh notation and Little omega notation.

UNIT II

Stacks: Introduction to Data Structures: Basic Stack Operations-pop, push, display, delete. Representation of a Stack, Implementation of stack using Arrays, Stack Applications: Recursion, Infix to postfix Transformation, Evaluating Post-fix Expressions

Queues: Basic Queue Operations-enqueue, dequeue, Representation of a Queue using array, Implementation of Queue Operations using arrays, Applications of Queues, Circular Queue.

UNIT III

LIST: Introduction, Dynamic memory allocation, single linked list, Advantages and disadvantages of Single linked list ,Single linked list VS Arrays, Representation of a linked list in memory, Operations-insertion, deletion, display, search, Implementation of stack, queue using linked list. Circular linked list, Double linked list.

UNIT IV

TREES: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, Operations on a Binary Search Tree, Binary Search Tree Traversals (recursive), Creation of binary tree from traversals.

UNIT V

Graphs: Definition, Basic Terminology, Representation of Graphs, Graph Traversal Techniques – Breadth First Traversal, Depth First Traversal. Introduction to Hashing (no implementation).

TEXT BOOKS:

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH

REFERENCE BOOKS:

1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3.Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Prees

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course Code: GR20A1014 **L/T/P/C: 0/0/3/1.5**

I Year II Semesters

Course Objectives:

1. Introduce practical applications of chemistry concepts to solve engineering problems.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. Measure the molecular or ionic properties such as conductance, redox potentials
4. Synthesize a drug molecule to learn how organic compounds are prepared in industry.
5. Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.

Course Outcomes:

1. Ability to perform experiments illustrating the principles of chemistry relevant to the study of science and engineering.
2. Determination of parameters like hardness and chloride content in water, measurement of redox potentials and conductance.
3. Understand the kinetics of a reactions from a change in concentrations of reactants or products as a function of time.
4. Synthesize a drug molecule as an example of organic synthesis methods widely used in industry.
5. Determination of physical properties like adsorption and viscosity.

List of Experiments: (any 12 experiments out of 14)

1. Determination total hardness of water by complexometric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Redox titration: Estimation of ferrous iron using standard $KMnO_4$
4. Estimation of HCl by Conduct ometrictitrations
5. Estimation of Acetic acid by Conduct ometrictitrations
6. Estimation of Ferrous iron by Potentiometry using dichromate
7. Determination of rate constant of acid catalyzed reaction of methylacetate
8. Determination of acid value of coconutoil.
9. Adsorption of acetic acid by charcoal
10. Determination of surface tension of liquid by using stalagmometer
11. Determination of viscosity of liquid by using Ostwald'sviscometer.
12. Determinationofpartitioncoefficientofaceticacidbetweenn-butanolandwater.
13. Synthesis of Aspirin
14. Synthesis of Paracetamol.

Reference Books:

1. Vogel's text book of Practical organic chemistry, 5^{th}Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co.,Delhi)
3. Text book on experiments and Calculations in Engineering Chemistry-S.S.Dara.
4. An introduction to practical chemistry, K.K. Sharma and D.S. Sharma (Vikas Publications, NewDelhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRUCTURES LAB

Course Code: GR20A1018 **L/T/P/C: 0/0/2/1**
I Year II Semester

Course Objectives:

1. To work with sorting techniques.
2. To translate algorithms to programs.
3. To develop programs to implement basic data structures.
4. To develop modular, reusable and readable C Programs.
5. To implement tree and graph traversals.

Course Outcomes:

1. Formulate the algorithms for sorting problems and translate algorithms to a working and correct program.
2. Implement stack and queue data structures and their applications.
3. Interpret linked list concept to produce executable codes.
4. Develop working procedure on trees using structures, pointers and recursion.
5. Implements graph traversal techniques

TASK 1

a. Implement Bubble sort using a C program.
b. Implement Selection sort using a C program.
c. Implement Insertion Sort using a C program.

TASK 2

a. Implement Quick sort using a C program.
b. Implement Merge sort using a C program.

TASK 3

a. Implementation of Stack operations using arrays in C.
b. Implementation of Queue operations using arrays in C.

TASK 4

a. Write a c program to convert Infix to Postfix expression.
b. Write a c program to evaluate a Postfix expression

TASK 5

a. Implement Circular Queue operations in C.

TASK6

a. Implement Single Linked List operations in C.

TASK 7

a. Implement Circular Linked List operations in C.

TASK 8

a. Implement Double Linked List operations in C.

TASK 9

a. Implement the following operations on Binary Search Tree.
   i. Create
   ii. Insert
   iii. Search

TASK 10

a. Implement Preorder, Inorder and Postorder traversals of Binary Search Tree using recursion in C.

TASK 11

a. Implement Depth First Traversal on graphs in C.

TASK 12

a. Implement Breadth First Traversal on graphs in C.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G. A.V.Pai, TMH

References:

1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis,Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR20A1019 **L/T/P/C: 1/0/ 3/2.5**

I Year II Semester

Course objectives:

1. To prepare and practice of scientific principles underlying the art of manufacturing in workshop/manufacturing practices.
2. To demonstrate basic knowledge of various tools and their use in different sections.
3. To make students to execute applications of various tools in carpentry.
4. To make students recognize applications of manufacturing methods casting, forming machining, joining and advanced manufacturing methods.
5. To develop generate safety rules, safe practices and workshop dress code.

Course Outcomes:

At the end of the course students will be able to

1. Develop various trades applicable to industries / Manufacturing practices.
2. Create Hands on experience for common trades.
3. Improve to fabricate components with their own hands.
4. Develop practical knowledge on the dimensional accuracies and dimensional tolerances possible with various manufacturing processes.
5. To build the requirement of quality of work life on safety and organizational needs.

TRADES FOR EXERCISES: At least two exercises from each trade:

1. Carpentry
2. Fitting Shop
3. Tin-Smithy
4. Casting
5. Welding Practice
6. House-wiring
7. Black Smithy
8. **VIDEO LECTURES:** Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

Text/ Reference Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal /Anuradha.
3. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
4. Workshop Manual / Venkat Reddy/BSP
5. Workshop Manual/K. Venugopal/Dr.V. Prabhu Raja/G.Sreekanjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR20A1020 **L/T/P/C: 2/0/0/1**

I Year II Semester

Course Objectives

1. Study a problem from multiple perspectives
2. Learn how to frame the design challenge properly.
3. Learn how to ideate, prototype and Iterate solutions.
4. Learn from the overall design process how to create value as entrepreneurs
5. Learn how to design successful products or enterprises

Course Outcomes

1. Students will be able to identify an Opportunity from a Problem
2. Students will be able to frame a Product/Service Idea
3. Students will be able to empathize with the customers
4. Students will be able to design and develop a Prototype
5. Students will be able to pitch their idea

UNIT I

Introd ction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking

UNIT II

Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathise, Define (the problem), Ideate, Prototype, and Test,

UNIT III

Ideation tools & exercises. Sample Design Challenge, Introduction to the Design Challenge Themes,Story telling and Tools for Innovation

UNIT IV

Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes-Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT V:

The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing-Documentation and the Pitch

TEXT BOOKS:

1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School - IdrisMootee.

REFERENCE BOOKS:

1. Zero to One: Note on Start-Ups, or How to Build the Future
2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
3. Start With Why: How Great Leaders Inspire Everyone To Take Action

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

KINEMATICS OF MACHINERY

Course Code: GR20A2038 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. Understand the kinematics and rigid-body dynamics of kinematically driven machine components.
2. Understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link.
3. Able to design some linkage mechanisms and cam systems to generate specified output motion.
4. Understand the kinematics of gear trains.
5. Estimate of transmission of power by belts drives.

Course Outcomes:

1. Identify, select and design various types of linkage mechanisms for obtaining specific motion with lower pairs and higher pairs.
2. Analyse analytical and graphical aspects of linkage mechanisms for optimal functioning.
3. Drawing displacement diagrams and cam profile diagram for followers executing different types of motions for various configurations of followers.
4. Evaluate gear tooth geometry and select appropriate gears for the required applications.
5. Understand the concept of friction in bearings, clutches, brakes and belt drives.

UNIT I

Classification of mechanisms, Basic kinematic concepts and definitions-Degree of freedom, mobility-Grashof's law, Kinematic inversions of four bar chain and slider crank chains-Limit positions-Mechanical advantage-Transmission angle-Description of some common mechanisms-Quick return mechanism, straight line generators-Universal Joint-Rocker mechanisms

UNIT II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations-kinematic analysis of simple mechanisms-slider crank mechanism dynamics- Coincident points-Coriolis component of acceleration-introduction to linkage synthesis-three position graphical synthesis formation and path generation.

UNIT III

Classification of cams and followers-Terminology and definitions-Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions-derivatives of follower motions-specified contour cams-circular and tangent cams-pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers.

UNIT IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/ under cutting-helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.

UNIT V

Surface contacts-sliding and rolling friction-friction drives-bearings and lubrication-friction clutches-

belt and rope drives-friction in brakes.

Text/Reference Books:

1. Thomas Bevan, Theory of Machines, 3 edition, CBS Publishers & Distributors, 2005.
2. Cleghorn W.L.Mechanisms of Machines, Oxford University Press, 2005.
3. Robert L.Norton, Kinematics and Dynamics of Machinery, Tata Mc Graw Hill, 2009.
4. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East- West Pvt. Ltd, New Delhi, 1988.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MATERIALS ENGINEERING

Course Code: GR20A2039 **L/T/P/C: 2/1/0/3**
II Year I Semester

Course Objectives:

1. Understand the concepts of fundamental science and engineering relevant to materials, various mechanical property measurements.
2. Categorize the various equilibrium diagrams and describe the changes which occurs on metals.
3. Explain the concepts on various heat treatment operations.
4. Categorize the various ferrous and nonferrous metals with their properties and applications.
5. Expose the concepts on composites, ceramics materials with their properties and applications.

Course Outcomes:

1. Relate crystal structures and identify the suitable method for mechanical property measurements.
2. Relate the equilibrium transformation diagrams for various metals.
3. Utilize appropriate techniques in treating a metal with proper heat treatment operations.
4. Have knowledge on different types of ferrous and nonferrous metals.
5. Identify the suitable composite and ceramic material for the required application.

UNIT I

Structure of metals & mechanical property measurements: Bonds in Solids, crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal, determination of grain size. Imperfection in solids: Point, line, interstitial and volume defects; dislocation strengthening mechanisms and slip systems, Tensile, compression and torsion tests; Young's modulus, true and engineering stress-strain curves, Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT II

Alloys & Phase diagrams: Necessity of alloying, Solid solutions, Types of Solid Solutions, Hume Rothery's rule, Intermediate alloy phases, effects of various alloying elements on steels, microstructure development, eutectic, peritectic, peritectoid. Iron Iron-carbide phase diagram and micro structural aspects of ledeburite, Austenite, Ferrite, Martensite and Cementite.

UNIT III

Heat treatment of steel: Annealing, Tempering, Normalizing, Hardening, Jominey quench Test for Hardenability, isothermal transformation diagrams, Continuous cooling curves and interpretation of final microstructures, austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame , induction & cryogenic hardening.

UNIT IV

Ferrous & Non ferrous metals: Steels, Types of steels, Properties and applications of Plain carbon steels, stainless steel and tool steels, maraging steels, cast irons; grey, white, malleable and spheroidal cast irons, copper and copper alloys, aluminium, alloys-Nickel based super alloys and Titanium alloys.

UNIT V

Ductile, brittle failures, composites & ceramics: Stress strain curves for brittle and ductile materials, differences between brittle and ductile fractures, Tresca, Von-mises, Maximum normal stress, Griffith criterion, Fatigue failure, SN curve, ceramics, glasses, cermets, abrasive materials, Composite materials: Classification of composites, various methods of manufacture of composites, particle–reinforced materials, fibre-reinforced materials, metal ceramic mixtures, metal–matrix composites and Carbon–Carbon composites.

Text/Reference Books:

1. W.D.Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India.
2. Kenneth G.Budinski and Michael K.Budinski, "Engineering Materials", Prentice Hall
3. V.Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, 1999.
4. U.C.Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: GR20A2017 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. Prepare the students a basic knowledge in the analysis of Electric Circuits.
2. Provide students with a strong back ground in induction machines, speed control techniques and its characteristics and different types of machines existing in present trend.
3. Train the students to have the solid foundation in technical concepts required to engineering problems.
4. Train the students in understanding the usage of electronic instruments in measuring techniques.
5. Have a thorough understanding on transistors and its uses

Course Outcomes:

1. Interpret and familiar with ac and dc circuits solving.
2. An ability to find role of electrical machinery in simple & complex applications.
3. To demonstrate the designing and conducting experiments, to analyze and interpret data and also provides the ability to visualize and work on laboratory and multidisciplinary tasks.
4. Analyze performance of Transformers and Instruments.
5. Evaluate the working of Diodes.

UNIT I: ELECTRICAL CIRCUITS

Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, Capacitive networks, Series, Parallel circuits and Star-delta and deltastar transformations.

UNIT II: DC MACHINES AND AC MACHINES

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

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

UNIT III: TRANSFORMERS AND INSTRUMENTS

Principle of operation of single phase transformers – EMF equation – losses – efficiency and regulation.Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

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

UNIT IV: **DIODE AND IT'S CHARACTERISTICS**

P-N junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).

UNIT V: TRANSISTORS

P-N-P and N-P-N Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

Text/Reference Books:

1. David V. Kerns, JR. J. David Irwin, Essentials of Electrical and Computer Engineering.
2. V.K.Mehta, S.Chand & Co, Principles of Electrical and Electronics Engineering.
3. M.S Naidu and S. Kamakshaiah, Introduction to Electrical Engineering, TMH Publications.
4. Kothari and Nagarath, Basic Electrical Engineering, TMH Publications, 2nd Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRENGTH OF MATERIALS

Course Code: GR20A2040 **L/T/P/C: 3/0/0/3**

II Year I Semester

Prerequisites: Knowledge in Engineering Mechanics (statics)

Course Objectives:

1. To provide the basic concepts and principles of strength of materials.
2. To study stresses, strains and elastic constraints of different materials.
3. To gain knowledge about shear stress and bending moment of different types of beams subjected to various loads.
4. To obtain knowledge about the effect of torsion on shafts.
5. To understand the flexural and shear stress concepts for different materials and shapes of structures.

Course Outcomes:

1. Understand the theory of elasticity including strain displacement and Hooke's law relationships.
2. Analyse the shear stresses and bending moment diagrams with various types of loads.
3. Calculate the slope and deflections in beams subjected to transverse loads.
4. Analyse various situations involving structural members subjected to combined stresses and solve the torsion problems in bars.
5. Evaluate the bending and shear stresses in beams.

UNIT I

Simple stresses & strains: Concept of stresses & strains (linear, lateral, shear, thermal and volumetric), Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials, Proof stress, True stress & strain - Various strengths of material- Yield strength, Ultimate tensile strength, Factor of safety, Strain energy-Gradual, sudden and Impact Loads.Concept of stress state, relation between elastic constants, Axial forces, stresses and strains in determinate and indeterminate composite bars, bars under axial loads and self-weight.

UNIT II

Shear force and Bending moment diagrams: Shear forces and bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads and couples, relation between hear Force and Bending Moment diagrams for cantilevers, simply supported beams, and their construction- Maximum bending moment & point of contra flexure.

UNIT III

Slope and Deflection of beams: Relation between BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases

UNIT IV

Principal stresses and strains: Normal and shear stresses on any oblique plane - Concept of principal planes, derivation for principal stresses and maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow).

Torsional stresses: Derivation of torsion equation, stresses, strain & deformations in solid & hollow Shafts, homogeneous & composite circular cross section subjected to twisting moment, stresses due to combined torsion, bending & axial force on shafts.

UNIT V

Stresses in machine elements:

Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, Bending of common cross sections (rectangular, I,T,C) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance and section modulus.

Shear stresses: Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for I, T and C symmetrical sections, maximum and average shears stresses, shear connection between flange & web.

Text/Reference Books:

1. Strength of Materials: Ramamrutham.
2. Strength of Materials R K Bansal, Laxmi Publications.
3. Analysis of structures by Vazirani and Ratwani.
4. Mechanics of Structures Vol-III, by S.B.Junnarkar.
5. Strength of Materials by S.Timshenko.
6. Strength of Materials by Andrew Pytel and Ferdinond L.Singer Longman.
7. Solid Mechanics, by Popov.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THERMODYNAMICS

Course Code: GR20A2041 **L/T/P/C: 3/0/0/3**

II Year I Semester

Note: Steam Table book Permitted

Course Objectives:

1. Understand the nature and role of the thermodynamic properties of matter such as internal energy, enthalpy, entropy, temperature, pressure and specific volume.
2. Interpret a thermodynamic system by a control mass or control volume, distinguish the system from its surroundings, and identify work and/or heat interactions between the system and surroundings
3. Identify and understand the different forms of energy and restrictions imposed by the first law of thermodynamics on conversion from one form to another
4. Demonstrate the implications of the second law of thermodynamics and limitations on the performance of thermodynamic systems
5. Appraise the performance of Diesel engine, Petrol engine, Gas turbine, refrigeration and heat pump systems by means of Thermodynamic cycles

Course Outcomes:

1. Describe the first and second laws of thermodynamics and their application to a wide range of systems
2. Discuss the first law of thermodynamics and identify the various forms of work
3. Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.
4. Execute the calculations of the efficiencies of heat engines and other engineering devices.
5. Explain and sketch the construction and principles governing the form of simple and complex one-component pressure-temperature diagrams and the use of volume-temperature and pressure-volume phase diagrams and the steam tables in the analysis of engineering devices and systems.

UNIT I

Fundamentals: System & Control volume, Property, State & Process, Exact & Inexact differentials, Thermodynamic definition of work, examples, Displacement work, Path dependence of displacement work and illustrations for simple processes, electrical, magnetic, gravitational, spring and shaft work.

Temperature, Definition of thermal equilibrium and Zeroth law, Temperature scales, Various Thermometers- Definition of heat, examples of heat/work interaction in systems- First Law for Cyclic & Non-cyclic processes, Concept of total energy E, Demonstration that E is a property, Various modes of energy, Internal energy and Enthalpy.

UNIT II

First Law for Flow Processes-Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume.

Second law-Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale.

UNIT III

Clausius inequality, Definition of entropy S, Demonstration that entropy S is a property, Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes, Determination of s from steam tables-Principle of increase of entropy, Illustration of processes in T-s coordinates, Definition of Isentropic efficiency for compressors, turbines and nozzles-Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Second law analysis for a control volume, Exergy balance equation and Exergy analysis.

UNIT IV

Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems-Const. temperature and Const. pressure heating of water, Definitions of saturated states, P-v-T surface, Use of steam tables and R134a tables, dryness fraction & measurement, Saturation tables, Superheated tables, Identification of states & determination of properties, Mollier's chart.

UNIT V

Thermodynamic cycles: Basic Rankine cycle, Basic Brayton cycle, Basic vapor compression cycle and comparison with Carnot cycle.

Text/Reference Books:

1. Sonntag, Borgnakke. C and Van Wylen,G.J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Cengel Y.A and Boles M.A. Thermodynamics an Engineering Approach. 7th Edition. McGraw-Hill Education
3. Jones.J.B. and Duggan,R.E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India.
4. Moran,M.J. and Shapiro,H.N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
5. Nag,P.K, 1995, *Engineering Thermodynamics*, Tata Mc Graw-Hill Publishing Co.Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MACHINE AND PRODUCTION DRAWING LAB

Course Code: GR20A2042 **L/T/P/C: 0/0/4/2**

II Year I Semester

Course Objectives:

1. To develop an understanding of the conventional representation of different materials and machine parts.
2. To analyze the various limits, fits, tolerances and surface roughness symbols adopted in the production drawings.
3. To provide an understanding on various forms of screw threads, nuts, bolts, joints and rivets.
4. To create assembly drawings of machine parts from the given part drawings.
5. To create part drawing assemblies by using specifications and standards.

Course Outcomes:

At the end of the course, the students will be able to

1. Understand the conventions used in Machine & production drawing.
2. Construct the machine elements including couplings, cotters, riveted, and bolted joints.
3. Determine limits and fits and allocate tolerances for machine components.
4. Construct an assembly drawing using part drawings of machine components.
5. Apply concepts and methods in the preparation of production drawings.

Unit I: **CONVENTIONAL REPRESENTATION**

Materials, Machine elements, screw, riveted and welded joints. Springs, gears. electrical, hydraulic and pneumatic circuits. Types of section – drawing of sections and auxiliary sectional views.

Unit II

a) Forms of screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Cotter joint and knuckle joint.
c) Rivetted joints for plates.

Unit III

a) Universal, Oldham coupling, journal and foot step bearings
b) Limits, fits and tolerance
c) Surface roughness and its indication

Unit IV: ASSEMBLY DRAWINGS

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions. Engine parts – stuffing boxes, cross head, eccentric, petrol engine connecting rod, piston assembly.

Unit V: PART DRAWINGS

Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc. Part Drawing Assemblies- Plummer block, Screw jack, Lathe tail stock. Valves: Feed check valve, air cock.

Text/Reference Books:

1. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers
2. Production and Drawing – K.L. Narayana & P. Kannaiah/ New Age
3. Machine Drawing – Dhawan, S. Chand Publications
4. Machine drawing with Auto CAD-Pohit and ghosh, PE
5. Machine Drawing – N. D. Bhatt
6. Machine Drawing – Rajput
7. Geometric dimensioning and tolerancing-James D. meadows/ B.S Publications
8. Engineering Metrology, R.K Jain, Khanna publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRENGTH OF MATERIALS LAB

Course Code: GR20A2043 **L/T/P/C: 0/0/3/1.5**

II Year I Semester

Prerequisites: Fundamentals of Engineering Mechanics, Mechanics of materials.

Course Objectives:

1. Opportunity to apply loads to various materials under different equilibrium conditions.
2. Perform tests on materials in tension, compression, torsion, bending, and impact.
3. Reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report.
4. Study engineering properties of materials, force-deformation, and stress-strain relationship.
5. Gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.

Course Outcomes:

1. Determine the Young's modulus for ductile materials and analyze the compression strength of both ductile and brittle materials.
2. Analyze the various points on stress strain diagram and calculate the modulus of rigidity of ductile materials.
3. Calculate & Compare the hardness values for various materials.
4. Experiment on a spring to interpret the stiffness and shear modulus.
5. Apply the concept of impact loading and to determine impact values for various materials.

List of Experiments:

Task-1: To conduct hardness test on given material using Brinnel's Hardness testing equipment.

Task-2: To conduct hardness test on given material using Rockwell's Hardness testing machine.

Task-3: To conduct hardness test on given material using Vicker's Hardness testing machine.

Task-4: To perform the following tests on the given material using UTM (Universal Testing Machine)

a) Tension test to determine young's modulus and

b) Shear test to determine ultimate shear strength

Task-5: To determine the stiffness and modulus of rigidity of the spring wire by performing Spring Test

Task-6: To perform compression test on cube to analyze compression strength of the material

Task-7: To determine the Young's modulus of the given structural material using Cantilever Beam set-up

Task-8: To determine the Young's modulus of given structural material using Simply Supported Beam set-up

Task-9: To determine the Young's modulus of given structural material by Maxwell's Reciprocal Theorem

Task-10: To determine the Young's modulus of given structural material using Continuous Beam set-up.

Task-11: To determine the Torsional strength and stiffness of a material using Torsion testing machine.

Task-12: To determine impact strength of the given material using Impact testing equipment (Izod and Charpy).

Teaching Methodology:

- Experimental Test rigs

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATERIAL SCIENCE AND METALLURGY LAB

Course Code: GR20A2044 **L/T/P/C: 0/0/3/1.5**

II Year I Semester

Course Objectives:

1. Know the micro structure of different materials.
2. Know the properties of materials at higher elevated temperatures.
3. Refine grain size by various heat treatment processes.
4. Gain knowledge on various materials for product based on microstructure.
5. Know differences between ferrous and nonferrous metals with their properties.

Course Outcomes:

1. Relate properties to microstructure.
2. Choose suitable metals and alloys for industrial applications.
3. Find out the hardness of various treated and untreated metals.
4. Tell the chemical composition of various ferrous and nonferrous metals.
5. Select a suitable heat treatment process for a material.

List of Experiments:

1. Preparation and study of micro structure of Mild steel and Low carbon steel.
2. Preparation and study of micro structure of High carbon steel and Stainless steel.
3. Preparation and study of micro structure of Medium carbon steel.
4. Preparation and study of micro structure of Grey cast iron and White cast Iron.
5. Preparation and study of micro structure of Malleable cast iron and Spheroidal cast iron.
6. Preparation and study of micro structure of Aluminium.
7. Preparation and study of micro structure of copper.
8. Preparation and study of micro structure of Titanium (Ti6Al4V).
9. Preparation and study of the micro structure of Inconel 718 –Super alloy.
10. Preparation and microscopic examination of heat treated and untreated metallic samples.
11. Hardenability of steels by Jominy End Quench test.
12. Find out the hardness of various treated and untreated steels.

Teaching Methodology:

- Experimental Test rigs & Microscopes

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

JAVA FOR ENGINEERS

Course Code: GR20A2007 **L/T/P/C: 2/0/0/2**

II Year I Semester

Course Objectives:

1. Analyze a software development problem and express its essence succinctly and precisely.
2. Understanding the OOP's concepts, classes and objects.
3. To learn how to extend Java classes with inheritance and dynamic binding.
4. To learn how to use exception handling in Java applications.
5. To understand how to design applications with threads in Java.

Course Outcomes: Upon the successful completion of the course, the student will be able to:

1. Understand Java programming concepts in Program writing
2. Identify the model of Object-Oriented Programming: Abstract data types, Encapsulation, Inheritance and Polymorphism.
3. Break a problem into logical pieces that can be solved independently.
4. Incorporate exception handling in object-oriented programs.
5. Correlate the advantages of Multi-threading.

Unit I

Introduction to OOP: Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK.

Unit II

Programming Constructs: Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control- branching, conditional, loops.

Classes and Objects- Classes, Objects, Creating objects, methods, constructors- constructor overloading, cleaning up unused objects- Garbage collector, class variable and methods- static keyword, this keyword, arrays, Command line arguments.

Unit III

Inheritance: Types of Inheritance, Deriving classes using extends keyword, method overloading, super keyword, final keyword, abstract class.

Interfaces: Interface, Extending interface, interface Vs Abstract classes.

Unit IV

Packages- Creating Packages, using Packages, Access protection, java I/O package. Exploring java.io and String classes.

Exceptions - Introduction, Exception handling techniques - try, catch, throw, throws, finally block, user defined Exception.

Unit V

Multithreading: java.lang. Thread, the main Thread, creation of new Threads, Thread priority, multiThreading- using isalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads.

Text/Reference Books:

1. Java: The Complete Reference, 10th edition, Herbert Schildt, McgrawHill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
3. Java for Programming, P.J.Dietel PearsonEducation
4. Object Oriented Programming through Java, P.Radha Krishna, UniversitiesPress.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THERMAL ENGINEERING

Course Code: GR20A2045 **L/T/P/C: 3/0/0/3**

II Year II Semester

Pre-requisite: Thermodynamics

Course Objectives:

1. Apply the laws of Thermodynamics to analyze air standard cycles
2. Understand and evaluate the performance analysis of the major components and systems of IC engines and their applications.
3. Analyze the processes to improve the performance of IC engines with respect to fuel economy and control of emissions in global, environmental and social context.
4. Explore to the components and working principles of rotary, reciprocating, dynamic and axial compressors.
5. Evaluation of parameters which influence the performance of the compressors in power plants, gas turbines and jet propulsions etc. for better engineering practice.

Course Outcomes:

1. Evaluate the performance of IC engines and compressors under the given operating conditions.
2. Apply the laws of Thermodynamics to evaluate the performance of IC Engines & Compressors
3. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance
4. Explain the function and working principles of rotary, reciprocating, dynamic and axial compressors
5. Elaborate the factors influence performance of the compressors by analytical and graphical methods using velocity triangles

UNIT I

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI Engines, Valve and Port Timing Diagrams, Air – Standard air-fuel and actual cycles.

Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process.

Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

Engine systems, cooling and lubrication systems, Fuel properties and Combustion Stoichiometry.

UNIT II

Combustion in S.I. Engines: Fuel system components, Carburetor, Fuel Injection System, Ignition systems, Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking.

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: Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition.

Significance of Performance test: Determination of Brake power, frictional losses and indicated power, Air fuel ratio, thermal and Mechanical efficiencies

Heat balance sheet: Significance, losses due to exhaust gases, cooling systems and various ways, Chart of Heat balance

UNIT IV

Reciprocating and Rotary Compressors:

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

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

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

UNIT – V

Dynamic and Axial Flow Compressors 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. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill

Reference books:

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern
3. Internal Combustion Engines Fundamentals – John B. Heywood – McGraw Hill Ed

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLUID MECHANICS AND FLUID MACHINES

Course Code: GR20A2046 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Objectives:

1. Explain the Concept and application of mass and momentum conservation laws for fluid flows
2. Understand the importance of dimensional analysis
3. Obtain the velocity and pressure variations in various types of simple flows
4. Analyze the flow in water pumps and turbines
5. Study and apply the Energy conservation laws for fluid flow applications

Course Outcomes:

1. Apply concept of mathematics, science and engineering in fluid flows
2. Use the governing equations of fluid flow and apply the same to simple flow problems
3. Explain the mathematical formulation of various flow problems.
4. Analyze the boundary layer concept to the fluid flow problems.
5. Execute the concept of fluid and models of fluids for flow problems.

UNIT I

Definition of fluid, Newton's law of viscosity, Units and dimensions- Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow, Bernoulli's equation and its applications.

UNIT II

Exact flow solutions in channels and ducts, Couette and Poiseuille flow, laminar flow through circular conduits and circular annuli-concept of boundary layer– measures of boundary layer thickness–Darcy Weisbach equation, friction factor, Moody's diagram.

UNIT III

Need for dimensional analysis–methods of dimension analysis–Similitude–types of similitude Dimensionless parameters–application of dimensionless parameters–Model analysis.

UNIT IV

Euler's equation–theory of roto dynamic machines–various efficiencies–velocity components at entry and exit of the rotor, velocity triangles–Centrifugal pumps, working principle, work done by the impeller, performance curves–Cavitation in pumps-Reciprocating pump–working principle.

UNIT V

Classification of water turbines, heads and efficiencies, velocity triangles-Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working principles–draft tube-Specific speed, unit quantities, performance curves for turbines–governing of turbines.

Text/Reference Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Introduction to Fluid Mechanics and Fluid Machines By S K Som, Gautam Biswas, McGrawHill.
3. Fluid Mechanics and Hydraulic Machines by R K Rajput.
4. Fluid Mechanics and Hydraulic machines by R K Bansal, Laxmi publications.
5. Fluid Mechanics & Hydraulic Machines: Problems & Solutions by K.Subrmanya /TMH private limited.
6. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DYNAMICS OF MACHINERY

Course Code: GR20A2047 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Objectives:

1. Understand the concept of gyroscopic couple and its effect on aero plane, ship, two and four wheel drive.
2. Introduce the approaches and mathematical models used in static and dynamic analysis of machinery
3. Impart the knowledge of Various Governors, Brakes and operation of Dynamometers.
4. Understand the concepts of balancing of rotating masses and reciprocating masses.
5. Introduce of mathematical models and solution methods to study Vibration of the mechanical systems

Course Outcomes:

1. Analyze complete motion analysis of machines in running condition and able to know friction and its effect on mechanical efficiency.
2. Design various mechanisms of machines which were used in real life and explain how to get equilibrium condition of machine members while the machine is in running condition.
3. Apply the knowledge regarding use of turning moment diagram and energy fluctuations with in systems.
4. Explain how to balance forces and moments produced by rotating or reciprocating masses of machine members.
5. Analyze the vibrations, which is the major disturbance in machines while in the running condition and also precautions to reduce vibration.

UNIT I

Gyroscopes: Introduction, Precisional angular motion, Gyroscopic couple, effect of gyroscopic couple on an aeroplane, effect of gyroscopic couple on a naval ship during steering, gyroscopic couple on a naval ship during pitching, Gyroscopic couple on a naval ship during rolling, stability of a four wheel drive moving in a curved path, stability of a two wheel vehicle taking a turn.

UNIT II

Static Force Analysis: Introduction, Static Equilibrium, Equilibrium of Two-force and three force members, Member with Two force

Dynamic force Analysis: Introduction, D'Alemberts principle, Equivalent Offset inertia force, Dynamic analysis of Four bar and Single slider mechanisms, Piston effort, Turning moment on crank shaft, Inertia of connecting rod, Inertia forces in reciprocating Engines.

UNIT III

Governors: Introduction, types of governors, Watt governor, Porter governor, Proell governor, Hartnell governor, Wilson-Hartnell governor, Spring controlled gravity governor, Inertia governors, Sensitiveness of governor, Hunting, Isochronism, Stability, effort of governor, Power of governor, Controlling force.

Brakes and Dynamometers: Types of brakes: Simple block brake, band and block brake internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT IV

Balancing of Rotating Masses: Balancing of rotating masses in single and different planes.

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

UNIT V

Vibrations: Free Vibration of mass attached to vertical spring – Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly's method – Raleigh's method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

Text books:

1. Theory of Machines / S.S Ratan/ Mc. GrawHill Publ.
2. Theory of machines/Khurmi/S.Chand.

References:

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines / R.K Bansal
3. Theory of Machines Sadhu Singh Pearson's Edition
4. Theory of Machines /Shigley/ Oxford.
5. Theory of machines – PL. Balaney/khanna publishers.
6. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age

Teaching Methodology:

- Power point Presentations
- Working models
- white board & marker

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROBABILITY AND STATISTICS

Course Code: GR20A2005 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Objectives:

1. Interpret the measures of central tendency and dispersion.
2. Distinguish between explanatory and response variables and analyze data using correlation and regression.
3. Apply various probability distributions.
4. Apply tests of hypothesis.
5. Employ basic analysis of time series data.

Course Outcomes:

The expected outcomes of the Course are:

1. Compute and interpret descriptive statistics.
2. Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Normal and Exponential distributions.
3. Fit the models using Regression Analysis.
4. Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
5. Interpret Time series data.

Unit I: Random Variables, Basic Statistics, Correlation and Regression

Notion of Randomness, Random Experiment, Random variables – Discrete and Continuous, Probability mass function and density function, constants of r.v.s (Mean, Variance, Monents about mean), Concept of Bivariate distributions and Covariance.

Measures of central tendency and moments.

Correlation : Karl-Pearson's correlation coefficient and Spearman's Rank correlation, Statements of their properties and problems, Simple and Multiple Linear Regression (three variables case only), Statements of properties of Regression coefficients and problems.

Unit II: Probability Distributions

Discrete Distributions: Binomial and Poisson distributions - definition, real life examples, Statements of their Mean and Variance, related problems, evaluation of statistical parameters.

Continuous Distributions: Normal, Exponential and Gamma distributions - definition, real life examples, Statements of their Mean and Variance and related problems, evaluation of statistical parameters for Normal distribution.

Unit III : Testing of Hypothesis-1 (Large sample)

Concept of Sampling distribution and Standard error, tests for single proportion, difference of proportions, single mean, difference of means and Chi-square test for independence of attributes. Estimation of confidence interval for population mean and population proportions.

Unit IV : Testing of Hypothesis-2 (Small Sample)

Tests for single mean, difference of means, Population variance, ratio of variances, ANOVA 1-way and 2-way. Estimation of confidence interval for Population mean.

Unit V: Time Series analysis

Components of Time series, Additive and Multiplicative Decomposition of Time series components, Measuring trend by method of Moving averages, Straight line and Second degree parabola, Measuring seasonal variation by Ratio to Trend method and Ratio to Moving averages method.

Text / References:

1. S. C.Gupta&V.K.Kapoor, "Fundamentals of Mathematical Statistics", S.Chand.
2. Richard A.Johnson," Probability and Statistics for Engineers", Pearson Education.
3. Jay Devore, "Probability and Statistics for Engineering and the Sciences",Cengage learning.
4. Murat Kulahci,"Time series analysis and forecasting by example",John Wiley & Sons
5. S. C.Gupta&V.K.Kapoor, "Fundamentals of Applied Statistics", S.Chand.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MANUFACTURING PROCESS

Course Code: GR20A2048 **L/T/P/C: 2/1/0/3**
II B.Tech II Semester

Prerequisites: Basic knowledge in engineering workshop practices

Course Objectives:

1. Impart knowledge about principles/methods of casting with detail design of gating/riser system needed for casting
2. Impart knowledge about process during welding and weldability aspects of different common engineering materials.
3. Impart knowledge about different forming processes and requirements for achieving good quality components.
4. Introduce the sheet metal forming techniques and its applications
5. Introduction to various plastic parts manufacturing methods used.

Course Outcomes:

1. Impart knowledge on role and value of production and identify basic production processes.
2. Introduction to methods of joining that shows a comprehensive understanding of tools, materials, equipment, and processes.
3. Apply critical thinking skills for development and evaluating sheet metal forming processes.
4. Identify and use the materials, tools, machines, and techniques used in various forming processes.
5. Demonstrate various ways of producing plastic products and its equipment details.

UNIT I

Metal Casting Processes: Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Methods of Sand testing – Moulding machines – Types of moulding machines - Melting furnaces – Working principle of Special casting processes – Shell, investment casting – Ceramic mould – Lost Wax process – Pressure die casting – Centrifugal casting – CO_2 process– Sand Casting defects – Inspection methods.

UNIT II

Joining Processes: Fusion welding processes – Types of Gas welding – Equipments used – Flame characteristics – Filler and Flux materials - Arc welding equipments - Electrodes – Coating and specifications – Principles of Resistance welding – Spot/butt, seam welding – Percusion welding - Gas metal arc welding – Flux cored – Submerged arc welding – Electro slag welding – TIG and MIG welding – Principle and application of special welding processes - Plasma arc welding – Thermit welding – Electron beam welding –Friction welding – Diffusion welding – Weld defects – Brazing and soldering process –Methods and process capabilities – Filler materials and fluxes – Types of Adhesive bonding.

UNIT III

Bulk Deforming Processes: Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – Characteristics of the process – Types of Forging Machines –Typical forging operations – Rolling of metals – Types of Rolling mills - Flat strip rolling– Shape rolling operations – Defects in rolled parts - Principle of rod and wire drawing -Tube drawing — Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion— Equipments used.

UNIT IV

Sheet Metal Processes: Sheet metal characteristics - Typical shearing operations, bending and drawing operations – Stretch forming operations — Formability of sheet metal – Test methods– Working principle and application of special forming processes - Hydro forming – Rubber pad forming – Metal spinning – Introduction to Explosive forming, Magnetic pulse forming, Peen forming, Super plastic forming.

UNIT V

Manufacturing of Plastic Components: Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of - Injection moulding –Plunger and screw machines – Compression moulding, Transfer moulding – Typical industrial applications – Introduction to Blow moulding – Rotational moulding – Film blowing – Extrusion - Thermoforming, - Bonding of Thermoplastics.

Text books:

1. Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", MediaPromotors Pvt Ltd., Mumbai, 2001
2. S.Gowri, P.Hariharan, and A.SureshBabu, "Manufacturing Technology 1", PearsonEducation , 2008.
3. 3.P.N. Rao,"ManufacturingTechnology",Tata McGraw-Hill Publishing Limited, IIEdition, 2002.

Reference books:

1. B.S. MagendranParashar& R.K. Mittal,"Elements of Manufacturing Processes",Prentice Hall of India, 2003.
2. P.C. Sharma, "A text book of production technology",S. Chand and Company, IVEdition, 2003.
3. Begman, 'Manufacturing Process", John Wilely& Sons, VIII Edition, 2005.
4. SeropeKalpajian, Steven R.Schmid, Manufacturing Engineering and Technology,Pearson Education, Inc. 2002(Second Indian Reprint).
5. Beddoes.J and Bibby M.J, 'Principles of Metal Manufacturing Processes', Elsevier, 2006.
6. Rajput R.K, 'A text book of Manufacturing Technology', Lakshmi Publications, 2007.

Teaching Methodology:

- Power point Presentations
- Working models
- white board & marker

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
THERMAL ENGINEERING LAB

Course Code: GR20A2049 **L/T/P/C: 0/0/4/2**
II Year II Semester

Course Objectives:

1. Understand the working principles of each component of internal combustion engines, refrigeration system, Boilers etc.
2. Explore to measuring devices functioning for air, fuel, temperature, pressure, loading, speed, Calorific value, viscosity etc.
3. Recollect the basic conservation of energy principles, laws of thermodynamics for real time applications.
4. Explain the process involved in the thermal systems for assessing the performance and its enhancement using graphs, balance sheets etc.
5. Summarize the differences between internal and external combustion engines, reciprocating and rotary type with merits and limitations.

Course Outcomes:

1. Explain the functioning of measuring devices such as manometer, thermocouples, loading devices, fuel measurements etc. by applying the conservation laws and demonstrate the function of parts of 4 stroke diesel/petrol engines by assembling and dismantling.
2. Evaluate the properties of fuels such as flash & fire points, calorific value, Viscosity using basic concepts by conducting experimentation.
3. Assess the performance parameters of different thermal systems such as diesel/Petrol engines, refrigeration system, air compressors, Boilers etc.,
4. Enumerate and calculate the amount of dissipation of heat/energy in different ways by drawing balance sheets for an IC Engine.
5. Represent the processes, performance of the system in the form of graphs, period of suction, compression, expansion, exhaust and injection/ignition in the form of diagrams.

LIST OF EXPERIMENTS:

Task-1: Disassemble and Assemble of 4 stroke single cylinder diesel and petrol engine
Task-2: Valve timing diagram for 4 stroke single cylinder diesel and petrol engine
Task-3: Performance test on 4-stroke single cylinder diesel engine with Electrical loading
Task-4: Heat balance test on 4 stroke single cylinder diesel engine with Electrical loading
Task-5: Performance test on 4- stroke single cylinder diesel engine with Mechanical loading
Task-6: Heat balance test on 4-stroke single cylinder diesel engine with Mechanical loading
Task-7: Determination of the calorific value of a given fuel
Task-8: Determination of the flash & fire points of a given fuel
Task-9: Determination of the density and viscosity of a given oil
Task-10: Performance test on two stage reciprocating Air Compressor
Task-11: Study of Babcock and Wilcox boiler
Task-12: Determination of COP of a Vapour compression refrigeration system

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MANUFACTURING PROCESS LAB

Course Code: GR20A2050 **L/T/P/C: 0/0/3/1.5**
II Year II Semester

Prerequisites: Fundamentals of Production of Technology

Course Objectives:

1. Provide practical experience in various welding processes with different materials.
2. Give knowledge and practical exposure on how to form plastic formation by using plastic moulding machine.
3. Impart Knowledge in casting process with various types of tools.
4. Know various welding processes.
5. Impart knowledge on various production processes in manufacturing a product.

Course Outcomes:

1. Design and manufacture simple patterns for castings.
2. Knowledge on different kinds of joining processes.
3. Manufacture plastic components.
4. Knowledge on different kinds of production processes available for shaping or moulding several daily used components.
5. Recognize the importance of safety devices and gain practical experience on various manufacturing processes.

Task-1: CASTING

1. Pattern Design and making-2 Exercises.
2. Moulding, Melting and Casting-1Exercise

Task-2: WELDING

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

Task-3: MECHANICAL PRESS WORKING

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

Task-4: PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLUID MECHANICS AND FLUID MACHINES LAB

Course Code: GR20A2051 **L/T/P/C: 0/0/3/1.5**

II Year II Semester

Prerequisites: Fundamentals of Fluid Mechanics and Fluid Machinery

Course Objectives:

1. Provide practical knowledge in verification of principles of fluid flow.
2. Impart knowledge in measuring pressure, discharge and velocity of fluid flow.
3. Understand Major and Minor Losses.
4. Gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head.
5. Familiarize laminar and turbulent flows in pipes.

Course Outcomes:

1. Demonstrate practical knowledge in fluid flow principles.
2. Demonstrate the knowledge in calculating performance analysis in turbines and pumps understand to analyse practical problems in all power plants and chemical industries.
3. Conduct experiments in pipe flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports.
4. Analyse a variety of fluid-flow devices and utilize fluid mechanics principles in design.
5. Analyze flow rate and pressure rise, select the proper pump to optimize the pumping efficiency.

LIST OF EXPERIMENTS:

Task-1: Verification of Bernoulli's theorem and draw the HGL, TEL

Task-2: Determination of Coefficient discharge of Venturi meter and Orifice meter.

Task-3: Determination of Darcy's Friction factor in various diameters of pipes

Task-4: Determination of Minor Losses (Different Valve connections, Sudden Expansion, Sudden Contraction, Bends, joints) in various pipe fittings

Task-5: Determination of coefficient of impact of Jet on given Vanes

Task-6: Determination of overall efficiency of Pelton wheel Turbine at Constant Speed and Constant Head

Task-7: Determination of overall efficiency of Francis Turbine at Constant Speed and Constant Head

Task-8: Determination of overall efficiency of Kaplan Turbine at Constant Speed and Constant Head

Task-9: Determination of the overall efficiency of Single Stage Centrifugal pump

Task-10: Determination of the overall efficiency of Multistage Centrifugal pump

Task-11: Determination of the overall efficiency of Reciprocating pump

Task-12: Determination of the laminar and turbulent flow using Reynold's apparatus.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

Course Code: GR20A2003 **L/T/P/C: 2/0/0/2**

II Year II Semester

Course Objectives:

1. Create an awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles.
2. Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature.
3. Learn the divisions of executive, legislative and judiciary and so on.
4. Know how a municipal office, panchayat office etc. works.
5. Understand the importance and role of Election Commission Functions.

Course Outcomes:

1. Know the importance of Constitution and Government.
2. Become Good Citizens and know their fundamental rights, duties and principles.
3. Learn about the role of PM, President, Council of Ministers and Local Administration.
4. Understand the importance of Election Commission.
5. Know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.,

UNIT I

Introduction: 'Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration: Structure of the Indian Union: Federalism, Centre - State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.

UNIT III

State Government and its Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT V

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Text/Reference Books:

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher
4. 'Indian Administration by avasthi and avasthi-by lakshminarain agarwal publication

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATABASE FOR ENGINEERS

Course Code: GR20A2006 **L/T/P/C: 2/0/0/2**
II Year II Semester

Course Objectives:

1. To understand the different issues involved in the design and implementation of a database system.
2. To understand Structured Query Language for manipulating the Data.
3. To study the physical, conceptual and logical database designs
4. To provide concepts of Transaction, Concurrency and Recovery Management Strategies of a DBMS
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

Course Outcomes:

1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications and apply indexing techniques.
3. Construct a Database Schema, Manipulate data using a SQL.
4. Can apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

UNIT –I

Introduction to DBMS, Data Base System Applications, Data Base System VS File System, Instances And Schemas, Data Models – The ER Model, ER Diagrams –Attributes And Entity Sets – Relationships And Relationship Sets – Concept Design With The ER Model .

To Practice:

1)Practicing DDL commands: Creating tables for various relations (in SQL).

2) Practicing Hostel Management System ER Diagram, Airlines Reservation System ER Diagram.

UNIT –II

Relational Model: Introduction To The Relational Model – Basic Structure, Database Schema, Keys, Form Of Basic SQL Query – Database Langugages , DDL , DML , Examples Of Basic SQL Queries .

To Practice:

Practicing SQL Queries of above mentioned topics

UNIT –III

SQLoperators,SQL functions, JOINS, -Types of Joins,Introduction To Nested Queries, Set Operators,Integrity Constraints over relations,Introduction to Views , Destroying / altering tables and views.Practice on DCL and TCL commands.

To Practice:

Practicing SQL Queries of above mentioned topics

UNIT –IV

Pitfalls in relational databases,Functional Dependencies ,Importance of Normalization– 1NF,2NF,3NF,BCNF,4NF

To Practice:

Concepts of Normalizations and its types, Writing Assertions.

UNIT –V

Transaction Concept- Transaction state,ACID properties, Concurrent executions,Serializability, Lock based protocols,Log based recovery.

To Practice:

Practicing, DCL and TCL commands,(Commit, rollback, Save points, Grant, Revoke and Roles commands on tables)

TEXT BOOK:

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATAMcGraw Hill 3rd Edition

REFERENCE BOOKS:

1."Data base System Concepts", Silberschatz, Korth, McGraw hill, V edition.

2. "Introduction to Database Systems", C.J.Date Pearson Education.

3. "Database Systems design, Implementation, and Management", Rob & Coronel 5th Edition.

4. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.

5. "Database Management System", ElmasriNavate Pearson Education.

6. "Database Management System", Mathew Leon, Leo.