

**Academic Regulations  
Programme Structure  
&  
Detailed Syllabus**

**Bachelor of Technology  
(B. Tech)**  
(Four Year Regular Programme)  
(Applicable for Batches admitted from 2017-18)



**Department of Mechanical Engineering**

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
Bachupally, Kukatpally, Hyderabad, Telangana, India  
500 090**

## Academic Regulations

### GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD DEPARTMENT OF MECHANICAL ENGINEERING (B. Tech) GR17 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2017 Regulations (GR17 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Mechanical Engineering with effect from the students admitted to the programmes in 2017-18 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 into two semesters.
  - b) Minimum number of instruction days in each semester is 90.
  - c) **Student is introduced to “Choice Based Credit System (CBCS)”**
  - d) **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).**
  - e) The total credits for the Programme is 192. Typically each semester has 24 credits.
  - f) **A student has a choice of registering for credits from the courses offered in the programme ensuring the total credits in a semester are between 20 and 28.**
  - 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	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes mathematics, physics and chemistry subjects
2		ES - Engineering Sciences	Includes fundamental Engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (ElC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OE – Open Electives	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
7	Core Courses	Project Work	B.Tech. project or UG project or UG major project
8		Industrial training/ Mini- project	Industrial training/ Internship/ UG Mini-project/ Mini-project
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor courses	-	1 or 2 Credit courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory courses Credits/Marks are not counted for grading/pass percentage

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:
- 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.
  - A student has to register for all the 192 credits and secure all credits.
  - 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.
  - The Degree of B.Tech in Mechanical 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 be condoned.
- 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 re-registration 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	25	50	75
3	Engineering Graphics	30	70	100
4	Industry Oriented Mini Project	25	50	75
5	Comprehensive Viva	-	100	100
6	Seminar	50	-	50
7	Major Project	50	150	0

- 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	0	Internal Exams & Continuous Evaluation	1) Two mid semester examinations shall be conducted for 20 marks each for a duration of 2 hours. Average of the two mid exams shall be considered <b>i) Subjective - 15 marks</b> <b>ii) Objective - 5 marks</b> <b>2) Tutorials - 5 marks</b> <b>3) Continuous Assessment – 5</b>

		0	Semester-end examination	The semester-end examination is for a duration of 3 hours
2	Practical	25	Internal Exams & Continuous Evaluation	<b>i) Internal Exam-10 marks</b> <b>ii) Record - 5 marks</b> <b>iii) Continuous Assessment - 10 marks</b>
		50	Semester-end examination	The semester-end examination is for a duration of 3 hours

d) **Industry Oriented Mini Project:** The Mini Project is to be taken up with relevance to Industry and is evaluated for 75 marks. Out of 75 marks, 25 marks are for internal evaluation and 50 marks are for external evaluation. The supervisor continuously assesses the students for 15 marks (Continuous Assessment – 10 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 50 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

e) **Comprehensive Viva:** The comprehensive viva shall be conducted by a Committee consisting of HOD and two senior faculty members of the department. The student shall be assessed for his/her understanding of various courses studied during the programme of study. The Viva-voce shall be evaluated for 100 marks.

f) **Seminar:** For the seminar, the student shall collect information on a specialized topic and prepare a technical report and present the same to a Committee consisting of HOD and two senior faculty and the seminar coordinator of the department. The student shall be assessed for his/her understanding of the topic, its application and its relation with various courses studied during the programme of study for **50 marks**.

g) **Major Project:** The project work is evaluated for 200 marks. Out of 200, 50 marks shall be for internal evaluation and 150 marks for the external evaluation. The supervisor assesses the student for 25 marks (Continuous Assessment – 15 marks, Report – 10 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 25 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 150 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor.

**h) Engineering Graphics:**

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

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for re-counting 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 credits can

appear for a supplementary examination, as per the schedule announced by the College.

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

**12. 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 semester only when he/she satisfies the requirements of all the previous semester

No.	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	Regular course of study of first year second semester. (ii) Must have secured at least 24 credits out of 48 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student 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	Regular course of study of second year second semester. (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student 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	Regular course of study of third year second semester. ) Must have secured at least 86 credits out of 144 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
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 grades and percentage of marks, as given below, is followed

Letter Grade	Grade Point	Percentage of marks
(Outstanding)	10	Marks $\geq$ 90
+ (Excellent)	9	Marks $\geq$ 80 and Marks < 90
(Very Good)	8	Marks $\geq$ 70 and Marks < 80
+ (Good)	7	Marks $\geq$ 60 and Marks < 70
(Average)	6	Marks $\geq$ 50 and Marks < 60
(Pass)	5	Marks $\geq$ 40 and Marks < 50
(Fail)	0	Marks < 40
b (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.,

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

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  $k \geq 2$ .

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

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 the 192 credits.

	Class Awarded	CGPA Secured
14.1	First Class With Distinction	CGPA $\geq$ 8.00 with no F or below grade/ detention anytime during the programme
14.2	First Class	CGPA $\geq$ 8.00 with rest of the clauses of 13.1 not satisfied
14.3	First Class	CGPA $\geq$ 6.50 and CGPA < 8.00
14.4	Second Class	CGPA $\geq$ 5.50 and CGPA < 6.50
14s.5	Pass Class	CGPA $\geq$ 5.00 and CGPA < 5.50

**14. 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 withheld 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 GR17 (Applicable for Batches Admitted from 2018-19)**

**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 144 credits and secure all credits. The marks obtained in all 144 credits shall be considered for the calculation of the final CGPA.

<b>S. No.</b>	<b>Promotion</b>	<b>Conditions to be fulfilled</b>
<b>1</b>	<b>Second year first semester to second year second semester.</b>	<b>Regular course of study of second year first semester.</b>
<b>2</b>	<b>Second year second semester to third year first semester.</b>	<b>(i) Regular course of study of second year second semester. (ii) Must have secured at least 29 credits out of 48 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.</b>
<b>3</b>	<b>Third year first semester to third year second semester.</b>	<b>Regular course of study of third year first semester.</b>
<b>4</b>	<b>Third year second semester to fourth year first semester.</b>	<b>(i) Regular course of study of third year second semester. (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to</b>



		<b>third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.</b>
<b>5</b>	<b>Fourth year first semester to fourth year second semester.</b>	<b>Regular course of study of fourth year first semester.</b>

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 semester only when he/she satisfies the requirements of all the previous semesters.

**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 144 credits.

	<b>Class Awarded</b>	<b>CGPA Secured</b>
<b>3.1</b>	<b>First Class With Distinction</b>	<b>CGPA <math>\geq</math> 8.00 with no F or below grade/ detention anytime during the programme</b>
<b>3.2</b>	<b>First Class</b>	<b>CGPA <math>\geq</math> 8.00 with rest of the clauses of 3.1 not satisfied</b>
<b>3.3</b>	<b>First Class</b>	<b>CGPA <math>\geq</math> 6.50 and CGPA <math>&lt;</math> 8.00</b>
<b>3.4</b>	<b>Second Class</b>	<b>CGPA <math>\geq</math> 5.50 and CGPA <math>&lt;</math> 6.50</b>
<b>3.5</b>	<b>Pass Class</b>	<b>CGPA <math>\geq</math> 5.00 and CGPA <math>&lt;</math> 5.50</b>

## I B.TECH

## I SEMESTER

Group	Subject code	Name of subject	Credits			Total credits	Total Hours	Internal Marks	External Marks	Total Marks
			L	T	P					
BS	GR17A1001	Linear Algebra and Single Variable Calculus	2	1		3	4	30	70	100
BS	GR17A1002	Advanced Calculus	2	1		3	4	30	70	100
BS	GR17A1008	Engineering Chemistry	2	1		3	4	30	70	100
ES	GR17A1023	Engineering Graphics	1		2	3	5	30	70	100
HS	GR17A1018	Basic Electrical Engineering	2	1		3	4	30	70	100
ES	GR17A1012	Engineering Mechanics (Statics)	2	1		3	4	30	70	100
ES	GR17A1024	Business Communication and Soft Skills			2	2	4	25	50	75
ES	GR17A1026	IT Workshop			2	2	4	25	50	75
BS	GR17A1030	Engineering Chemistry lab			2	2	4	25	50	75
		<b>TOTAL</b>	<b>11</b>	<b>5</b>	<b>8</b>	<b>24</b>	<b>37</b>	<b>255</b>	<b>570</b>	<b>825</b>

## I B.TECH

## II SEMESTER

Group	Subject code	Name of subject	Credits			Total credits	Total Hours	Internal Marks	External Marks	Total Marks
			L	T	P					
BS	GR17A1003	Transform Calculus and Fourier Series	2	1		3	4	30	70	100
BS	GR17A1004	Numerical Methods	2	1		3	4	30	70	100
BS	GR17A1006	Physics for Engineers	2	1		3	4	30	70	100
ES	GR17A1005	English	2	1		3	4	30	70	100
ES	GR17A1011	Computer Programming & Data structures	2	1		3	4	30	70	100
ES	GR17A1020	Engineering Mechanics (Dynamics)	2	1		3	4	30	70	100
HS	GR17A1025	Engineering Workshop			2	2	4	25	50	75
ES	GR17A1029	Engineering Physics lab			2	2	4	25	50	75
BS	GR17A1028	Computer Programming & Data Structures lab			2	2	4	25	50	75
		<b>TOTAL</b>	<b>11</b>	<b>5</b>	<b>8</b>	<b>24</b>	<b>36</b>	<b>255</b>	<b>570</b>	<b>825</b>

<b>MECH II. B.Tech I-SEMESTER</b>											
<b>Group</b>	<b>Subject code</b>	<b>Name of subject</b>	<b>Credits</b>			<b>Total credits</b>	<b>Hours</b>			<b>Total Hours</b>	<b>Total Marks</b>
			<b>L</b>	<b>T</b>	<b>P</b>		<b>L</b>	<b>T</b>	<b>P</b>		
BS	GR17A2011	Probability and Statistics	2	1		3	2	2		4	100
PC	GR17A2019	Kinematics of Machinery	3	1		4	3	2		5	100
PC	GR17A2020	Mechanics of Solids	2	1		3	2	2		4	100
PC	GR17A2021	Engineering Thermodynamics	3	1		4	3	2		5	100
PC	GR17A2022	Material Science and Metallurgy	3	1		4	3	2		5	100
PC	GR17A2023	Machine Drawing Lab			2	2			4	4	75
PC	GR17A2024	Material Science and Metallurgy Lab			2	2			4	4	75
PC	GR17A2025	Mechanics of Solids Lab			2	2			4	4	75
		<b>Total credits/Hours/Marks</b>	<b>13</b>	<b>5</b>	<b>6</b>	<b>24</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>35</b>	<b>725</b>
MC	GR17A2002	Value Education and Ethics			2	2			2	2	100
MC	GR17A2106	Gender sensitization Lab			2	2			2	2	75

<b>MECH II. B.Tech II-SEMESTER</b>											
<b>Group</b>	<b>Subject code</b>	<b>Name of subject</b>	<b>Credits</b>			<b>Total credits</b>	<b>Hours</b>			<b>Total Hours</b>	<b>Total Marks</b>
			<b>L</b>	<b>T</b>	<b>P</b>		<b>L</b>	<b>T</b>	<b>P</b>		
PC	GR17A2026	Electrical and Electronics Technology	2	1		3	2	2		4	100
PC	GR17A2027	Production Technology	3	1		4	3	2		5	100
PC	GR17A2028	Fluid Mechanics and Hydraulic Machinery	3	1		4	3	2		5	100
PC	GR17A2029	Internal Combustion Engines	2	1		3	2	2		4	100
PC	GR17A2030	Advanced Mechanics of Solids	3	1		4	3	2		5	100
PC	GR17A2031	Production Technology Lab			2	2			4	4	75
PC	GR17A2032	Electrical and Electronics Technology Lab			2	2			4	4	75
PC	GR17A2033	Fluid Mechanics and Hydraulic Machinery lab			2	2			4	4	75
		<b>Total credits/Hours/Marks</b>	<b>13</b>	<b>5</b>	<b>6</b>	<b>24</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>35</b>	<b>725</b>
MC	GR17A2001	Environmental Science	4			0	4			4	100
		<b>TOTAL</b>				<b>24</b>				<b>39</b>	<b>825</b>

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**LINEAR ALGEBRA AND SINGLE VARIABLE CALCULUS**

**Course Code: GR17A1001**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Vector algebra, Matrix algebra and Pre-calculus

### **Unit-I**

**Linear Algebra and Matrix eigen value problem:** Rank of a matrix, Normal form, Consistency of a system of linear equations-Rank-Nullitytheorem, Pseudo inverse of a matrix-Condition number of a matrix-Norm of matrix, Approximate solution of an over determined system of linear equations using the pseudoinverse-Moore penrose method, -Solution of a system of homogeneous linear equations.

Vector norms, Linear dependence and independence of vectors, Gram-Schmidt Orthogonalization of vectors, Matrix norms, Cayley Hamilton theorem determination of Eigen values and Eigen vectors of a square matrix-Properties of Eigen values and Eigen vectors of real and complex matrices

### **Unit-II**

**Matrix factorization and Quadratic Forms:** Diagonalization of a matrix- Orthogonal diagonalization of symmetric matrices-Computation of matrix powers- -Singular value decomposition - QR factorization Quadratic forms-Definiteness of a quadratic form-Rank, index and signature of a quadratic form- Reduction of a quadratic form into a canonical form by an orthogonal transformation

### **Unit-III**

**Differential Calculus of functions of a single variable:** Mean value theorems (Rolles', Lagrange's, Cauchy's, Taylor's and Maclaurin's theorems Geometrical Interpretation without proof) –L – Hospital rule , Hessian matrix . Approximation of functions by Taylor's and Maclaurin's theorems-Series expansion of functions, Power series representation total derivative; Tangent plane and normal line

### **Unit-IV**

**Linear differential equations of the first order and their applications:** Formation of ODE- Methods to solve first order LDE (exact, reducible to exact, linear and Bernoulli equations)Applications-Growth and decay models-Newton's law of cooling- Applications to electrical circuits (LR and RC circuits)-Geometrical applications-Orthogonal trajectories solvable for  $p$ , equations solvable for  $y$ , equations solvable for  $x$  and Clairaut's type.

## Unit-V

**Linear differential equations of the higher order and applications:** Equations with constant coefficients-Particular integrals for functions of the type - - Exponential shift - Method of variation of parameters. CauchyEuler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties  
Applications-Deflection of beams, Simple harmonic motion (simple pendulum, spring-masssystems) and RLC circuits

### Text Books

1. Advanced Engineering Mathematics: R.K.Jain and S.R.K.Iyengar- Narosa Publishing House
2. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.
3. Higher Engineering Mathematics: B.S.Grewal-Khanna Publications.

### References Books

1. Introduction to Linear Algebra-Gilbert Strang
2. Schaum's outline series on Linear Algebra
3. GRIET reference manual

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ADVANCED CALCULUS**

**Course Code: GR17A1002**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Analytical 2-D and 3-D geometry, differential and integral calculus

**Unit-I**

**Differential Calculus of functions of several variables and Function Optimization:**

Partial differentiation – Visualization of partial derivatives - Hessian matrix-Total differentiation-Jacobian and its utility

Optimization of functions of several variables without constraints- Constrained optimization of functions of several variables with one or more equality constraints-The Lagrange's multiplier method

**Unit-II**

**Curve tracing principles and Applications of integration:** Basic principles of tracing Cartesian, polar and parametric curves -Applications of the definite integral to evaluate arc lengths, surface areas of revolution and volumes of revolution

**Unit-III**

**Multiple integrals and applications:** Evaluation of Double integrals in Cartesian and polar coordinates-Changing the order of integration- Change of variables - Evaluation of triple integrals in Cartesian, cylindrical and spherical polar coordinates

Application of multiple integrals to evaluate plane areas and volumes of solids

**Unit-IV**

**Vector Calculus:** Vector differentiation in Cartesian coordinates-Gradient, Divergence and Curl and their physical interpretation-Directional derivatives-Angle between surfaces, Vector Identities, Irrotational fields and scalar potentials

Vector integration-Evaluation of line integrals-Work done by conservative fields-Surface integrals

**Unit-V**

**Vector Field theorems:** Green's theorem in the plane-Divergence theorem of Gauss-Stoke's theorem (Without Proofs)

**Text Books**

1. Advanced Engineering Mathematics: R.K.Jain and S.R.K.IyengarNarosa Publishing House
2. Schaum's outline series on Vector Analysis
3. Higher Engineering Mathematics: B.S.Grewal-Khanna Publications

**Reference Books**

1. Advanced Engineering Mathematics: Erwin Kreyszig-Wiley
2. Calculus and Analytical Geometry-Thomas & Finney-Narosa
3. GRIET Reference Manual.

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGINEERING CHEMISTRY**

**Course Code: GR17A1008**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Fundamentals in Engineering Chemistry Theory Course

### **Unit-I**

**Water Technology:** Sources of natural water, impurities, hardness: causes, types, expression, units, estimation of hardness of water using complexometric titration method, problems on hardness, Boiler feed water, boiler troubles (scale, sludge, carry over, Caustic Embrittlement, Boiler Corrosion). Internal treatment methods (carbonate, phosphate, Calgon), Softening of water – Lime Soda, Ion- Exchange and zeolite processes. Potable water- its characteristics and steps involved in Municipal Water Treatment, Chlorination-Break Point Chlorination, sterilization by ozonation. Desalination of Brackish water - Reverse Osmosis, Electrodialysis. Waste water-types of effluents, domestic and industrial effluents, sewage treatment-primary, secondary and tertiary .

### **Unit-II**

**Electrochemistry & Corrosion:** Concept of Conductance -specific, equivalent, molar conductance and their inter relationships applications of conductance-conductometric titrations-(Strong acid Vs Strong Base and Weak Acid Vs Strong Base). EMF of a cell, Single Electrode Potential, Standard Electrode potential, potentiometric titrations(dichrometry), Electro chemical series and its applications, Electrochemical Cells-types, Galvanic cell: cell representation, Cell reactions, Cell EMF, Electrolytic cells, Concentration cell. Batteries-types, dry cell, Lithium Cells (liquid and solid cathode), Secondary cells: Pb-PbO<sub>2</sub> cell, Fuel cells: H<sub>2</sub>-O<sub>2</sub> fuel cells and their applications.

**Corrosion:** Causes and effects of corrosion-types of corrosion- chemical (Dry) corrosion-types and their mechanism, Electrochemical (Wet) corrosion and its mechanism, factors affecting the rate of corrosion – nature of metal and nature of environment. Corrosion Control Methods-Cathodic Protection: Sacrificial Anodic, Impressed Current Cathodic protection. Metallic Coatings –Anodic and Cathodic coatings, Methods of application of metallic coatings- Hot Dipping method (Galvanization and tinning), Electroplating (Cu coating), Electroless plating (Ni plating), Organic Coatings: Paints – its constituents and their functions.

### **Unit-III**

**Engineering Materials I:** Cement-types-port land cement –composition, Setting & Hardening of Portland cement.

Ceramics-types-ceramic products - whitewares, Stone wares, preparation, properties and applications of ceramics.

Refractories-classification, properties (refractoriness, RUL, porosity, thermal spalling) and their application.

**Lubricants:** Classification with examples, mechanisms of lubrication (thick film, thin film, extreme pressure), solid lubricants, properties of lubricants- viscosity, flash point, fire point, cloud point, pour point (Definition and significance).

## Unit-IV

**Engineering Materials II:** Electronic materials: Semiconductors, intrinsic & extrinsic semiconductors, Preparation of Pure Ge and Si by Zone Refining, Czochralski Crystal Pulling, Doping Techniques-Epitaxy, Diffusion & ion implantation.

Polymer Materials: Monomer, polymer, types of polymerization-addition and condensation, Plastics-Thermoplastic resins, Thermo set resins. Compounding & fabrication of plastics (compression & Injection moulding), Preparation, Properties, Engineering applications of High Density Poly Ethylene (HDPE), differences between HDPE & LDPE, Poly Vinyl Chloride (PVC), Bakelite & Nylon 6,6. Organic Light Emitting Diodes (an Overview). Biodegradable polymers-their advantages and their applications. Elastomers – preparation, properties and applications of Butyl rubber, Styrene-Butadiene Rubber. Conducting polymers, classification with examples-mechanism of conduction in trans poly acetylene and their applications.

## Unit-V

**Energy sources: Fossil Fuels:** Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Calorific value of fuel – HCV, LCV, Determination of Calorific Value using BOMB calorimeter, analysis of flue gas using Orsat apparatus, Theoretical calculation of Calorific Value by Dulong's formula, Numerical Problems. Petroleum-its composition-synthetic petrol – Bergius and Fischer Tropsch's processes, cracking -definition, its types and significance, knocking and its mechanism in Internal Combustion engines, Octane Rating of Gasoline, Composition, and applications of natural gas, LPG, CNG. Bio-fuels: preparation of Bio-diesel by trans esterification method, advantages of Bio-fuel.

### Text Books

1. A text book of Engineering Chemistry by PC Jain and Monica Jain, DhanpatRai publishing company.

### Reference Books

1. A text book of Engineering Chemistry by SS Dara and SS Umre, S Chand publications.
2. A text book of Engineering Chemistry by Dr Y Bharathikumari and DrChJyothsna, VGS publications.
3. A text book of Engineering Chemistry by R.P.Mani, K.N.Mishra, B.Rama Devi, V.R.Reddy, Cengage Learning Publications



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGINEERING GRAPHICS**

**Course Code: GR17A1023**

**L:1 T:0 P:2 C:3**

**Prerequisites:** Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability.

**Unit-I**

**INTRODUCTION TO ENGINEERING DRAWING:** Principles of Engineering Graphics and their Significance Drawing Instruments and their Use Conventions in Drawing Lettering BIS Conventions. Curves used in Engineering Practice & their Constructions: a) Conic Sections, b) Cycloid, Epicycloid and Hypocycloid, c) Involute.

**SCALES:** Different types of scales. Plain Scale, Diagonal Scale & Vernier Scale

**Unit-II**

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

**Unit -III**

**PROJECTIONS OF PLANES:** Planes parallel, perpendicular and inclined to one of the reference planes. Plane inclined to both the reference planes.

**PROJECTIONS OF SOLIDS:** Projections of Regular Solids inclined to both planes.

**Unit-IV**

**SECTIONS OF SOLIDS:** Types of section planes, Section by a plane perpendicular to V.P., Section by a plane perpendicular to H.P.

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

**Unit-V**

**ISOMETRIC PROJECTIONS:** Principles of Isometric Projection Isometric Scale Isometric Views Conventions Isometric Views of Lines, Plane Figures, Simple and Compound Solids Isometric Projection of objects having non-isometric lines. Isometric Projection of Spherical Parts.

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

**Text Books**

1. Engineering Drawing, N.D. Bhat / Charotar

**Reference Books**

1. Engineering Drawing and Graphics, Venugopal / New age.
2. Engineering Drawing- Johle/Tata Macgraw Hill.
3. Engineering Drawing, Narayana and Kannaiah / Scitech publishers. Engineering Drawing, Narayana and Kannaiah / Scitech publishers.
4. Engineering Drawing Basanth Agrawal/ C M Agrawal; 2e McGraw Hill Education

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

**Course Code: GR17A1018**

**L:2 T:1 P:0 C:3**

**Unit-I**

**Basic Laws:** Ohm's law , Kirchoff's voltage and current laws , Nodes-Branched and Loops ,Series elements and Voltage Division , Parallel elements and Current Division , Star-Delta transformation, Independent sources and Dependent sources , Source transformation.

**Unit-II**

**AC Fundamentals-I:** Review of Complex Algebra , Sinusoids , Phasors , Phasor Relations of Circuit elements , Impedance and Admittance , Impedance Combinations , Series and Parallel combination of Inductors and Capacitors, Mesh analysis and Nodal Analysis.

**Unit-III**

**AC Fundamentals-II:** RMS and Average values, Form factor, Steady State Analysis of Series,Parallel and Series Parallel combinations of R, L,C with Sinusoidal excitation, Instantaneous power, Average power, Real power, Reactive power and Apparent power, concept of Power factor, Frequency.

**Unit-IV**

**Resonance and Network Theorems:** Resonance in Electric circuits: Analysis of Series and Parallel Resonance, Theorems: Superposition theorem, Thevenin's theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity theorem.

**Unit-V**

**Fundamentals of Electrical Machines:** Construction, Principle, Operation and Applications of (i) DC Motor (ii) Single phase Transformer (iii) Single phase Induction motor

**Text Books**

1. Fundamentals of Electric Circuits by Charles K.Alexander, Matthew N.O.Sadiku, Tata McGraw Hill Company.

**Reference Books**

1. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti – DhanpatRai& Co
2. Basic Electrical Engineering by Nagasarkar, Oxford Publishers
3. Network Theory by Prof.B.N.Yoganarasimham.
4. Engineering Circuit Analysis by William H.Hayt.Jr, Jack E.Kemmerly and Steven
5. M.Durbin by Tata McGraw Hill Company.
6. Electrical Engineering Fundamentals by Vincent Deltoro
7. Circuit Theory by Sudhakar and ShyamMohan

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGINEERING MECHANICS-STATICS**

**Course Code: GR17A1012**

**L:2 T:1 P:0 C:3**

**Prerequisites:** A good working knowledge of calculus, vector algebra, General Physics is required.

### **Unit-I**

**Forces, Moments, Equilibrium:** Introduction to Engineering Mechanics, Basic Concepts.

**System of forces:** Coplanar forces, concurrent forces, Resultant, Moment of forces and its application, Varignon's principle, Couples and resultant of force system.

**Equilibrium of systems of forces:** Free body diagrams, equations of equilibrium of coplanar systems, Lami's theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of triangle of forces, converse of the law of polygon of forces, conditions of equilibrium.

### **Unit-II**

**Friction:** Introduction, Types of friction, Laws of Solid friction, definitions- coefficient of friction, Angle of friction, Angle of repose. Equilibrium of a body on horizontal rough plane- under horizontal & inclined force. Equilibrium of a body on a rough inclined plane- with force acting parallel to the plane and inclined to the plane.

### **Unit-III**

**Properties of surfaces and Solids:** Determination of Areas and volumes, First moment of area and the centroid of sections- Rectangle, circle & triangle from method of integration, Composite sections: T-section, I-section, Angle Sections, Hollow Section by using standard formula.

### **Unit-IV**

**Moment of inertia:** Second and product moments of plane area. Parallel Axis theorem, Perpendicular axis theorem, Moment of inertia of sections- rectangle, triangle, circle from method of integration, Composite Sections: T-Section, I section, Angle section, Hollow Section by using standard formula. Polar moment of inertia, moment of inertia about inclined axis, principal moments of inertia of plane areas, Principal axes of inertia.

**Mass Moment of Inertia:** Derivation of mass moment of inertia for rectangular section, circular section, prism, cylinder and sphere from first principles. Relation to area moments of inertia.

### **Unit-V**

**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.

### **Text Books**

1. Engineering Mechanics by A. Nelson, Tata-McGrawhill
2. Engineering Mechanics-Timoshenko & Young, Tata-McGrawhill
3. Engineering Mechanics- A.K Tayal, Uma Publications.

### **Reference Books**

1. Engineering Mechanics by Shames L.H, prentice Hall.
2. Engineering Mechanics by Pakirappa, Durga publications.
3. Engineering Mechanics- R.S Khurmi, S Chand Publications
4. Engineering Mechanics- R.C. Hibbler, twelfth edition, Prentice hall.
5. Engineering Mechanics- Basudeb Bhattacharyya, Oxford University press

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND  
TECHNOLOGY  
BUSINESS COMMUNICATION AND SOFT SKILLS**

**Course Code: GR17A1024**

**L:0 T:0 P:2 C:2**

**Prerequisites:** Familiarity with basic language and communication skills.

**Unit-I**

**Just A Minute (JAM);** Ice Breaking Activity: Self-Introduction ; Introducing others; elocution

**Unit-II**

**Phonetics**

Introduction to speech sounds; identification of sound symbols; vowel and consonants; Word stress and Rhythm; Word Accent; Difference in British and American Pronunciation; Indian English

**Unit-III**

**Role play**

Introduction to role play;; Telephonic Etiquette; situation handling; making requests; seeking permissions; greetings; showing gratitude; situation handling; non-verbal communication

**Unit-IV**

**Debate and Brain-Storming**

Introduction and features of Debate; Types of Debate; Understanding critical thinking; building sustainable arguments; assessing credibility of the argument; overcoming obstacles; Introduction to Brain-Storming; brain-storming technique

**Unit-V**

**Describing a Person, Situation, Process and Object**

**Unit-VI**

**Letter Writing**

Manual and Emailing; types and formats; letter writing expressions; content and body of the letter. Email etiquettes

**Unit-VII**

**Report Writing**

Formats and types of reports; structure of reports

**Unit-VIII**

**Mind Mapping and Six Thinking Hats**

Assimilation of thoughts; expansion of ideas on central idea; suggesting parameters to carry forward the thinking process without deviation.

## **Reference Books**

1. Business Communication; HorySankarMukerjee; Oxford University Press
2. Business Communication; Meenakshi Raman, Prakash Singh; Oxford University Press
3. English and Soft skills; SP DHanavel; Orient Blackswan
4. Soft Skills for Everyone; Jeff Butterfield; Cengage Learning
5. Communication Skills; Viva Career Skills Library
6. Personality Development and Soft Skills; Barun K Mitra; Oxford University Press
7. Six Thinking Hats, Penguin Books, Edward De Bono
8. English for Engineer's; AedaAbidi, Ritu Chaudhry; Cengage Learning
9. Communication Skills ; Sanjay Kumar , Pushpalatha; Oxford University Press
10. Business English: The Writing Skills you need for today's work place: Geffner, Andrea: Fifth edition, Barron's Educational Series, Newyork.

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
IT WORKSHOP**

**Course Code: GR17A1026**

**L:0 T:0 P:2 C:2**

**Prerequisites:**

- Fundamentals of Computer and its parts.
- Identification of peripherals of computer.

PC Hardware introduces the students to a personal computer and its basic peripherals, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. The students should work on working PC to install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced. Productivity tools module would enable the students in crafting professional word documents, spread sheets and slide presentations.

**Task-1**

Installation of OS Every student should install Ubuntu and RedHat Linux on the computer. Lab instructors should verify the installation and follow it up with viva.

**Task-2**

Hands on experience on OpenOffice: Every student should install open office on the computer. Students would be exposed to create word documents with images, tables, formula and with additional word processing features, Power point presentation, Excel and access. Lab instructors should verify the installation and follow it up with viva.

**Task-3**

Internet Based Applications: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

**Task-4**

Networking-Network Infrastructure: Understand the concepts of Internet, intranet, and extranet, local area networks (LANs), Wide area networks (WANs), Wireless networking, network topologies and access methods

**Task-5**

**Network Hardware:** Understand switches, routers, media types. static routing, dynamic routing(routing protocols), default routes; routing table and how it selects best route(s); routing table memory, network address translation (NAT).Introduction to Cisco Packet Tracer, design LAN using routers and switches.

**Task-6**

**Network Protocols:** Understand the Open Systems Interconnection (OSI) model, IPv4, IPv6,tunnelling, dual IP stack, subnet mask, gateway, ports, packets, reserved address ranges for local use (including local loopback IP) Understanding Cisco Router and Switches.

### **Task-7**

**Network Services:** Understand names resolution, networking services, TCP/IP-Tools (such as ping), tracert, pathping, Telnet, IPconfig, netstat, reserved address ranges for local use (including local loopback IP), protocols.

### **Task-8**

**Database -Core Database Concepts:** Understand how data is stored in tables, Understanding DML and DDL statements.

### **Task-9**

**Creating and Insertion of Data:** Understanding Data types, tables and how to insert data in to the tables.

### **Task-10**

**HTML Basic HTML Tags:** Understand what are the tags used for creation of website.

### **Task-11**

**Designing a Static web page:** Understand how to create static web page using forms and tables.

### **References Books**

1. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education.
2. Introduction to Computers, Peter Norton, 6/e McGraw Hill
3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
4. Comdex Information Technology Course tool kit Vikas Gupta, WILEY Dreamtech
5. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme- CISCO Press, Pearson Education
6. PC Hardware and A+Handbook – Kate J. Chase PHI(Microsoft)
7. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill
8. Introduction to Database Systems, C.J.Date Pearson Education.
9. Networking Fundamentals, Wiley, by Microsoft Official Academic Course, 1st Edition.

### **Suggested Tutorials on Lab:**

**Tutorial/Lab 1:** Installation of Ubuntu and RedHat Linux on the computer. Lab instructors should verify the installation and follow it up with viva

**Tutorial/Lab 2:** Students would be exposed to create word documents with images, tables, formula and with additional word processing features, Power point presentation, Excel and access. Lab instructors should verify the installation and follow it up with viva.

**Tutorial/Lab 3:** Understand the concepts of networking topics.

**Tutorial/Lab 4:** DDL and DML statements

**Tutorial/Lab 5:** Designing of static web page and verify it.



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGINEERING CHEMISTRY LAB**

**Course Code: GR17A1030**

**L:0 T:0 P:2 C:2**

**Prerequisites:** Fundamentals in Engineering Chemistry Laboratory

**List of Experiments**

**Task1:** Estimation of Total Hardness in sample water by complexometry

**Task2:** Estimation of percentage available chlorine in Bleaching Powder.

**Task3:** Estimation of  $\text{Fe}^{2+}$  by permanganometry.

**Task4:** Determination of strength of an acid by potentiometric titration method

**Task5:** Determination of strength of an acid by using conductometry.

**Task6:** Determination of Strength of an acid in Pb-Acid battery by titrimetric method

**Task7:** Determination of percentage of Iron in Cement sample by colorimetry.

**Task8:** Estimation of Calcium in port land cement.

**Task9:** Determination of Viscosity of the given unknown liquid by Oswald's viscometer.

**Task10:** Determination of surface tension of the given unknown liquid by stalagmometer.

**Task11:** Preparation of Thiokol rubber.

**Task12:** Determination of percentage Moisture content in a coal sample.

**Task 13.** Estimation of ferrous iron by potentiometric titration using dichromate.

**Task 14.** Preparation of aspirin drug.

**Reference Books**

1. Laboratory Manual on Engineering Chemistry, by Dr. Sudha Rani, Dhanpat Rai Publishing house.
2. A Text book on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications.
3. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited.
4. Engineering Chemistry practical manual prepared by faculty of engineering chemistry, GRIET(A) - (for college circulation only)

# **II SEMESTER**

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
TRANSFORM CALCULUS AND FOURIER SERIES**

**Course Code: GR17A1003**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Differential and integral calculus, multiple integrals and linear differential Equations

### **Unit-I**

**Improper Integrals and Beta, Gamma Functions:** Beta and Gamma functions – Their properties– Evaluation of improper integrals in terms of Beta and Gamma functions. Improper integrals of the first Kind- Improper integrals of the second kind Convergence of Improper Integrals

### **Unit-II**

**Laplace Transform:** Introduction Basic theory of Laplace Transforms-Definition and existence of the Laplace Transform-Elementary functions- Properties of the Laplace transform-Convolution integral - Convolution theorem-Heaviside's unit step-function-Dirac delta function.

The inverse Laplace transform-Properties-Method of partial fractions- Heaviside's inversion formula-Inversion by convolution theorem.

Application of the Laplace transform to solve initial value problems and boundary value problems in ODE.

Solution of a system of linear differential equations-Solution of problems in electrical circuits by Laplace transforms method.

Laplace Transform Method for the solution of some Partial Differential Equations

### **Unit-III**

**Z-Transform and Fourier series:** Introduction- Basic Theory of Z transform - Definition-Z transform of elementary sequences-Properties- The inverse Z Transform, Z transform to solve difference equations -Application of Z transform to find the sum of series

Definition of orthogonal functions-The concept of Weight function-Fourier series of  $2L$  periodic functions- Fourier expansion of  $2\pi$  periodic functions-Half range Fourier series expansions.

Fourier Series Expansions of Even and Odd functions

### **Unit-IV**

**Fourier Transform:** Exponential Fourier series-Introduction – Definition-Fourier integrals –Fourier sine and cosine integral. The continuous one dimensional Fouriertransform-Properties-Convolution-Parseval's identity- Fourier Sine and Cosine transforms.

### **Unit-V**

**Partial differential equations:** Introduction- formulation of First and Second order Partial Differential Equations -Solution of Lagrange's linear equations-Method of separation of variables to solve IBVP like 1-D heat, 1-D wave and BVP like 2-D

Laplace's equations. Application of Fourier transform to the solution of partial differential equations

**Text Books**

1. Advanced Engineering Mathematics: R. K. Jain and S. R. K. Iyengar Narosa Publishing House.
2. Advanced Engineering Mathematics: Erwin Kreyszig-Wiley
3. Schaum's outline series on Laplace transforms

**Reference Books**

1. Higher Engineering Mathematics: B. S. Grewal-Khanna Publications
2. Higher Engineering Mathematics: C. Das Chawla-Asian Publishers
3. GRIET reference manual

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
NUMERICAL METHODS**

**Course Code: GR17A1004**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Elementary calculus, Partial differentiation, Geometry and ordinary differential equations.

**Unit-I**

**Root finding techniques and Numerical solution of linear algebraic systems:** Bi-section method- RegulaFalsi- Fixed point iteration method-Newton Raphson method - Rate of convergence of the above methods (without proof). LU decomposition method- Cholesky's method-Jacobi and Gauss Seidel iteration methods- Convergence of iterative methods (without proof)

**Unit-II**

**Interpolation and Cubic Splines:** Finite differences - Forward, backward and central differences, Relationship between operators- Interpolation with uniform data-Newton's forward and backward difference interpolation formulas- Gauss forward, Gauss backward and Stirling's central interpolation formulas- Lagrange and Newton's divided difference interpolation formulas for non-uniform data- Cubic spline interpolation.

**Unit-III**

**Curve fitting and B-spline approximation:** Method of least squares- Fitting a straight line, and second degree parabola, exponential and power curves to data-Approximation of functions by B-Splines (Linear and Quadratic cases only).

**Unit-IV**

**Numerical differentiation and numerical integration:** Numerical differentiation using the Newton's forward, backward and central difference formulas-Numerical integration by Trapezoidal rule, Simpson's 1/3rd and 3/8th rules-Gauss-Legendre one point, two point and three point rules.

**Unit-V**

**Numerical solution of initial and boundary value problems in ODE:** Initial Value Problems :Picard's method of successive approximation, Solution by Taylor series method, Euler method, Runge- Kutta methods of second and fourth orders. Predictor-corrector methods, Combinations of first and second order P-C methods. Boundary Value Problems in ODE: Finite difference methods for solving second order linear ODE.

**Text Books**

1. Advanced Engineering Mathematics: R.K. Jain and S.R.K. Iyengar - Narosa Publishing House.
2. Advanced Engineering Mathematics: Erwin Kreyszig- Wiley.
3. Introductory methods of Numerical Analysis (5th edition)-S.S. Sastry- PHI.

**Reference Books**

1. Applied Numerical Methods using MATLAB- Yang, Cao, Chung & Morris – Wiley Interscience
2. Numerical methods in Engineering with MATLAB-JaanKiusalaas -Cambridge University Press.
3. GRIET Reference Manual.
- 4.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND**  
**TECHNOLOGY PHYSICS FOR ENGINEERS**

**Course Code: GR17A1006**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Fundamentals in Physics and Mathematics.

**UNIT-I**

- 1. Crystal Structures:** Lattice points, Space lattice, Basis, Bravais lattice, unit cell and lattice parameters, Seven Crystal Systems with 14 Bravais lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Inter planer spacing of Cubic crystal system.
- 2. Defects in Crystals:** Classification of defects, Point Defects: Vacancies, Substitution, Interstitial, Concentration of Vacancies, Frenkel and Schottky Defects, Edge and Screw Dislocations (Qualitative treatment), Burger's Vector, Overview of Surface and Volume defects.

**UNIT –II**

- 1. Acoustics & Acoustic Quietening:** Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time (Qualitative Treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting the Architectural Acoustics and their Remedies. Acoustic Quietening: Aspects of Acoustic Quietening, Methods of Quietening, Mufflers, Sound-proofing.
- 2. Ultrasonics:** Introduction, Production of ultrasonic waves: Piezo electric & Magnetostriction methods, Properties of ultrasonic waves, Applications of ultrasonics: Introduction to NDT, Ultrasonic testing systems: pulse echo, through transmission, Resonance systems and Ultrasonic testing methods: Contact and Immersion methods.

**UNIT – III**

- 1. Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Types of polarization: Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities (Electronic & Ionic) -Internal Fields in Solids, Clausius -Mossotti Equation, Piezo-electricity, Pyro-electricity and Ferro- electricity.
- 2. Magnetic Properties:** Magnetic Permeability, Magnetic Field Intensity, Magnetic Field Induction, Intensity of Magnetization, Magnetic Susceptibility, Magnetic Flux, Origin of Magnetic Moment, Bohr Magnetron, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Hysteresis Curve on the basis of Domain Theory of Ferro Magnetism, Soft and Hard Magnetic Materials, Anti-Ferro, Ferrites and their Applications.

**UNIT – IV**

- 1. Lasers:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Pumping mechanisms, Optical Feedback, Resonator, Characteristics of Laser, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers..
- 2. Fiber Optics:** Structure and Principle of Optical Fiber, Acceptance Angle, Numerical Aperture, Types of Optical Fibers (SMSI, MMSI, MMGI), Skew rays and Meridional rays, Attenuation in Optical Fibers: Scattering losses, absorption losses and bending losses, Application of Optical Fibers, Optical fiber Communication Link with block diagram.

**UNIT –V**

- 1. Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Bottom-up Fabrication: Sol-gel Process, Electrodeposition, Top-down Fabrication: Ball milling, Chemical Vapor Deposition, Physical, Chemical and Optical properties of Nano materials, Characterization (SEM, EDAX), Applications.

**Text Books**

1. Engineering Physics: P.K.Palanisamy, Scitech Publishers.
2. Engineering Physics: S.O.Pillai, New age International.
3. Applied Physics: T.BhimaSankaram,GPrasad,BS Publications.

**Reference Books**

1. Solid State Physics, Charles Kittel, Wiley & Sons (Asia) Pte Ltd.
2. Fundamentals of physics, Halliday,Resnick,Walker.
3. Optical Electronics, A.J Ghatak and K.Thyagarajan, Cambridge University Press.

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGLISH**

**Course Code: GR17A1005**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Familiarity with basic language and communication skills.

**Unit I**

**Sir C.V. Raman-** Enjoying Every Day English & **Mother Teresa-** Inspiring Speeches and Lives

**Unit II**

**i) Grammar :** Types of Articles and their usages; Tense and Aspect; Subject verb Agreement; Prepositions; Redundancies and clichés; Correction of Sentences;

**ii) Vocabulary Development :** Synonyms and Antonyms; One-word substitutes; prefixes and suffixes; words often confused; idioms and phrases; Standard Abbreviations in English

**iii) Speaking & Writing skills :** Information transfer; Public Speaking; Paragraph Writing; Punctuation; Essay Writing;

**Unit-III**

**Connoisseur** - Enjoying Every day English & **Sam Pitroda-** Inspiring Speeches and Lives

**Unit IV**

**Bubbling Well Road-** Enjoying Every day English & **Amarthya Kumar Sen-** Inspiring Speeches and Lives

**Unit V**

**Cuddalore Experience-** Enjoying Every day English & **Martin Luther King Jr.** (I have a dream) - Inspiring Speeches and Lives

**Text Books**

1. Enjoying Every day English by A. Rama Krishna Rao- Sangam Books
2. Inspiring Speeches and Lives by Dr.B.YadavaRaju, Dr.C.Muralikrishna, Maruthi Publications.

**Reference Books**

1. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
2. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw Hill.
3. Technical Communication, Meenakshi Raman, Sangeeta Sharma, Oxford higher Education.
4. English for Engineers Made Easy, AedaAbidi, Ritu Chaudhry, CengageLearning.
5. Communicate or Collapse, Pushpa Latha, Sanjay Kumar, PHI Learning Pvt.Ltd.
6. Communication Skills, Sanjay Kumar, Pushpa Latha, Oxford Higher Education.
7. A Hand Book for Engineers, Dr. P. Eliah, BS Publication



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
COMPUTER PROGRAMMING AND DATA STRUCTURES**

**Course Code: GR17A1011**

**L:2 T:1 P:0 C:3**

**Prerequisites:** Knowledge of mathematics required

### **Unit-I**

**Introduction to Computers:** Computer Hardware and Software, System Software, Program Development Steps, Algorithms, Flowcharts.

**Introduction to C:** Structure of C-Program, Keywords, Identifiers, Data Types, Constants, Variables, Operators, Expressions, Precedence and Order of Evaluation, Type Conversions and Type Casting.

**Managing I/O:** Input-Output Statements, Formatted I/O.

### **Unit-II**

**Decision Making Statements:** if, if-else, if-else-if, nested if, switch

**Iterative Statements:** while, do- while, for

**Unconditional Statements:** break, continue, go to.

**Arrays:** Introduction, One-dimensional Arrays, Declaring and Initializing Arrays, Multidimensional Arrays.

**Strings:** Introduction to Strings, String Handling Functions, Array of Strings.

### **Unit-III**

**Functions:** Introduction, Function Definition, Function Declaration, Function Calls, Return Values and Their Types, Categories of Functions, Nested Functions, Recursion, Storage Classes, Passing Arrays to Functions.

**Pointers:** Pointers and Addresses, Pointer Expressions and Pointer Arithmetic, Pointers and Functions, Pointers and Arrays, Pointers and Strings, Array of Pointers, Pointer to Pointers.

### **UNIT-IV**

**Structures:** Basics of Structures, Nested Structures, Arrays of Structures, Arrays within Structures, Structures and Functions, Self-Referential Structures, Unions.

**Files:** Introduction, Types of Files, File Access Functions, I/O on Files, Random Access to Files, Error Handling, Command Line Arguments.

### **Unit-V**

**Sorting:** Bubble sort, Merge sort, Insertion sort, Selection Sort, Quick Sort.

**Searching:** Linear Search, Binary Search.

**Introduction to Data Structures:** Stack Operations using Arrays: Push and Pop,

**Queue Operations using Arrays:** Insert, Delete

**Teaching Methodologies:** White board and marker, power point presentation

### **Text Books**

1. The C Programming Language, BRIANW. KERNIGHAN Dennis M.Ritchie, Second Edition, PHI.
2. Programming in C, PradipDey, Manas Ghosh, Second Edition, Oxford University Press.
3. Computer Programming and Data structures by EBalaguruswamy, published by McGraw Hill.

## **Reference Books**

1. Data structures using C, A.K. Sharma, Pearson publication
2. Let Us C, Yashwanth Kanetkar, 10th Edition, BPB Publications.
3. C & Data structures, P. Padmanabham, B.S. Publications.
4. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
5. Programming with problem solving, J.A. Jones & K Harrow, Dreamtech Press.
6. Programming in C, Stephen G. Kochan, III Edition, Pearson Education.
7. Data Structures and Program Designing, C, R. Kruse, C.L. Tondo, B P Leung, Shashi M, Second Edition, Pearson Education.
8. Programming in C, Ashok N Kamthane, 2nd edition, Pearson Publication.
9. Introduction to Data Structures in C, Ashok N Kamthane, Pearson Publication.

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGINEERING MECHANICS-DYNAMICS**

**Course Code: GR17A1020**

**L:3 T:1 P:0 C:4**

**Prerequisites:** A good working knowledge of calculus, vector algebra, General Physics & Engineering Mechanics-statics is required.

**Unit-I**

**KINEMATICS OF PARTICLES- RECTILINEAR MOTION:** Introduction- Rectilinear motion of a particle, displacement, velocity and acceleration. Rectilinear motion along X-axis, Determination of motion of particle using methods of differentiation and integration.

**UNIFORMLY ACCELERATED MOTION:** Velocity-time, displacement-time & velocity-displacement relationship. Motion curves - graphical representation of motion of particles. Motion along vertical Y-axis. Motion of the particle projected horizontally in air.

**KINEMATICS OF PARTICLES-CURVILINEAR MOTION:** Introduction, curvilinear motion of a particle, rectangular components of velocity, acceleration components of particle-tangential & normal acceleration components, radial & transverse components of acceleration. Projectile motion, Projectile on Inclined Plane.

**Unit-II**

**KINETICS OF PARTICLES:** Introduction-Definitions of Matter, body, particle, mass, weight, inertia, momentum. Newton's law of motion. Relation Between force & mass. Motion of a particle in rectangular coordinates. Motion of Lift. Motion of body on an inclined plane. Motion of connected Bodies. D'Alembert's Principle and applications.

**WORK ENERGY METHOD:** Law of conservation of Energy, Application of Work Energy Method to particle motion and connected system.

**Unit-III**

**IMPULSE AND MOMENTUM:** Introduction- Impact, Momentum, Impulse & Impulsive forces, Units. Law of conservation of Momentum, Newton's law of collision of elastic bodies-coefficient of Restitution. Recoil of Gun. Impulse Momentum Equation, Non-Impulsive Forces, Impact of jet on a stationary perpendicular flat plate, Impact of jet on a Moving Perpendicular Flat plate.

**Unit-IV**

**KINEMATICS OF RIGID BODIES:** Types of Rigid body motions- Motion of translation, Motion of Rotation, & General Plane Motion. Rotational motion about a fixed axis- Angular displacement, Angular Velocity, Angular acceleration. Equations of circular motion-Rotational motion with constant Angular Acceleration & angular Velocity. Relation between linear & angular acceleration.

**KINETICS OF RIGID BODIES:** Definitions-Force & Translation, Moment of couple & rotation, Torque & rotation. Newton's Law of Rotation. Relation between torque & Moment of inertia. Motion of bodies tied to a string and passing over a pulley.

**UNIT-V**

**MECHANICAL VIBRATIONS:** Introduction-simple harmonic motion, Definitions. Equations of Simple Harmonic Motion, Motion of a body attached to a spring, Springs in series and in parallel, Horizontal Motion of a block attached to a spring. Simple pendulum, Seconds

pendulum, Gain & loss of oscillations due to change in gravity ( $g$ ) & length ( $l$ ) of a simple pendulum, Compound pendulum and Torsional pendulum.

### **Text Books**

1. Engineering Mechanics by A. Nelson, Tata-McGrawhill
2. Engineering Mechanics-Timoshenko & Young, Tata-McGrawhill

### **Reference Books**

1. Engineering Mechanics by Pakirappa, Durga publications.
2. Engineering Mechanics- R.S Khurmi, S Chand Publications
3. Engineering Mechanics- R.C. Hibbler, twelfth edition, Prentice hall.
4. Engineering Mechanics- A.K Tayal, Uma Publications

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENGINEERING WORKSHOP**

**Course Code: GR17A1025**

**L: 0 T: 0 P: 2 C: 2**

**Prerequisites**

Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

**Unit-I**

**Carpentry Shop – 1:**

Introduction to various types of wood such as Teak, Mango, Sheesham, etc. (Demonstration and their identification). Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed. Job I Marking, sawing, planning and chiseling & their practice. Introduction to various types of wooden joints, their relative advantages and uses. Job II Preparation of half lap joint Job III Preparation of Mortise and Tenon Joint Safety precautions in carpentry shop.

**Unit-II**

**Fitting Shop – 2:**

Introduction to fitting shop tools, common materials used in fitting shop. Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.

Job II Filing a dimensioned rectangular or square piece of an accuracy of + 0.5 mm

Job III Filing practice (production of flat surfaces). Checking by straight edge.

Job IV Making a cutout from a square piece of MS Flat using hand hacksaw such as T-fit and V-fit

2.3 Care and maintenance of measuring tools like calipers, steel rule, try square.

**Unit-III**

**House wiring – 3:**

Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, PVC Conduits. Study of electrical safety measures and demonstration about use of protective devices such as fuses, and relays including earthing.

Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.

Job II Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.

Job III Two lamps in series and parallel connection with one way switch

Job IV Two lamps in series and one lamp in parallel connection with one way switch.

Job V Stair case lamp connection with two way switch.

**Unit-IV**

**Tin-smithy – 4:**

Introduction to tin-smithy shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.

Introduction and demonstration of hand tools used in tin-smithy shop.

Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminum sheets etc.

4.4. Preparation of a rectangle tray and open scoop/ funnel.

### **Reference Books**

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayanaet. al; MacMillan India Ltd.
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
5. Workshop Technology by B.S. Raghuwanshi, DhanpatRai and Co., New Delhi.
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**ENGINEERING PHYSICS LAB**

**Course Code: GR17A1029**

**L: 0 T: 0 P: 2 C: 2**

**Prerequisites:** Fundamentals of Physics and Mathematics.

**List of Experiments:**

**Task1:** Determine the energy gap of a given semiconductor.

**Task 2:** Calculate the energy loss in a given Ferro magnetic material by plotting B-H curve.

**Task 3:** Calculate the Numerical Aperture of a given optical fiber.

**Task 4:** Determine the Dielectric constant and Curie temperature of PZT material.

**Task 5:** Calculate the Acceptance angle of a given optical fiber.

**Task 6:** Draw V-I & L-I Characteristics of LASER diode.

**Task7:** Determine the bending losses in a given optical fibers.

**Task8:** Determine the Air-gap losses in a given optical fibers.

**Task9:** Determine the Hall Coefficient in Ge semiconductor by using Hall Experimental setup.

**Task10:** Determine the carrier concentration, mobility of charge carrier in Ge semiconductor.

**Task11:** Measure Ac voltage and frequency through CRO.

**Task12:** Measure Resistance and Capacitance by using digital multimeter.

**Task13:** Determination of wave length of a source -Diffraction Grating.

**Task14:** Determination of Rigidity modulus of a given wire - Torsional Pendulum

**Task15:** Dispersive power of the material of a prism

**Task16:** Determination of wave length of a source using N

**Task17:** Draw V-I and L-I characteristics - LED

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
COMPUTER PROGRAMMING AND DATA STRUCTURES LAB**

**Course Code: GR17A1028**

**L: 0 T: 0 P: 2 C: 2**

**Prerequisite:** Basic operations of computer

**Task- I**

- a) The heights of three students are 165, 148, 154 cm. respectively. Write a c program to sort the heights of the students in descending order.
- b) Write a C program to find the roots of a quadratic equation using if-else.
- c) 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.

- d) In a mathematical number sequence let the first and second term in the sequence are 0 and 1. Subsequent terms are formed by adding the preceding terms in the sequence. Write a C program to generate the first 10 terms of the sequence.

**Task-II**

- a) Write a C program to construct pyramid of numbers.
- b) The reliability of an electronic component is given by reliability  $r=e^{-\lambda t}$  where  $\lambda$  is the component failure rate per hour and  $t$  is the time of operation in hours. Determine the reliability at various operating times from 0 to 3000 hours by plotting a graph using a C program. The failure rate  $\lambda$  is 0.001. Plot the graph with a special symbol.
- c) Write a C program to accept the date of birth and the current date to find the age of the person. The output should specify the age of a person in terms of number of years, months and days.

**Task-III**

- a) Write a C program to calculate the following Sum:  $\text{Sum}=1-x^2/2!+x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$
- b) For a certain electrical circuit with an induction (L) and Resistance (R) , the damped natural frequency is given by  $f=\sqrt{1/LC - R^2/ 4C^2}$ . Write a C program to calculate the frequency for different values of C starting from 0.01 to 0.1.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Task-IV**

- a) Write a C program to find both the largest and smallest number in a list of integers.
- b) Write a C program to count the lines, words and characters in a given text.
- c) Write a C program to sort the names of 5 students in the alphabetical order.  
Ex: Rita, Sneha, Priti, Briya, kittias Briya, Kitti, Priti, Rita, Sneha

**Task-V**

- a) Write a C program to print all the rotations of a given string.
  1. Ex: Rotations of  
the string  
"NEWS" are  
NEWS  
EWSNWSNESN  
EW



- b) Write a C program to perform the following operations:
- To insert a sub-string in a given main string at a given position.
  - To delete n Characters from a given position in a given string.

#### **Task-VI**

- a) Write a C program that uses functions to perform the following:
- Transpose of a matrix
  - Addition of Two Matrices
  - Multiplication of two matrices

#### **Task-VII**

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

#### **Task-VIII**

- a) Using pointers, write a function that receives a character string and a character as argument and deletes all occurrences of this character in the string.
- b) Write a function using pointer parameter that compares two integer arrays to see whether they are identical. The function returns 1 if they are identical, 0 otherwise.

#### **Task-IX**

- a) Write a c program which accepts employee details like (outer structure: name, employee\_id, salary and (inner structure: area, street number, houseno)).Display the employee names and id belonging to a particular area.
- b) Write a C program that uses functions to perform the following operations:
- Addition of two complex numbers
  - Multiplication of two complex numbers
- (Note: represent complex number using a structure.)

#### **Task-X**

- a) Write a C Program to display the contents of a file.
- b) Write a C Program merging of two files in a single file.
- c) Write a C Program to append data into a file.
- d) Write a C program to reverse the first n characters in a file. (Note : The file name and n are specified on the command line.)

#### **Task-XI**

- a) Write a C Program to Search for a given element using Linear & Binary Search Techniques.
- b) Write a C Program to Sort a given list of integers using Bubble Sort Technique.

#### **Task-XII**

- a) Write a C Program to Sort a given list of integers using Merge Sort Technique.
- b) Write a C Program to Sort a given list of integers using Insertion Sort Technique.

#### **Task-XIII**

- a) Write a C Program to Sort a given list of integers using Quick Sort Technique.
- b) Write a C Program to Sort a given list of integers using Selection Sort Technique.

#### **Task-XIV**

- a) Write a C program to implement the following using arrays.
- Push and pop operations of a stack
  - Insert and delete operations of a queue

### **Text Books**

1. The C Programming Language, BRIAN W. KERNIGHAN Dennis M. Ritchie, Second Edition, PHI.
2. Programming in C, Pradip Dey, Manas Ghosh, Second Edition, Oxford University Press.
3. Computer Programming and Data structures by E. Balaguruswamy, published by McGraw Hill.

### **Reference Books**

1. Data structures using C, A.K. Sharma, Pearson publication
2. Let Us C, Yashwanth Kanetkar, 10th Edition, BPB Publications.
3. C & Data structures, P. Padmanabham, B.S. Publications.
4. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
5. Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
6. Programming in C, Stephen G. Kochan, III Edition, Pearson Education.
7. Data Structures and Program Designing, C.R. Kruse, C.L. Tondo, B.P. Leung, Shashi M, Second Edition, Pearson Education.
8. Programming in C, Ashok N Kamthane, 2nd edition, Pearson Publication.
9. Introduction to Data Structures in C, Ashok N Kamthane, Pearson Publication.

**II YEAR I SEMESTER  
SYLLABUS**

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROBABILITY AND STATISTICS**

Course Code: GR17A2011

L: 2 T: 1 P: 0 C: 3

**Prerequisites:** Fundamentals in Basic Mathematics.

**Unit-I**

**Probability:** Basic concepts in Probability - Conditional probability—Addition and Multiplication theorems for two events,(Concepts without derivations)- Bayes' theorem, Boole's inequality.

**Random variables:** Definition of a random variable, discrete and continuous random variables –Distribution function and statement of its properties. Probability mass function, probability density function with illustrations -Joint, marginal and conditional distributions with illustrations, statistical independence - Mathematical expectation and variance of ar.v with examples and statement of their properties.

**Unit-II**

**Distributions:** Distributions: Binomial, Poisson, Normal, Gamma and Exponential distributions(definition, Statements of their Mean and Variance and problems).evaluation of parameters in Binomial and Poisson distributions.

**Sampling distribution:** Definition of Population and sample, Overview of types of sampling(Purposive,Random, SRS with and without replacement cases, Stratified and Systematic random samplings) – Sampling distribution, standard error, statements of sampling distribution of mean(s) (Population variance(s)known and unknown) and proportion(s) (Population proportion(s)known and unknown) with examples.

**Unit-III**

**Estimation and Testing of Hypothesis:** Estimation &Testing of Hypothesis:Definitions of Point and Interval estimation. Confidence intervals for single mean, difference of two means, single proportion and difference of two proportions. Concepts of Null and Alternative hypotheses, Critical region, Type I and Type II errors, one tail and two tail tests, Level of significance and power of a test.

**Large Samples Tests:** Tests of hypothesis for mean(s) (single and difference between means), Tests of hypothesis for proportion(s) (single and difference between proportions), Chi-square test for testing goodness of fit and independence of attributes.

**Unit-IV**

**Small samples:** Student's t-test for testing the significance of single mean, difference of means(independent samples and paired samples), F-test for equality of variances (Concepts and problemsolving)

**Correlation & Regression:** Product moment correlation coefficient, Spearman's rank correlation coefficient and Statements of their properties – Simple linear regression, Lines of Regression, Regression coefficients and Statements of their properties, Multiple regression for three variables only.

**Unit-V**

**Stochastic Process:** Definitions of stochastic process, parameter space and state space. Classification of stochastic processes. Definitions of a Markov chain, transition probability matrix, initial probability distribution. Classification of states in a Markov chain and limiting distribution.

**Queuing theory:** Queue description, characteristics of a queuing model, Poisson process, concept of Birth and death process, steady state solutions of (M/M/1:  $\infty$ /FIFO) and (M/M/1: N/FIFO).(Concepts and problem solving).

### **Teaching Methodologies**

1. Chalk &Talk
2. Ppts

### **Text Books**

1. Probability and statistics for engineers (Erwin Miller and John E. Freund), R.A Johnson and C. B. Gupta, Pearson education.
2. Fundamentals of Stochastic process-Medhi (for Unit-V), New age international publications.
3. Probability and Statistics, Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi et.al, S. Chand.

### **Reference Books**

1. Fundamentals of Mathematical Statistics, S.C. Gupta ,V. K. Kapoor, S. Chand.
2. Probability, Statistics and Queuing Theory with Computer Applications-Arnold O.Allen, Academic press.
3. Introduction to Probability and Statistics, 12th edition, W. Mendenhall, R.J. Beaverand, B.M. Beaver, Thomson. (Indian edition)
4. Probability, Statistics and Queuing Theory, 2nd Edition, Trivedi, John Wiley and Sons.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**KINEMATICS OF MACHINERY**

Course Code: GR17A2019

L:3 T:1 P:0 C:4

**Prerequisites:** Engineering Mathematics

**Unit-I**

**Mechanisms:** Elements, Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs - Types of constrained motions.

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

**Straight Line Motion Mechanisms:** Exact, approximate and intermediate types – Peaucellier, Hart and Scott Russell – Grasshopper – Watt -T.Chebicheff and Robert Mechanisms - Pantograph.

**Unit-II**

**Kinematics:** Velocity and acceleration–Motion of link in machine –Determination of Velocity and acceleration diagrams–Graphical method –Application of relative velocity method four bar chain.

**Analysis of Mechanisms:** Analysis of slider crank chain for displacement, velocity and acceleration of slider–Acceleration diagram for a given mechanism, Klein’s Construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane motion of body:** Instantaneous centre of rotation, centroids and axodes –relative motion between two bodies–Three centres inline theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

**Unit-III**

**Cams and Followers:** Definition of cam and follower – their uses – Types of followers and cams –Terminology – Types of follower motion - Uniform velocity– Simple harmonic motion and uniform acceleration. Maximum velocity and acceleration during outward and return strokes in the above cases. Analysis of motion of followers - Roller follower – circular cam with straight, concave and convex flanks.

**Unit-IV**

**Gears:** Higher pairs, friction wheels and toothed gears – types – Gear Terminology– Law of gearing, Condition for constant velocity ratio for transmission of motion- Form of teeth: Cycloidal and involute profiles - Velocity of sliding – Phenomena of Interference – Condition for minimum number of teeth to avoid interference, Expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

**Gear Trains:** Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gearTrain - Methods of finding train value or velocity ratio –Epicyclic gear trains - Selection of gear box - Differential gear box for an automobile.

**Unit-V**

**Steering Mechanisms:** Conditions for correct steering-Davis Steering gear, Ackerman’s steeringgear – velocity ratio.

**Hooke’s Joint:** Single and double Hooke’s joint-Universal coupling-application- problems.

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

### **Teaching Methodology**

White Board and Marker, PPTs, Models

### **Text Books**

1. Theory of Machines and Mechanisms-S.S.Rattan, Tata McGraw Hill Publishers
2. Theory of Machines R.S Khurmi & J.K Gupta

### **References Books**

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 Dukupati / New Age

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MECHANICS OF SOLIDS**

Course Code: GR17A2020

L:2 T:1 P:0 C:3

**Prerequisites:** Knowledge in Engineering Mechanics (statics)

**Unit-I**

**Simple stresses & strains:** Concept of stresses and 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 - True stress strain Curve Various strengths of material- Yield strength, Ultimate tensile strength, Factor of safety, Strain energy-Gradual, sudden and Impact Loads. Relation between elastic constants, Axial forces, stresses and strains in composite bars, bars under axial loads and self-weight.

**Unit-II**

**Shear Force and Bending Moment Diagrams:** Shear forces and bending moments of beams due to concentrated loads, uniformly distributed loads, uniformly varying loads and couples; Shear Force and Bending Moment diagrams for cantilevers, simply supported beams, and their construction- Maximum bending moment & point of contra flexure. Relation between shear force, bending moment and load intensity.

**Unit-III**

**Slope and Deflection of Beams:** Relation between Bending Moment and slope, slope & deflection of beams, double integration method (Macaulay's method), derivation of formula for maximum slope & deflection for standard cases like cantilever, simply supported carrying point loads and UDL loads.

**Unit-IV**

**Stresses in Machine Elements. Bending stresses:** Theory of simple bending, assumptions, derivation of flexural formula, Bending of common cross sections like 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.

**Unit-V**

**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.

**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).



### **Teaching Methodology**

Power point Presentations, Working models, white board & marker

### **Text Books**

1. Strength of Materials: Ramamrutham.
2. Strength of Materials R K Bansal, Laxmi Publications

### **Reference Books**

1. Analysis of structures by Vazirani and Ratwani.
2. Mechanics of Structures Vol-III, by S.B. Junnarkar.
3. Strength of Materials by Andrew Pytel and Ferdinand L. Singer Longman.
4. Solid Mechanics, by Popov

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGINEERING THERMODYNAMICS**

Course Code: GR17A2021

L:3 T:1 P:0 C:4

**Prerequisites:** Basic Knowledge in Physics, Differentiation, Integration, Fundamental units and dimensions.

**Unit-I**

**Introductory Concepts and Energy:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

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

**Unit-II**

**Second Law of Thermodynamics and Entropy:** Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence /Corollaries, PMM-II, Carnot cycle and its significance, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the third Law of Thermodynamics.

**Unit-III**

**Pure Substances and Perfect Gas Laws:** Pure Substances: P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry. Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables.

**Unit-IV**

Mixtures of Perfect Gases and Air conditioning Concepts: Mixtures of perfect Gases – Mole Fraction, Mass fraction, Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas constant, Molecular Internal Energy, Enthalpy, Specific heat and Entropy of Mixture of perfect Gases and Vapour. Air conditioning Concepts: Psychrometric Properties – Atmospheric air, Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

## **Unit-V**

**Power Cycles:** Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle, Brayton and Rankine cycles - Performance Evaluation – combined cycles – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressure on Air standard basis – comparison of Cycles. Refrigeration Cycles: Reversed Carnot Cycle-Bell- Coleman cycle, Vapour compression cycle-performance Evaluation.

### **Teaching Methodology**

1. Power point Presentations, Working models, white board & marker

### **Text Books**

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen / John Wiley & sons (ASIA) Pte Ltd.

### **Reference Books**

1. Engineering Thermodynamics – Jones & Dugan
2. Thermodynamics – An Engineering Approach – YunusCengel& Boles /TMH
3. Thermodynamics – J.P.Holman / McGrawHill
4. An introduction to Thermodynamics / YVC Rao / New Age
5. Engineering Thermodynamics – K. Ramakrishna / Anuradha Publishers.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MATERIAL SCIENCE AND METALLURGY**

Course Code: GR17A2022

L:3 T:1 P:0 C:4

**Prerequisites:** Basic knowledge from Engineering Physics and chemistry

**Unit-I**

**Structure of Metals:** Bonds in Solids – Metallic bond, crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Crystal systems indices for planes and directions, crystal defects and dislocations, Mechanism of plastic deformation.

**Constitution of Alloys:** Necessity of alloying, types of solid solutions, Hume Rothery's rule, intermediate alloy phases, and electron compounds.

**Unit-II**

**Equilibrium of Diagrams:** Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state –allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe<sub>3</sub>C.

**Unit-III**

**Cast Irons and Steels:** Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

**Unit-IV**

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

**Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

**Unit-V**

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

**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.

**Teaching Methodology**

Power point Presentations, Working models, white board & marker

**Text Books**

1. Introduction to Physical Metallurgy / Sidney H. Avener/TMH
2. Materials Science and engineering / William and Callister/WILEY

**Reference Books**

1. Material Science and Metallurgy/kodgire.
2. Science of Engineering Materials / Agarwal
3. Essential of Materials science and engineering/ Donald R.Askeland/Thomson.
4. Elements of Material science / V. Raghavan
5. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.
6. Engineering materials and metallurgy/R.K.Rajput/ S.Chand.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MACHINE DRAWING LAB**

Course Code: GR17A2023

L:0 T:0 P:2 C:2

**Prerequisites:** Knowledge in Engineering Graphics.

**Unit-I**

**Machine Drawing Conventions:** Need for drawing conventions – introduction to IS conventions

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

**Unit-II**

- a) Forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cottered joints and knuckle joint.

**Unit-III**

- a) Rivetted joints for plates
- b) Shaft coupling, spigot and socket pipe joint.
- c) Journal, pivot and collar and foot step bearings.

**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 heads, Eccentrics, Petrol Engine connecting rod, piston assembly.

**Unit-V**

**Machine parts:** Screws jacks, Machine Vices Plummer block, Tailstock. Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

**Valves:** Steam stop valve, spring loaded safety valve, feed check valve and air cock.

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

**Teaching Methodology**

Power point Presentations, Working models, white board & marker

**Text Books**

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

**Reference Books**

1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Luzzader
3. Machine Drawing - Rajput
4. Machine Drawing – N.D.Bhatt

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MATERIAL SCIENCE AND METALLURGY LAB**

Course Code: GR17A2024

L:0 T:0 P:2 C:2

**List of Experiments**

- Task 1** Preparation and study of the micro structure of Mild steel and Low carbon steel.
- Task 2** Preparation and study of the micro structure of High carbon steel and Stainless steel.
- Task 3** Preparation and study of the micro structure of Grey cast iron and White cast Iron.
- Task 4** Preparation and study of the micro structure of Malleable cast iron and Spheroidal cast iron.
- Task 5** Preparation and study of the micro structure of Aluminium.
- Task 6** Preparation and study of the micro structure of copper.
- Task 7** Preparation and study of the micro structure of Titanium (Ti6Al4V
- Task 8** Preparation and study of the micro structure of Inconel 718 –Super alloy.
- Task 9** Study of the microstructure of Heat treated steels.
- Task 10** Harden ability of steels by Jominy End Quench test.
- Task 11** Find out the hardness of various treated and untreated steels.

**Teaching Methodology:** Experimental Test rigs & Microscopes

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MECHANICS OF SOLIDS LAB**

Course Code: GR17A2025

L: 0 T: 0 P:2 C:2

**Prerequisites:** Fundamentals of Mechanics of solids

**List of Experiments**

**Task 1** To determine the resistance of a material to indentation using Brinell's Hardness Test

**Task 2** To determine the resistance of a material to indentation using Rockwell's Hardness Test

**Task 3** To determine the resistance of a material to indentation using Vicker's Hardness Test

**Task 4** To determine the rigidity modulus of a spring using Compression Test

**Task 5** To determine the strength of material in tension using Tension Test

**Task 6** To determine the strength of material under compression using Compression Test

**Task 7** To determine the young's modulus of the given structural material using Cantilever Beam

**Task 8** To determine the young's modulus of the given structural material using Simply Supported Beam

**Task 9** To determine the young's modulus of the given structural material using Maxwell's Reciprocal Theorem

**Task 10** To determine the young's modulus of the given structural material using Continuous Beam

**Task 11** To determine the tensional strength and stiffness of a material using Torsion Test

**Task 12** To determine the ultimate shear strength of the given structural material using Direct Shear Test.

**Teaching Methodology:** Experimental Test rigs

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**VALUE EDUCATION AND ETHICS**

Course Code: GR17A2002

L:0 T:0 P:2 C:2

**Prerequisites:** General awareness on Moral Science

**Unit-I**

Values and self-development –social values and individual attitudes, Work ethics, Indian vision of Moral and non-moral valuation, Standards and principles. Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Honesty, Humanity, and National unity. .Basic manners-courtesy, respect; humility, modesty, politeness Discovery and acceptance of one’s own abilities, talents, strengths/ weaknesses; optimism to face challenges with hope and resilience.

**Unit-II**

Personality and Behavior Development-God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering,Doing best, Saving nature.SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

**Unit-III**

Character and Competence-Science Vs God, Holy books Vs blind faith, Self-management and good health, Equality:Social equality, Economic equality, Egalitarianism, Equality before the law, Equal opportunity, Racial equality  
All religions and same message, Mind your mind, Self-control, Honesty, Studying effectively.

**Unit-IV**

**Professional consciousness Ethics:** Ethical Human conduct, Development of human consciousness, Holistic technologies, Universal human order, Code of conduct.Professional Ethics and Information Professions, Ethlcal Principles and Professional Relationships

**Unit-V**

**Legislative procedures:** Supreme Court and High Courts-jurisdiction, powers, appointment and transfer of judges; Separation of Powers; Distribution of Legislative and Administrative Powers between Union and States  
Rights and Rules, Human Rights, Copy rights, IPR, RTI Act, Lokpal.

**Text Books**

1. Chakraborty,S.K., Values and Ethics for Originations Theory and Practice, Oxford University Press, New Delhi, 2001
2. R R Gaur, R Saugal, G P Bagaria, “A foundation course in Human values and Professional Ethics”, Excel books, New Delhi, 2010.

**Reference Books**

1. Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.
2. Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
GENDER SENSITIZATION LAB**

Course Code: GR17A2106

L:0 T:0 P:2 C:2

**Unit-I**

UNDERSTANDING GENDER: Gender: Why should we study it? (Towards a world of Equals: Unit – 1) Socialization: Making women, making men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities. Institutional/System Influences on Gender Stereotypes Legal and Political Frameworks for Gender Equality

**Unit-II**

GENDER AND BIOLOGY: Missing Women: Sex Selection and its Consequences (Towards a World of Equals: Unit – 4) Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit – 10) Two or Many? Struggles with Discrimination. Developmental changes in the female, Reproductive Health, Special Health Risks to Women and Ethical concerns in Women's Health

**Unit-III**

GENDER AND LABOUR: Housework: the Invisible Labour (Towards a World of Equals: Unit – 3) "My Mother doesn't Work". "Share the Load". Women's Work: Its Politics and Economics (Towards a World of Equals: Unit – 7) .Gender equality and the world of work, Gender and working poverty and Gender dimensions of various key labour market indicators.

**Unit-IV**

ISSUES OF VIOLENCE: Sexual Harassment: Say No! (Towards a World of Equals: Unit – 6) Sexual Harassment, not Eve-teasing – Coping with Everyday Harassment – Further Reading: "Chupulu" Domestic Violence: Speaking Out (Towards a World of Equals: Unit – 8) Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading. Wife battering., Domestic abuse., Intimate Partner Violence (IPV), Family violence., Relationship violence., Spousal violence and Dating violence.

**Unit-V**

GENDER STUDIES: Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit – 5) Point of View. Gender and the Structure of Knowledge. Further Reading. Unacknowledged Women Artists of Telangana. Whose History? Questions for Historians and Others (Towards a World of Equals: Unit – 9) .Abortion rights, Femicide, Femme invisibility, First-wave feminism, Heterosexual transvestites, Partial-birth abortion, Radical feminism, Same-sex marriage and Women's suffrage

**Text Books**

1. Towards a World of Equals: A Bilingual Textbook on Gender" Telugu Akademi, Hyderabad  
Written by A. Suneetha, Uma Bhugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

**Reference Books**

1. Sen, Amartya. "More than Once Million Women are Missing". New York Review of Books 37.20 ( 20 December 1990). Print. 'We Were Making History.....' Life Stories of Women in the Telangana People's Struggle. New Delhi : Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where India Women Work." Women's Studies Journal (14 November 2012) Available online at: <http://blogs.wsj.com/India/real-time/2012/11/14/by-the-numbers-where-Indian-women-works>
3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada  
<http://harpercollins.co.in/BookDetail.asp?BookCode=3732>
4. Vimala "Vantilu (The Kitchen)". Omen Writing in India: 600BC to the Present, Volume II The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, India Council of Medical Research 1993. B.Tech (ANE) R-15 Malla Reddy College of Engineering and Technology (MRCET) 113
6. Stress Shakti Sanghatana. "We Were Making History....' Life Stories of Women in the Telangana

People`s Struggle. New Delhi:Kali of Women, 1989.

7. Menon, Nivedita. *Seeing Like a Feminist*. New Delhi. Zubaan-Penguin Books, 2012.
8. Jayaprabha, A. "Chupulu (Stares)". *Women Writing in India: 600BC to the Present. Volume II: The 20th Century* Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayam and AnupamManuhaar. "Women and Wage Discrimination in India: A Critical Analysis". *International Journal of Humanities and Social Science Invention* 2, 4(2013).
10. Gautam, Liela and Gita Ramaswamy. "A 'Conversation' between a Daughter and Mother". *Broadsheet on Contemporary Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today*. Ed.Madhumeeta Sinha and Asma Rasheed. Hydrabad: Anveshi research Center for Women`s Studies, 2014.
11. Abdulali Sohaila. " I Fought For My Life...and Won." Available online at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>
12. Jeganathan Pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Black and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. *The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India*. London: Zed Books, 2002.
14. S. Benhabib. *Situating the self: Gender, Community, and Postmodernism in Contemporary Ethics*, London: Routledge, 1992.
15. Virginia Woolf *A Room of One`s* Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Fa*

## **II SEMESTER**

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

Course Code: GR17A2026

L:2 T:1 P:0 C:3

**Unit-I**

**DC Machines:** Principle of operation of DC Generator – EMF equation - types – DC motor types–torque Equation – applications – three point starter.

**Unit-II**

**Transformers:** Principle of operation of single phase transformers –EMF equation – losses – efficiency and Regulation.

**AC Machines:** Principle of operation of alternators – regulation by synchronous impedancemethod –Principle of Operation of induction motor – slip – torque characteristics – applications

**Unit-III**

**Semiconductors and pn Junction Diode:** Types of semiconductors, Conductivity, Energybands, charge carriers, doping. Fermi level, temperature effects, Drift and diffusion currents, recombination and life time, Diode current equations, Junction capacitance, Diode switching characteristics, Zener and avalanche break down Diodes.

**Unit-IV**

**Diode Applications, Special Diodes:** Types of Rectifiers: Half wave, Full wave and Bridgerectifiers, operation and analysis of rectifiers without filters, Operation of rectifiers with filters types: L , C, LC, and pi. Special Diodes; Tunnel, LDR, LED, LCD, Varactor Diode.

**Unit-V**

**Bipolar Junction Transistor:** Transistor Diode Equivalent Circuit, Transistor biasing, DC load line, current components in BJT, Modes of transistor operation, BJT input and output characteristics in CB, CE CC configuration, BJT as an amplifier, BJT stabilizing and biasing techniques, Thermal runaway, heat sinks.

**Teaching Methodologies**

1. Power Point presentations
2. Tutorial Sheets
3. Assignments
4. Lab experiments with Multisim software

**Text Books**

1. Electrical machines P.S Bimbira Khanna Publishers
2. David A. Bell; Electronic Devices and Circuits, Oxford University Press, 5th edition, 2008.
3. R.L. Boylestad and Louis Nashelsky; Electronic Devices and Circuits, Pearson/Prentice Hall, 9th Edition, 2006.

**Reference Books**

1. Electrical Technology B.L.Theraja, Schand Publishers
2. T.F. Bogart Jr J.S.Beasley and G.Rico; Electronic Devices and Circuits – Pearson Education, 6th edition, 2004.
3. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, Prentice Hall of India(p) Ltd,3rd Ed., 2002.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**PRODUCTION TECHNOLOGY**

Course Code: GR17A2027

L:3 T:1 P:0 C:4

**Prerequisites:** Basic knowledge in engineering workshop practices

**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 –Special casting processes – Shell, investment casting – Ceramic mould – Lost Wax process – Pressure die casting  
– Centrifugal casting – CO<sub>2</sub> 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 – Percussion 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 anddrawing 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 andshaping 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.

### **Teaching Methodology**

1. Power point Presentations, Working models, white board & marker

### **Text Books**

1. Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", Media Promoters Pvt Ltd., Mumbai, 2001
2. S.Gowri, P.Hariharan, and A.Suresh Babu, "Manufacturing Technology 1", Pearson Education, 2008.
3. P.N. Rao, "Manufacturing Technology", Tata McGraw-Hill Publishing Limited, II Edition, 2002.

### **Reference Books**

1. B.S. Magendran Parashar & 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, IV Edition, 2003.
3. Begman, "Manufacturing Process", John Wiley & Sons, VIII Edition, 2005.
4. Serop Kalpajian, 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.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**FLUID MECHANICS AND HYDRAULIC MACHINERY**

Course Code: GR17A2028

L:3 T:1 P:0 C:4

Prerequisites: Engineering Mathematics, Fundamentals of Thermodynamics

**Unit-1**

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

Fluid Kinematics: Stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform, non uniform, laminar, turbulent, rotational and irrotational flows- equation of continuity for three dimensional flows.

**Unit-II**

**Fluid Dynamics:** Surface and body forces –Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend. Stream function and Velocity potential

**Unit-III**

**Internal and External Flows:** Flow through tubes and plates -Shear stress and velocity distributions- Navier-stokes equations of fluid motion(Explanation only)- Reynolds’s experiment-Darcy-Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturi meter and orifice meter.

**Unit-IV**

**Basics of turbo machinery :** Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes. Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

**Unit-V**

**Hydraulic Turbines:** Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency. Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

**Hydraulic Pumps:** Classification, working, work done – manometric head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH. Reciprocating pumps : Working, Discharge, slip, indicator diagrams. Power required to drive the pump. Air vessels

### **Teaching Methodology**

1. Power point Presentations, Working models, white board & marker

### **Text Books**

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

### **Reference Books**

1. Fluid Mechanics and Hydraulic machines by R K Bansal, Laxmi publications.
2. Fluid Mechanics & Hydraulic Machines : Problems & Solutions by K.Subrmanya /TMH private limited.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.



**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTERNAL COMBUSTION ENGINES**

Course Code: GR17A2029

L:2 T:1 P:0 C:3

**Prerequisites:** Basic knowledge of Thermodynamics, Basic power cycles and Basic knowledge of fluid mechanics.

**Unit-I**

**Introduction and Analysis of Actual Cycles I.C. ENGINES:** Classification - Working principles, 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.

**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.

**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, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

**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 – 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.

### **Teaching Methodology**

Power point Presentations, Working models, white board & marker

### **Text Books**

1. I.C. Engines / V. GANESAN- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications

### **Reference Books**

1. I C Engines – Mathur & Sharma – DhanpathRai& Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy– TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ADVANCED MECHANICS OF SOLIDS**

Course Code: GR17A2030

L:3 T:1 P:0 C:4

**Prerequisites:** Basic mechanics of solids, Engineering Mechanics.

**Unit-I**

**Thin Cylinders and Spherical Shells:** Stresses and strains in thin cylinders, thin spherical shell.

**Thick cylinders:** Thick cylinders subjected to internal and external pressure and compound cylinders.

**Unit-II**

**Fixed Beams:** Fixing moments and Reactions for a fixed beam of uniform section, Effect of sinking support, slope and deflection. Construction of shear force and bending moment diagrams.

**Unit-III**

**Continuous Beams:** Reaction at the supports, and support moments Effect of sinking of supports.

**Unit-IV**

**Columns and Struts:** Columns with one end free and the other fixed, Both ends fixed, One end fixed and other hinged, Limitation of Euler's formula, Rankine's Formula, Column with initial curvature, Column carrying eccentric load, Laterally loaded columns.

**Unit-V**

**Bending of Curved Beams:** Stresses in bars of circular, rectangular and Trapezoidal sections.

**Stresses due to rotation:** Wheel rim, disc of uniform thickness, disc of uniform strength.

**Teaching Methodology**

Power point Presentations, Working models, white board & marker

**Text Books**

1. Strength of materials by Dr. Sadhu Singh, Khanna Publishers
2. Strength of Materials by R.K .Rajput

**Reference Books**

1. Analysis of Structures, Vol. 1, 1993 edition, by Vazirani and Ratwani.
2. Mechanics of solids by Crandal, Dahl and Lardner.
3. Theory of structures by S.Ramamrutham and R. Narayan, Dhanpat Rai Publishers

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**PRODUCTION TECHNOLOGY LAB**

Course Code: GR17A2031

L:0 T:0 P:2 C:2

**Prerequisites:** Fundamentals of Production of Technology

**List of Experiments**

**I. CASTING**

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

**II. WELDING**

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

**III. MECHANICAL PRESS WORKING**

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

**IV. PROCESSING OF PLASTICS**

1. Injection Moulding
2. Blow Moulding

**Teaching Methodology**

Welding Equipment, Plastic Moulding Equipment, Casting Equipment

**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ELECTRICAL TECHNOLOGY LAB**

Course Code: GR17A2032

L:0 T:0 P:2 C:2

**Contents**

- Task 1** Verification of KCL and KVL.
- Task 2** Verification of Superposition and Reciprocity Theorem.
- Task 3** Verification of Maximum Power Transfer Theorem.
- Task 4** Verification of Thevenin's Theorem.
- Task 5** Magnetization characteristics of D.C. Shunt generator.
- Task 6** Speed control of DC motor.
- Task 7** Swinburne's Test on DC shunt machine.
- Task 8** Brake test on DC shunt motor.
- Task 9** OC and SC tests on Single-phase transformer.
- Task 10** Brake test on 3-phase Induction motor.
- Task 11** Regulation by an alternator by synchronous impedance method.

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**

Course Code: GR17A2033

L:0 T:0 P:2 C:2

Prerequisites: Fundamentals of Fluid Mechanics and Hydraulic Machinery

**List of Experiments**

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

**Task 2** Determine the Coefficient discharge of Venturi meter and Orifice meter

**Task 3** Determine the Darcy's Friction factor in various diameters of pipes

**Task 4** Determine the Minor Losses (Different Valve connections, Sudden Expansion, Sudden Contraction, Bends, joints) in various pipe fittings

**Task 5** Determine the coefficient of impact of Jet on given Vanes

**Task 6** Determine the overall efficiency of Pelton wheel Turbine at Constant Speed and Constant Head

**Task 7** Determine the overall efficiency of Francis Turbine at Constant Speed and Constant Head

**Task 8** Determine the overall efficiency of Kaplan Turbine at Constant Speed

**Task 9** Determine the overall efficiency of Single Stage Centrifugal pump

**Task 10** Determine the overall efficiency of Multistage Centrifugal pump

**Task 11** Determine the overall efficiency of Reciprocating pump

**Task 12** Determine the overall efficiency of Kaplan turbine under constant head.

**Teaching Methodology**

Experimental Test Rigs, Turbines and Pumps

**GOKARAJU RANGARAJU**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENVIRONMENTAL SCIENCE**

Course Code: GR17A2001

L:4 T:0 P:0 C:0

**Prerequisites:** Basic knowledge on basic sciences and natural resources

### **Unit-I**

**Introduction to Environment, Ecology and Ecosystems:** Definition, Scope and Importance ecosystem, public awareness and Participation, Ecology, Concept of ecosystem, Classification of ecosystem, Structure , components and function of ecosystem, Typical ecosystem, Food chain, Food web, Biodiversity-Types and Values, biogeochemical cycles.

### **Unit-II**

**Natural Resources:** Definition, Occurrence, Classification of resources, Important Natural Resources for Human society, Utilization-Positive and negative effects of water resources, Mineral resources, forest resources, Energy resources, Land resources, renewable and non-renewable resources.

### **Unit-III**

**Environmental Pollution:** Definition, Classification of pollution, Types of pollution and pollutants, Cause, effects and control of Air pollution, water pollution, Soil pollution, Noise pollution, Thermal and Nuclear pollution.

### **Unit-IV**

**Environmental Problems and Management Policies:** Natural Disasters-Types, Causes and Effects, Global warming, climate change-EI NiNo-La Nina, Ozone layer-location, role and degradation, Deforestation and desertification, Green belt Development, Rain water harvesting, Renewable and alternative resources.

### **Unit-V**

**National Policy on Environment Protection and Sustainability:** Air (pollution and prevention) act 1981, Water(Pollution and prevention) Act 1974, Pollution Act 1977, Forest conservation Act; wild life protection act; Municipal solid waste management and handling Act, Hazardous waste management and handling rules, Role of IT in environment, environmental ethics, environmental economics.

**Sustainable development:** cause and threats to sustainability, strategies for achieving sustainable development, Concept of green buildings and clean development Mechanism (CDM).

### **Teaching Methodology**

1. White board and marker
2. OHP and Field visit

### **Text Books**

1. Text Book of Environmental Studies, ErachBarucha. University Press
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007

### **Reference Books**

1. Biotechnology & Environmental Chemistry. Surinder Jeswal & Anupama Deswal, Dhanpat Rai & Co Pvt. Ltd.
2. A Text Book of Environmental Science. Aravind Kumar. APH Publishing Corporation.
3. Glimpses of Environment. Dr. KVSG. Murali Krishna. Environmental Protection Society