Academic Regulations
Programme Structure
&
Detailed Syllabus

Bachelor of Technology
(B. Tech)
(Four Year Regular Programme)
(Applicable for Batches admitted from 2018)

Department of Electrical and Electronics Engineering

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

Academic Regulations

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING (B. Tech)
GR18 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2018 Regulations (GR18 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Electrical and Electronics Engineering with effect from the students admitted to the programmes in 2018-19 academic year.

1. **Programme Offered:** The programme offered by the Department is B. Tech in Electrical and Electronics 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 Electrical and Electronics 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/Universityor on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**
   a) Each Academic year of study is divided in to two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) **Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).**
   d) The total credits for the Programme is 160.
   e) **Student is introduced to "Choice Based Credit System (CBCS)".**
   f) **A student has a choice to register for all courses in a semester/ one less or one additional course from other semesters provided the student satisfies prerequisites.**
   g) **All the registered credits will be considered for the calculation of final CGPA.**
   h) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.
   i) **Subject/Course Classification:** All subjects/ courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows.

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

5. **Award of B. Tech Degree:** A student will be declared eligible for the award of B. Tech Degree if he/she fulfills the following academic requirements:
   a) He/She pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
   b) A student has to register for all the 160 credits and secure all credits.
   c) A student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the date of admission, shall forfeit his/her seat in B. Tech course.
   d) The Degree of B. Tech in Electrical and Electronics 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 reregistration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

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

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

b) **Distribution and Weightage of marks**

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

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

Assessment Procedure:

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

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

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

f) Project Work (Phase–I and Phase-II): The project work is evaluated for 100 marks. Out of 100, 30 marks shall be for internal evaluation and 70 marks for the external evaluation. The supervisor assesses the student for 20 marks (Continuous Assessment – 15 marks, Report –5 marks). At the end of the semester, projects shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Project Review Committee for 10 marks. The external evaluation for Project Work is a Viva-Voce Examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 70 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor. These rules are applicable for both Phase I and Phase II.

g) 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 recounting of his/her answer book on payment of a prescribed fee.
9. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.
10. **Supplementary Examinations:** A student who has failed to secure the required 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 year only when he/she satisfies the requirements of all the previous semesters.

S. 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	(i) Regular course of study of first year second semester. (ii) Must have secured at least 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	(i) Regular course of study of second year second semester (ii) Must have secured at least 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	(i) Regular course of study of third year second semester. (ii) Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
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
O (Outstanding)	10	Marks >= 90
A+ (Excellent)	9	Marks >= 80 and Marks < 90
A (Very Good)	8	Marks >= 70 and Marks < 80
B+ (Good)	7	Marks >= 60 and Marks < 70
B (Average)	6	Marks >= 50 and Marks < 60
C (Pass)	5	Marks >= 40 and Marks < 50
F (Fail)	0	Marks < 40
Ab (Absent)	0	

Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-P. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.

Computation of SGPA and CGPA:

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

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

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

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

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

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 160 credits.

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

15. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be 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 GR18
(Applicable for Batches Admitted from 2019-2020)

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

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

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

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

2. **Academic Requirements and Promotion Rules:**

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

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

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

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

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

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090, India. (040) 6586 4440

ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR I SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A1001	Linear Algebra and Differential Calculus	3	1	0	4	4	30	70	100
2	GR18A1005	Engineering Chemistry	3	1	0	4	4	30	70	100
3	GR18A1008	Basic Electrical Engineering	3	0	0	3	3	30	70	100
4	GR18A1006	English	2	0	0	2	2	30	70	100
5	GR18A1013	Engineering Chemistry Lab	0	0	3	3	1.5	30	70	100
6	GR18A1016	Basic Electrical Engineering Lab	0	0	2	2	1	30	70	100
7	GR18A1014	English Language and Communication Skills Lab	0	0	2	2	1	30	70	100
8	GR18A1017	Engineering Workshop	1	0	3	4	2.5	30	70	100
		Induction Programme								
Total			**12**	**2**	**10**	**24**	**19**	**240**	**560**	**800**

I YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A1003	Applied Physics	3	1	0	4	4	30	70	100
2	GR18A1002	Differential Equations and Vector Calculus	3	1	0	4	4	30	70	100
3	GR18A1007	Programming for Problem Solving	3	1	0	4	4	30	70	100
4	GR18A1010	Engineering Graphics	1	0	4	5	3	30	70	100
5	GR18A1011	Applied Physics Lab	0	0	3	3	1.5	30	70	100
6	GR18A1015	Programming for Problem Solving Lab	0	0	3	3	1.5	30	70	100
Total			**10**	**3**	**10**	**23**	**18**	**180**	**420**	**600**

II YEAR I SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2023	Electrical Circuit Analysis	3	1	0	4	4	30	70	100
2	GR18A2024	Analog Electronic Circuits	3	0	0	3	3	30	70	100
3	GR18A2025	Electrical Machines – I	3	0	0	3	3	30	70	100
4	GR18A2026	Electromagnetic Fields	3	1	0	4	4	30	70	100
5	GR18A2027	Engineering Mechanics	3	1	0	4	4	30	70	100
6	GR18A2028	Analog Electronic Circuits Lab	0	0	4	4	2	30	70	100
7	GR18A2029	Electrical Machines – I Lab	0	0	4	4	2	30	70	100
Total			**15**	**3**	**8**	**26**	**22**	**210**	**490**	**700**
8	GR18A2003	Constitution of India	2	0	0	2	2	30	70	100
9	GR18A2002	Value Ethics and Gender Culture	2	0	0	2	2	0	70	100

II YEAR II SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2030	Digital Electronics	3	0	0	3	3	30	70	100
2	GR18A2031	Electrical Machines – II	3	0	0	3	3	30	70	100
3	GR18A2032	Control Systems	3	0	0	3	3	30	70	100
4	GR18A2005	Probability and Statistics	3	0	0	3	3	30	70	100
5	GR18A2004	Economics and Accounting for Engineers	3	0	0	3	3	30	70	100
6	GR18A2033	Digital Electronics Lab	0	0	4	4	2	30	70	100
7	GR18A2034	Electrical Machines – II Lab	0	0	4	4	2	30	70	100
8	GR18A2035	Control Systems Lab	0	0	2	2	1	30	70	100
		Total	**15**	**0**	**10**	**25**	**20**	**240**	**560**	**800**
9	GR18A2001	Environmental Science	2	0	0	2	2	30	70	100

III YEAR I SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Power Systems – I	3	0	0	3	3	30	70	100
2		Power Electronics	3	0	0	3	4	30	70	100
3		Microprocessors	3	0	0	3	3	30	70	100
4		Professional Elective I	3	0	0	3	3	30	70	100
5		Signals and Systems	3	0	0	3	3	30	70	100
6		Fundamentals of Management and Entrepreneurship	3	0	0	3	3	30	70	100
7		Power Systems – I Lab	0	0	2	2	1	30	70	100
8		Power Electronics Lab	0	0	2	2	1	30	70	100
9		Microprocessors Lab	0	0	2	2	1	30	70	100
Total			**18**	**0**	**6**	**24**	**22**	**270**	**630**	**900**

III YEAR II SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Power Systems – II	3	0	0	3	3	30	70	100
2		Measurements and Instrumentation	3	0	0	3	3	30	70	100
3		Artificial Intelligence Techniques	3	0	0	3	3	30	70	100
4		Professional Elective II	3	0	0	3	3	30	70	100
5		Open Elective I	3	0	0	3	3	30	70	100
6		Power Systems – II Lab	0	0	2	2	1	30	70	100
7		Measurements and Instrumentation Lab	0	0	2	2	1	30	70	100
8		Mini Project with Seminar	0	0	6	6	3	30	70	100
		Summer Internship	-	-	-	-	-			
Total			**15**	**0**	**10**	**25**	**20**	**240**	**560**	**800**

IV YEAR I SEMESTER-

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Power Systems – III	3	0	0	3	3	30	70	100
2		Electronics Design	2	0	0	2	2	30	70	100
3		Professional Elective III	3	0	0	3	3	30	70	100
4		Professional Elective IV	3	0	0	3	3	30	70	100
5		Open Elective II	3	0	0	3	3	30	70	100
6		Electronics Design Lab	0	0	2	2	1	30	70	100
7		Project work(Phase-I)	0	0	12	12	6	30	70	100
Total			**14**	**0**	**14**	**28**	**21**	**210**	**490**	**700**

IV YEAR II SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Programmable Logic Controllers	3	0	0	3	3	30	70	100
2		Professional Elective V	3	0	0	3	3	30	70	100
3		Professional Elective VI	3	0	0	3	3	30	70	100
4		Open Elective III	3	0	0	3	3	30	70	100
5		Project work (Phase-II)	0	0	12	12	6	30	70	100
Total			**12**	**0**	**12**	**24**	**18**	**150**	**350**	**500**

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Thread 1: Power Electronics	Thread 2: Power Systems	Thread 3: Machines and Control Systems	Thread 4: Electromagnetics
1	Line-Commutated and Active PWM Rectifiers	Wind and Solar Energy Systems	Electrical Machine Design	Electromagnetic waves
2	Electrical Drives	Power System Protection	Control Systems Design	Computational Electromagnetics
3	Electrical and Hybrid Vehicles	HVDC Transmission Systems	Computer Architecture	Electrical Energy Conservation and Auditing
4	Advanced Electric Drives	EHVAC	Digital Control Systems	High Voltage Engineering
5	Power Quality and FACTS	Power System Dynamics and Control	Digital Signal Processing	Industrial Electrical Systems
6	Modern Power Electronics	Electric Smart Grid	Advanced Control Systems	Electrical Distribution Systems

OPEN ELECTIVES – 2 THREADS

S. No.	THREAD 1	THREAD 2
1	Soft Skills and Interpersonal Communication	CSE: 1. E-Commerce 2. Database Management Systems 3. Java Programming
2	Human Resource Development and Organizational Behaviour	IT: 1. Multimedia and Application Development 2. Web Programming 3. Operating Systems
3	Cyber Law and Ethics	EEE: 1.Embedded Systems 2. Control Systems 3. Artificial Intelligence Techniques
4	History of Science	ECE: 1. Principles of Satellite Communications 2. Scientific Computing 3. Wavelets
5	Introduction to Art and Aesthetics	ME: 1.Operations Research 2. Automobile Engineering 3. Robotics
6	Economic Policies in India	CE: 1. Green Building Technology 2.Building Materials and Construction Planning 3. Introduction to Fluid Mechanics

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS

Course code: GR18A1001 **L/T/P/C: 3/1/0/4**

Course Objectives:

- The ideas of linearity and linear systems, which lie at the core of many engineering concepts
- The concept of latent values of a matrix which is critical in many engineering applications
- The ideas of function approximation using the tools of mean value theorems
- The skill of using a definite integral for various geometrical applications
- The skill of finding the optimal values of multi-variable functions

Course Outcomes:

- Compute the rank of a matrix to determine the existence of solutions of a linear algebraic system
- Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
- Determine approximate solution of over determined systems using the pseudo inverse
- Apply the definite integral for various computational problems in geometry and Evaluate some improper integrals using special functions
- Develop the skill of determining optimal values of multivariable functions using classical methods

Unit I: VECTOR AND MATRIX ALGEBRA

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

Unit II: MATRIX EIGENVALUE PROBLEM AND QUADRATIC FORMS

Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof), diagonalization of a matrix, orthogonal diagonalization of symmetric matrices, Similarity of matrices,Quadratic Forms: Definiteness and nature of a quadratic form, reduction of quadratic form to canonical forms by orthogonal transformation.

Unit III: MATRIX DECOMPOSITION AND PSEUDO INVERSE OF A MATRIX

Spectral decomposition of a symmetric matrix, L-U decomposition, Q-R factorization, Singular value decomposition ,Moore-Penrose pseudo inverse of a matrix, least squares solution of an over determined system of equations using pseudo inverse.

Unit IV: SINGLE VARIABLE CALCULUS

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem and Taylor's theorem (without proof), their geometrical interpretation and applications, approximation of a function by Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates), Evaluation of improper integral using Beta and Gamma functions.

Unit V: MULTIVARIABLE DIFFERENTIAL CALCULUS AND FUNCTION OPTIMIZATION

Partial Differentiation: Total derivative; Jacobian; Functional dependence, unconstrained optimization of functions using the Hessian matrix, constrained optimization using Lagrange multiplier method

Text/Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house,
2. Fourth edition 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9^{th} edition,Pearson, Reprint,
5. 2002.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
7. GRIET reference manual.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR18A1005 **L/T/P/C: 3/1/0/4**

Course Objectives:

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

Course Outcomes:

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

Unit I: ATOMIC AND MOLECULAR STRUCTURE

Atomic and molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of homo-nuclear diatomic molecules, MO energy diagrams of N_2, and O_2.Metallic bonding, Valence Bond Theory, Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in tetrahedral, octahedral, and square planar geometries.

Unit II: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

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

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

Nuclear Magnetic Resonance: Basic concepts of NMR, Chemical shift. Magnetic resonance Imaging.

Unit III: ELECTROCHEMISTRY AND CORROSION

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

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

Unit IV: ENGINEERING MATERIALS AND WATER TECHNOLOGY

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

Polymeric Materials: plastics-classification, types of polymerization, properties of polymers-crystallinity, melting and boiling points, glass transition temperature, viscoelasticity. Compounding and fabrication by compression moulding and injection moulding, conducting polymers – definition, classification, application.

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

Unit V: STEREOCHEMISTRY AND ENERGY RESOURCES

Stereo chemistry: Structural isomers and stereoisomers, representations of 3D structures, configurations and symmetry, chirality, enantiomers, diastereomers, optical activity, conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of paracetamol and aspirin.

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

Text/Reference Books:

1. Engineering Chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry by Prasanta Rath, B. Rama Devi, Ch. Venkata Ramana reddy, S. Chakroborty. Cengage publications, 2018.
3. University Chemistry, by B.H. Mahan.
4. Engineering Chemistry by B. Siva Sankar, Mc Graw Hill Publication.
5. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. Mc Graw Hill Publication
6. A Text book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASIC ELECTRICAL ENGINEERING

Course Code: GR18A1008 **L/ T/ P/ C: 3/0/0/3**

Course Objectives:

- To introduce the fundamentals of Electrical Engineering.
- To Solve problems in AC circuits.
- To provide foundation in theory and applications of Transformers and DC machines
- Understand the basic principles of AC Electrical machinery and their applications.
- To import the knowledge of Electrical Installations.

Course Outcomes:

- To understand and analyze basic electric circuits with suitable theorems.
- To solve 1-phase and 3-phase balanced sinusoidal systems.
- To interpret the working principle of Electrical machines.
- To appraise the applications of Induction motors and synchronous generators used in Industries.
- To identify the components of Low Voltage Electrical Installations.

Unit I: D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
Time-domain analysis of first-order RL and RC circuits.

Unit II:A.C. CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series RLC circuit.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit III: TRANSFORMERS

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit IV: ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Unit V:ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse UNIT (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Text/Reference Books:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

Course Code: GR18A1006 **L/T/P/C: 2/0/0/2**

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development,fostering ideas and practice of language skills in various contexts and cultures.*

Course Objectives: The course will help to

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

Course Outcomes: Students should be able to

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

Unit I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation--The Use of Prefixes and Suffixes. **Grammar:** Identifying Common Errors in Writing with Reference to Articles andPrepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Unit II

Letter Writing

Vocabulary: Synonyms and Antonyms. Use of phrases for formal and informal letter writing. Eg.., I would like to apply, I regret to inform, This is to bring to your kind notice... etc.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronounAgreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension, Read a letter

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint,Letter of Requisition, Job Application with Resume. Reorganising of sentences /paragraphs in a letter.

Unit III

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

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

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiersand Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places andEvents – **Classifying**- Providing Examples or Evidence.

Unit IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-PrécisWriting.

Unit V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: **Technical Reports**- Introduction – Characteristics of a Report – Categories ofReports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text/Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course code: GR18A1013 **L/T/P/C: 0/0/3/1.5**

Course Objectives:

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

Course Outcomes:

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

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

TASK 1: Determination total hardness of water by complexometric method using EDTA.

TASK 2: Determination of chloride content of water by Argentometry.

TASK 3: Redox titration: Estimation of ferrous iron using standard $KMnO_4$

TASK 4: Estimation of HCl by Conductometric titrations

TASK 5: Estimation of Acetic acid by Conductometric titrations

TASK 6: Estimation of Ferrous iron by Potentiometry using dichromate

TASK 7: Determination of rate constant of acid catalyzed reaction of methyl acetate

TASK 8: Determination of acid value of coconut oil.

TASK 9: Adsorption of acetic acid by charcoal

TASK 10: Determination of surface tension of liquid by using stalagmometer

TASK 11: Determination of viscosity of liquid by using Ostwald's viscometer.

TASK 12: Determination of partition coefficient of acetic acid between n-butanol and water.

TASK 13: Synthesis of Aspirin

TASK 14: Synthesis of Paracetamol.

Text/Reference Books:

1. Vogel's text book of Practical Organic Chemistry, 5th Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co., Delhi)
3. Text book on Experiments and Calculations in Engineering Chemistry- S.S.Dara.
4. An Introduction to Practical Chemistry, K.K. Sharma and D.S. Sharma (Vikas Publications, New Delhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASIC ELECTRICAL ENGINEERING LAB

Course Code: GR18A1016 **L /T/ P/ C: 0/ 0/ 2/1**

Course Objectives:

- To introduce the use of measuring instruments.
- To analyze a given network by applying various electrical laws
- To calculate, measure and know the relation between basic electrical parameters.
- To know the response of electrical circuits for different excitations
- To summarize the performance characteristics of electrical machines.

Course Outcomes:

- Get an exposure to common electrical components and their ratings.
- Get an exposure to basic electrical laws.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the response of different types of electrical circuits to different excitations.
- Compare the basic characteristics of Electrical machines

TASK 1: Verification of Ohms Law
TASK2: Verification of KVL and KCL
TASK3: Transient Response of Series RL and RC circuits using DC excitation
TASK4: Transient Response of RLC Series circuit using DC excitation
TASK5: Resonance in series RLC circuit
TASK6: Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
TASK7: Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
TASK8: Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
TASK9: Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
TASK10: Measurement of Active and Reactive Power in a balanced Three-phase circuit
TASK11: Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
TASK 1**2:** Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
TASK13: Performance Characteristics of a Three-phase Induction Motor
TASK14: Torque-Speed Characteristics of a Three-phase Induction Motor
TASK15: No-Load Characteristics of a Three-phase Alternator

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course code: GR18A1014 **L/T/P/C: 0/0/2/1**

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

Course Objectives:

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, word accent, intonation, rhythm and Neutralization of accent for intelligibility
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Course Outcomes:

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

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

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

Listening Skills Objectives:

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

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

- Listening for general content
- Listening for specific information

Speaking Skills
Objectives:

- To involve students in speaking activities in various contexts

- To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people
- Role play – Individual/Group activities

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise-III:

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV:

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V:

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.

Practice: Mock Interviews.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning** (CALL) Lab

Computer systems, headphones and English language learning software for self- study by students.

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs, audio-visual aids with a Podium, LCD and a projector.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR18A1017 **L/T/P/C: 1/0/1.5/2.5**

Course objectives :

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

Course Outcomes:

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

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

i. Carpentry
ii. Fitting Shop
iii. Tin-Smithy
iv. Casting
v. Welding Practice
vi. House-wiring
vii. Black Smithy

2. VIDEO LECTURES: Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

Text/ Reference Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.
3. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
4. Workshop Manual / Venkat Reddy/ BSP

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code : GR18A1002 **L/T/P/C : 3/1/0/4**

Course Objectives:

- The knowledge to visualize solutions to engineering problems governed by differential equations
- The skill of evaluating multiple integrals needed for applications in mechanics and electro-magnetic field theory
- The knowledge to visualize the functions arising in vector field theory and use mathematical tools for some computations
- The skill of calculating work done by a field and flux across a surface
- The skill of using specialized theorems for fast computation of work and flux

Course Outcomes:

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

Unit I: FIRST ORDER ODE

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

Non - linear differential equations of the first order:Equations solvable for *p*, equations solvable for *x*, equations solvable for *y*

Unit II: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

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

Unit III: MULTIPLE INTEGRALS

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

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

Applications:Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelepipeds

Unit IV: VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation:Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in cartesian framework, solenoidal fields, irrotational fields, potentials

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

Unit V: SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

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

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

Text/Reference Boooks

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
5. GRIET reference manual
6. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
7. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS

Course Code: GR18A1003 **L/T/P/C: 3/1/0/4**

Course Objectives:

- Demonstrate skills in scientific inquiry and problem solving techniques.
- Identify the role of quantum mechanics and its applications on physical system.
- Summarize the use of semiconductors and optoelectronics devices.
- Interpret the properties of Laser light and its uses in optical fiber communication.
- Outline the properties of electric and magnetic materials.

Course Outcomes:

- Outline the development of quantum mechanics and solve Schrodinger equation for simple potentials.
- Demonstrate the operation mechanism of electronic devices such as transistors and diodes.
- Explain the development and applications of optoelectronic devices.
- Analyze the properties of Laser and its propagation in optical fibers.
- Evaluate the properties of dielectric and magnetic materials for various applications

Unit I: QUANTUM MECHANICS

Introduction to quantum physics, Black body radiation, Planck's law, photoelectric effect Compton effect, wave-particle duality, de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, particle in one dimensional box, potential barrier.

Unit II: SEMICONDUCTOR PHYSICS

Intrinsic and extrinsic semiconductors: Estimation of carrier-concentration, Dependence of Fermi level on carrier-concentration and variation with temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall Effect, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation and characteristics.

Unit III: OPTOELECTRONICS

Radiative, Non-radiative transitions and recombination mechanism in semiconductors, LED and Semiconductor lasers: Device structure, materials, Characteristics, Semiconductor photo-detectors: PIN and Avalanche detectors and their structure, Materials, Working principle and Characteristics, Solar cell: structure and Characteristics.

Unit IV: LASERS AND FIBER OPTICS

Lasers: Introduction, Interaction of radiation with matter: Absorption, Spontaneous and Stimulated emission, Einstein coefficients, Characterizes of lasers: Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, application of lasers. Fiber Optics: Introduction, Principle and Construction of an optical fiber, Acceptance angle, Numerical aperture, Types of Fibers, losses associated with optical fibers, Basic components in optical fiber communication system, Application of optical fibers.

Unit V: DIELECTRIC AND MAGNETIC PROPERTIES OF MATERIALS

Dielectrics: Introduction, Types of polarizations (Electronic, Ionic and Orientation Polarizations) and calculation of Electronic, Ionic polarizability, internal fields in a solid, Clausius-Mossotti relation. Magnetism: Introduction, Bohr magnetron, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Properties of anti-ferro and ferri magnetic materials.

Text/ References Books:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2. Halliday and Resnick, Physics - Wiley.
3. Engineering Physics, P.K Palanisamy, Scitech Publishers.
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
5. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
6. Richard Robinett, Quantum Mechanics
7. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson, McGraw Hill.
8. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Inc.(1995)
9. Semiconductor Physics and Devices, 4e, Neamen and Biswas, McGraw Hill.
10. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Gupthaon NPTEL

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR18A1007 **L/T/P/C: 3/1/0/4**

Prerequisite: Knowledge of Mathematics required.

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes:

The Student will learn:

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.

Unit I: INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program, Number systems

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O: Simple input and output with scanf and printf, formatted I/O.

Unit II: ARRAYS, STRINGS, STRUCTURES AND POINTERS

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation)Enumeration data type

Unit III: PREPROCESSOR AND FILE HANDLING IN C

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef **Files:** Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions. Introduction to stdin,stdout and stderr.

Unit IV: FUNCTION AND DYNAMIC MEMORY ALLOCATION

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series , Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

Unit V: INTRODUCTION TO ALGORITHMS

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number,Basic searching in an array of elements (linear and binary search techniques),Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

Text/ Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3^{rd} Edition)**:**
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
4. Hall of India
5. R.G. Dromey, How to solve it by Computer, Pearson (16^{th} Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4^{th} Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GRAPHICS

Course Code: GR18A1010 **L/T/P/C : 1/0/4/3**

Course Objectives:

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

Course Outcomes:

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

Unit I: INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain and Diagonal.

Unit II: ORTHOGRAPHIC PROJECTIONS

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures-Auxiliary Planes.

Unit III: PROJECTIONS OF REGULAR SOLIDS

Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

Unit IV: DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS

Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism-cylinder vs cylinder

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. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

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

Text /Reference Books:

1. Engineering Drawing by N.D. Bhatt/Charotar
2. Engineering Drawing/ N.S.Parthasarathy and Vela Murali/Oxford
3. EngineeringGraphics.ByBasanthAgrawal/CMAgrawal/McGrawHillEducation
4. EngineeringDrawingbyK.VenuGopal/NewAgePublications.
5. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers
6. Engineering Graphics and Design by Kaushik Kumar / Apurba kumar Roy / Chikesh Ranjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS LAB

Course Code: GR18A1011 **L/T/P/C : 0/0/3/1.5**

Course Objectives:

- Compare and tabulate the characteristics of Solar cells, LED and Laser sources.
- Analyze the behavior of semiconductors in various aspects.
- Apply the theoretical concepts of optical fibers in practical applications.
- Recall the basic concepts of LCR and RC circuits through hands on experience.
- Analyze the behavioral aspects of electric and magnetic fields.

Course Outcomes:

- Compare the behavior of p-n junction diode, Solar cells and LED.
- Analyze the behavior of magnetic and electric fields with the help of graphs.
- Determine the work function of a material through photoelectric effect.
- Asses the characteristics of Lasers and infer the losses in optical fibers.
- Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

TASK 1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.

TASK 2. Solar Cell: To study the V-I Characteristics of solar cell.

TASK 3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.

TASK 4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.

TASK 5. Hall effect: To determine Hall co-efficient of a given semiconductor.

TASK 6. Photoelectric effect: To determine work function of a given material.

TASK 7. LASER: To study the characteristics of LASER sources.

TASK 8. Optical fiber: To determine the bending losses of Optical fibers.

TASK 9. LCR Circuit: To determine the Quality factor of LCR Circuit.

TASK 10. R-C Circuit: To determine the time constant of R-C circuit.

Note: Any 8 experiments are to be performed

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR18A1015 **L/T/P/C: 0/0/3/1.5**

Prerequisite: Basic operations of computer and knowledge of mathematics

Laboratory Objectives: The students will learn the following:

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

Laboratory Outcomes The candidate is expected to be able to:

- formulate the algorithms for simple problems and translate given algorithms to a working and correct program.
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures and use pointers of different types
- create, read and write to and from simple text and binary files and modularize the code with functions so that they can be reused

Task 1: (Practice sessions)

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Task 2: (Simple numeric problems)

a. Write a program for fiend the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

Task 3: (Simple numeric problems)

a. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
    i. 5 x 1 = 5
    ii. 5 x 2 = 10
    iii. 5 x 3 = 15
b. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Task 4: (Expression Evaluation)

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number

Task 5: (Expression Evaluation)

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

Task 6: (Expression Evaluation)

a. Write a C program to find the roots of a Quadratic equation.
b. Write a C program to calculate the following, where x is a fractional value.
   1-x/2 +x^2/4-x^3/6
c. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+…….+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Task 7: (Arrays and Pointers and Functions)

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
c. Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix

   with memory dynamically allocated for the new matrix as row and column counts may not be same.

Task 8: (Arrays and Pointers and Functions)

a. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the GCD (greatest common divisor) of two given integers.
   iii. To find x^n
b. Write a program for reading elements using pointer into array and display the values using array.
c. Write a program for display values reverse order from array using pointer.
d. Write a program through pointer variable to sum of n elements from array.

Task 9: (Files)

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

Task 10: (Files)

a. Write a C program that does the following:It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function).The program should then read all 10 values and print them back.
b. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).

Task 11: (Strings)

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
   i. To insert a sub-string in to a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

Task 12: (Strings)

a. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
b. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn‘t contain ch.
c. Write a C program to count the lines, words and characters in a given text.

Task 13:(Miscellaneous)

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
b. Write a C program to construct a pyramid of numbers as follows:

```
 1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * * *
 4 4 4 4     * *
    *
```

Task 14: (Sorting and Searching)

a. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
b. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.
c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Task 15: (Sorting and Searching)

a. Write a C program that sorts the given array of integers using selection sort in descending order.
b. Write a C program that sorts the given array of integers using insertion sort in ascending order .
c. Write a C program that sorts a given array of names.

Text/ Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL CIRCUIT ANALYSIS

Course Code: GR18A2023 **L/T/P/C : 3/1/0/4**

II Year I Semester

Course Objectives:

- Explain the various circuit solving techniques and theorems.
- Simplify the transient and steady state analysis of a circuit.
- Evaluate the steady state analysis of a given circuit.
- Apply the Laplace Transforms to electrical circuits.
- Determine the circuit analysis using network parameters.

Course Outcomes:

- Apply network theorems for the analysis of electrical circuits
- Solve the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Solve electrical circuits using Laplace and Inverse Laplace transform and Identify poles, zeros and draw the frequency response of a transfer function.
- Simplify network by two port parameters.

Unit I: NETWORK THEOREMS

Superposition theorem, Thevenins theorem, Nortons theorem, Maximum Power Transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.

Unit II: SOLUTION OF FIRST AND SECOND ORDER NETWORKS

Solution of first and second order differential equations for Series and parallel RL, RC, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

Unit III: SINUSOIDAL STEADY STATE ANALYSIS

Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

Unit IV: ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, Inverse Laplace Transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

Unit V: TWO PORT NETWORK AND NETWORK FUNCTIONS

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

Text/Reference Books

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
3. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
4. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti-Dhanpat Rai & Co.
5. Network Theory by N.C.Jagan and C.Lakshminarayana, BS Publications.
6. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
7. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALOG ELECTRONIC CIRCUITS

Course Code: GR18A2024 **L/T/P/C : 3/0/0/3**

II Year I Semester

Course Objectives:

- To illustrate the students about Diode circuits
- To comprehend the characteristics of the BJT and MOSFET circuits
- To emphasis the working of Operational Amplifiers
- To study the linear applications of Op-Amps
- To study the Non-linear applications of Op-Amps

Course Outcomes:

- Understand the characteristics of transistors.
- Analyse various rectifier and amplifier circuits.
- Differentiate the characteristics of BJT and MOSFET
- Understand the sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of Op-Amp based circuits.

Unit I: DIODE CIRCUITS

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

Unit II: BJT AND MOSFET CIRCUITS

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier:

Unit III: DIFFERENTIAL, MULTI-STAGE AND OPERATIONAL AMPLIFIERS

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Unit IV: LINEAR APPLICATIONS OF OP-AMP

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.

Unit V: NONLINEAR APPLICATIONS OF OP-AMP

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot.

Text/References Books:

1. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. D Roy Choudhury, Shail B Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., Fourth Edition.
3. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
4. P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL MACHINES - I

Course code: GR18A2025 **L/T/P/C : 3/0/0/4**

II Year I Semester

Course Objectives:

- Knowledge on the concepts of magnetic circuits and principals of generators and motors.
- explain the operation of dc machines.
- Analyse the differences in operation of different dc machine configurations.
- Understanding the testing of different DC machines
- Analyse single phase and three phase transformers circuits.

Course Outcomes:

- Explain the differences between linear and non-linear magnetic circuits
- The concepts of generators and motors
- Select the appropriate DC generator or DC motor for the given application
- Able to test ant given DC Generator or DC motor.
- Explain the different types of materials used in transformers.

Unit I: MAGNETIC FIELDS AND MAGNETIC CIRCUITS

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

Unit II: ELECTROMAGNETIC FORCE AND TORQUE

B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

Unit III: DC MACHINES

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

Unit IV: DC MACHINE - MOTORING AND GENERATION

Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back

EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

Unit V: TRANSFORMERS

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

Text / Reference Books:

1. A.E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A.E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTROMAGNETIC FIELDS

Course Code: GR18A2026 **L/T/P/C : 3/1/0/4**

II Year I Semester

Course Objectives:

- Apply vector Calculus and different coordinates systems for Electro and Magnetic systems.
- Understand the knowledge of Electro field theory for Point, Line ,Surface Charge.
- Understand the concept of conductors, dielectrics, inductance ,capacitance.
- Understand the concept of Magnetic Fields and Calculation of MFI for Line, Surface Conductors with different Shapes.
- Understand the Knowledge of Time Varying Fields.

Course Outcomes:

- Can solve the problems in different EM fields using Different Coordinates Systems.
- Evaluate the Electric Field Density and Intensity for Different Charges.
- Understand the Electromagnetic Relation using Maxwell Formulae.
- Apply Electro Static and Magnetic to Static circuits using Basic relations.
- Analyze circuits using Conductors in Time Varying Fields.

Unit I

Review of Vector Calculus- Vector algebra-addition-subtraction- components of vectors-scalar and vector multiplications-triple products-three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation-partial differentiation-integration- vector operator del-gradient- divergence and curl; integral theorems of vectors. Conversion of a vector from one co-ordinate system to another.

Unit II

Static Electric Field Coulomb's law- Electric field intensity-Electrical field due to point charges. Line- Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential- Potential difference-Calculation of potential differences for different configurations. Electric dipole- Electrostatic Energy and Energy density.

Unit III

Conductors- Dielectrics and Capacitance Current and current density- Ohms Law in Point form- Continuity of current- Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials- Capacitance-Capacitance of a two wire line- Poisson's equation-Laplace's equation- Solution of Laplace and Poisson's equation- Application of Laplace's and Poisson's equations.

Unit IV

Static Magnetic Fields Biot-Savart Law- Ampere Law-Magnetic flux and magnetic flux density- Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Magnetic Forces-Materials and Inductance Force on a moving charge-Force on a differential current element- Force between differential current elements- Nature

of magnetic materials- Magnetization and permeability- Magnetic boundary conditions- Magnetic circuits- inductances and mutual inductances.

Unit V

Time Varying Fields and Maxwell's Equations Faraday's law for Electromagnetic induction- Displacement current- Point form of Maxwell's equation- Integral form of Maxwell's equations- Motional Electromotive forces, Boundary Conditions.

Text/Reference Books:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. W.Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012 .
3. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
4. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
5. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING MECHANICS

Course Code: GR18A2027 **L/T/P/C : 3/1/0/4**

II Year I Semester

Course Objectives:

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method, impulse-momentum and its applications to translation, rotation and plane motion

Course Outcomes:

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

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, fixed axis rotation and plane motion.
- Solve problems using work energy equations for translation, fixed axis rotation and plane motion of rigid bodies
- Solve problems using impulse-momentum equation for the bodies having direct and oblique impact
- Solve problems using D'Alembert's principle for the bodies which are connected

Unit I:

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

Unit II:

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

Unit III:

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

Unit IV:

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

Unit V:

Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

Text/Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALOG ELECTRONIC CIRCUITS LAB

Course Code: GR18A2028 **L/T/P/C : 0/0/4/2**

II Year I Semester

Course Objectives:

- Introduce the fundamentals and basic properties of op-amps to students.
- Enable the students to design various circuits using op-amp for several applications.
- Enable the students to design multi vibrator circuits.
- Study and analyze wave shaping and sweep circuits.
- Implement positive feedback circuits using BJT.

Course Outcomes: -

- Analyze and select Analog devices using circuit specifications based on circuit requirements.
- Conduct experiments on different types of multi vibrators.
- Design pulse stretcher and square wave generating circuits.
- Design oscillators and function generator circuits.
- Discriminate the design of simple circuits like summers, subtactors, and multi vibrators using op-amps.

Task-1: Design and simulate linear wave shaping circuits.
Task-2: Design and simulate non-linear wave shaping circuits.
Task-3: Design and verify experimentally the theoretical closed loop gain using LM324AD IC for Operational Amplifier as Inverting, Non-Inverting and voltage follower.
Task-4: Construct & Verify Summing Amplifier using LM324AD IC.
Task-5: Test that, the Subtractor output is the difference of two input.
Task-6: Design LM324AD IC as Integrator.
Task-7: Design LM324AD IC as Differentiator.
Task-8: Design & Verify Astable Multivibrator using LM324AD IC.
Task-9: Design & Verify Monostable Multivibrator using LM324AD IC.
Task-10: Design a triangular wave generator using LM324AD IC
Task-11: Design a Square wave Generator using LM324AD IC.
Task-12: Design and simulate Bistable Multi vibrator(using BJT)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL MACHINES-I LAB

Course Code: GR18A2029 **L/T/P/C : 0/0/4/2**

II Year I Semester

Course Objectives:

- Strong background in different types of DC generators, Motors and Transformers, their construction, operation and applications
- Knowledge on various lab experiments connected with dc generators and there by achieve the design concepts.
- Knowledge on application of dc motor concepts with respect to the performance characteristics of dc motors.
- Knowledge on application of dc generator concepts with respect to the performance characteristics of dc generators.
- Concept of back to back connection of a transformer and three phase to two phase conversion by Scott connection.

Course Outcomes:

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

- Have knowledge of various parts of electrical DC machines and Transformers.
- Develop knowledge helpful for application of DC machines and Transformers
- Start and control of different DC Machines.
- Assess the performance of different machines using different testing methods
- Determine the parameters of equivalent circuit of single phase transformer and performance

Task-1: Swinburne's test and Speed Control of a D.C Shunt Motor
Task-2: Brake Test on a DC Shunt Motor
Task-3: Brake Test on a DC Compound Motor
Task-4: Open Circuit Characteristics of a DC Shunt Generator
Task-5: Load test on a D.C. Shunt Generator.
Task-6: Load test on a D.C. Series Generator
Task-7: Load test on D.C. Compound Generator
Task-8: Hopkinson Test
Task-9: Fields Test
Task-10: Separation of Core Losses of DC machine
Task-11: OC, SC and Load tests on single phase transformer.
Task-12: Sumpner's test.
Task-13: Scott connection.
Task-14: Seperation of core losses of a single phase Transformer.
Task-15: Parallel operation of single phase Transformer.
Task-16:Hysteresis loss determination.

In addition to the above experiments, at least any two of the following experiments are required to be conducted from the following list

Task-14: Heat run test on transformer.
Task-15: Separation of core losses of a single phase transformer

Task-16: Parallel operation of Single phase Transformers
Task-17: Hysteresis loss determination.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTITUTION OF INDIA

Course Code: GR18A2003 **L/T/P/C : 2/0/0/2**

II Year I Semester

Course Objectives:

- To create an awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles
- To Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature
- To learn the divisions of executive, legislative and judiciary and so on.
- To know how a municipal office, panchayat office etc. works
- To understand the importance and role of Election Commission Functions.

Course Outcomes:

- Students will be able to know the importance of Constitution and Government
- Students will be able to become Good Citizens and know their fundamental rights, duties and principles.
- Students will learn about the role of PM, President, Council of Ministers and Local Administration.
- The Students understand the importance of Election Commission.
- They will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.,

Unit I: INTRODUCTION

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

Unit II: UNION GOVERNMENT ANDITS ADMINISTRATION

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

Unit III: STATE GOVERNMENT AND ITS ADMINISTRATION

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Unit IV: LOCAL ADMINISTRATION

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

Unit V: ELECTION COMMISSION

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

Text/Reference Books:

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.

2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher

3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher

4. *'Indian Administration by Avasthi* and Avasthi-by lakshminarainagarwal publication

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE ETHICS AND GENDER CULTURE

Course Code: GR18A2002 **L/T/P/C : 2/0/0/2**

II Year I Semester

Course Objectives:

- To understand about the importance of values
- To understand the significance of human conduct and self development.
- To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.
- To provide a critical perspective on the socialization of men and women.
- To expose the students reflect critically on gender violence.

Course Outcomes:

- To enable the student to understand the core values that shapes the ethical behaviour.
- Student will be able to realize the significance of ethical human conduct and self-development
- Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
- Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
- Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

Unit I: VALUES AND SELF DEVELOPMENT

social values and individual attitudes, Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National UNITy, Patriotism, Love for nature, Discipline.

Unit II: PERSONALITY AND BEHAVIOUR DEVELOPMENT

Positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

Unit III: INTRODUCTION TO PROFESSIONAL ETHICS

Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Unit IV: INTRODUCTION TO GENDER

Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

Unit V: GENDER-BASED VIOLENCE

The concept of violence, Types of Gender-based violence, the relationship between gender, development and violence, Gender-based violence from a human rights perspective.

Text /Reference Books:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.
3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.
4. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
5. 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/
6. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
7. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL ELECTRONICS

Course Code: GR18A2030 **L/T/P/C : 3/0/0/3**

II Year II Semester

Course Objectives:

- Understand the types of logic gates and their families.
- Design of arithmetic and logic operations using digital IC's.
- Discuss, how the memory is created using sequential circuits.
- Classify the types of Flip-Flops and their applications.
- Describe the importance of PLD with example.

CourseOutcomes:

- Understand the working of logic families and logic gates.
- Design of Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Analyze the types of Flip-Flops used in designing the registers.
- Discuss the types of Memories and use of PLD's

Unit I: FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGICFAMILIES

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples ofICgates, number systems-binary, signed binary, octal hexadecimal number, binaryarithmetic, one's and two's complements arithmetic, codes, error detecting and correctingcodes, characteristics of digital IC's, digital logic families, TTL, Schottky TTL and CMOS logic.

Unit II: COMBINATIONAL DIGITALCIRCUITS

Standard representation for logic functions, K-map representation and simplification oflogicfunctions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, carry look ahead adder,serialadder, elementary ALU design, popular MSI chips, digital comparator,paritychecker/generator, code converters, priority encoders.

Unit III: SEQUENTIAL CIRCUITS AND SYSTEMS

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K, TandDtypesflip-flops,applicationsofflip-flops,shiftregisters,applicationsofshiftregisters,serialtoparallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops,specialcounter IC's, applications ofcounters.

Unit IV: A/D AND D/A CONVERTERS

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/Aconverter, specifications for D/A converters, examples of D/A converter IC's, sample and hold circuit,analog to digital converters: quantization and encoding, parallel comparator A/Dconverter,successive approximation A/D converter, counting A/D converter, dual slope A/Dconverter, A/Dconverterusing voltagetofrequencyandvoltagetotimeconversion,specificationsofA/Dconverters, example of A/D converterIC's

Unit V: SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES

Memory organization and operation, expanding memory size, classification andcharacteristicsof memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Text/References Books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

4. Charles H. Roth, Jr and Lizy Kurian John's, "Digital Systems Design Using VHDL", Cengage Learning

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL MACHINES-II

Course Code: GR18A2031 **L/T/P/C : 3/0/0/3**

II Year II Semester

Course Objectives:

- To know the applications of single phase induction motor
- To provide a foundation in the theory and application of Ac machines.
- To train to have the solid foundation in technical concepts required to control the speed of 3-phase IM .
- To provide with a strong back ground in 3-phase induction motor, speed control techniques and its Characteristics.
- To provide Sufficient background in synchronous motor, testing of different types of rotors viz salient Pole & cylindrical pole machines

Course Outcomes:

- Understand the concepts of rotating magnetic fields.
- Express importance of application of electrical Ac machines.
- Demonstrate working of single and three phase AC machines.
- Calculate Machine Variables in direct and quadrature axis form for salient pole type,
- Know the concept of harmonic created in supply system, need for reduction and design of synchronous machines for reducing them

Unit 1: FUNDAMENTALS OF AC MACHINE WINDINGS

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor

Unit II: PULSATING AND REVOLVING MAGNETIC FIELDS

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

Unit III: INDUCTION MACHINES

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

Unit IV: SINGLE-PHASE INDUCTION MOTORS

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications

Unit V: SYNCHRONOUS MACHINES

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

Text/References Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.

2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.

6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons,2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONTROL SYSTEMS

Course Code: GR18A2032 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Objectives:

- Outline of the fundamental concepts of Control Systems and block diagram algebra.
- Analyze time response of second order systems, stability and root locus technique.
- Interpret the stability of a system by Nyquist and Bode plots.
- Design the feedback Controller.
- Apply the concepts of Controllability and Observability and define a discrete time system and non linear system.

Course Outcomes:

- Understand the modelling of linear time-invariant systems using transfer function and apply block diagram algebra.
- Understand the concept of time response, stability and its assessment for linear time-invariant systems.
- Compare the Bode and Nyquist plot to determine the stability of a system.
- Determine the dynamic model of a system using state space approach.
- Design of PI,PD controllers and lead ,lag compensators

Unit I: INTRODUCTION TO CONTROL PROBLEM

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems.
Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

Unit II: TIME RESPONSE ANALYSIS

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response.
Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Unit III: FREQUENCY RESPONSE ANALYSIS

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Unit IV: INTRODUCTION TO CONTROLLER DESIGN

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.
Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

Unit V: STATE VARIABLE ANALYSIS AND INTRODUCTION TO OPTIMAL CONTROL AND NONLINEAR CONTROL

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability.
Pole-placement by state feedback.
Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.
Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts and analysis.

Text /Reference Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
4. Control Systems by A. Anand Kumar, 2nd edition, PHI Learning Private Limited.
5. Control Systems Engineering by Nise 3rd Edition John Wiley.
6. I.J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International,2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROBABILITY AND STATISTICS

Course Code: GR18A2005 **L/T/P/C : 3/0/0/3**

II Year II Semester

Course Objectives:

- State the fundamentals of Probability and Statistics.
- Describe the properties of random variables and distributions.
- Interpret the measures of central tendency, dispersion, and association
- Distinguish between explanatory and response variables and analyze multi variable data using correlation and regression.
- Apply the tests of hypothesis.

Course Outcomes:

- Estimate the chance of occurrence of various uncertain events in different random experiments with strong basics of probability.
- Compute and interpret descriptive statistics.
- Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Multinomial, Exponential, Normal and Gamma distributions.
- Forecast the models using Regression Analysis.
- Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.

Unit I: BASIC PROBABILITY AND RANDOM VARIABLES

Probability spaces, conditional probability, independence, Bayes' rule;Discrete random variables, Continuous random variables and their properties, Distribution functions and densities
Independent random variables, Sums of independent random variables; Expectation of Discrete and Continuos Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.

Unit II: BASIC STATISTICS AND DISCRETE PROBABILITY DISTRIBUTIONS

Measures of Central tendency: Moments, Skewness and Kurtosis.
Probability distributions: Infinite sequences of Bernoulli trials, Binomial, Poisson, Poisson approximation to the binomial distribution, multinomial distribution and evaluation of statistical parameters for Binomial and Poisson distributions.

Unit III: CONTINUOUS PROBABILITY DISTRIBUTIONS AND BIVARIATE DISTRIBUTIONS

Bivariate distributions and their properties, Distribution of sums and quotients, Conditional densities.
Normal, Exponential and Gamma density functions, Evaluation of statistical parameters for Normal distribution.

Unit IV: CURVE FITTING AND CORRELATION

Curve fitting by the method of least squares- fitting of straight line, Second degree parabola, Exponential and Power curves.

Correlation (Karl Pearson's Correlation coefficient and Spearman's Rank correlation (Statements of their properties and problems)) , Regression (including Multiple regression with two independent random variables), (Statements of their properties and problems only).

Unit V: APPLIED STATISTICS

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.
Test for single mean, difference of means and correlation coefficient, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text / References Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
3. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
4. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
6. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
7. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ECONOMICS AND ACCOUNTING FOR ENGINEERS

Course Code: GR18A2004 **L/T/P/C : 3/0/0/3**

II Year II Semester

Course Objectives:

- To provide the student with a clear understanding of demand analysis, elasticity of demand and demand forecasting;
- production function and cost analysis necessary to decide the levels of production and cost of production of the products or services;
- To provide knowledge on different types of markets and competition
- different forms of organisation and different methods of pricing;
- To make the students to understand the capital and capital budgeting, and fundamentals of accounting.

Course Outcomes:

- The student will be able to scan the economic environment and forecast demand of products through demand forecasting techniques.
- The student will be able to plan the production levels in tune with maximum utilization of organizational resources and with maximum profitability and list out various costs associated with production and able to compute breakeven point.
- To outline the different types markets and competition, forms of business organization and methods of pricing.
- To analyze the profitability of various projects using capital budgeting techniques
- The students will be able prepare the financial statements.

Unit 1: INTRODUCTION & DEMAND ANALYSIS

Definition and Scope: Introduction to Economics, Nature and Scope of Managerial Economics. **Demand Analysis**: Demand Determinants, Law of Demand and its exceptions. **Elasticity of Demand**: Definition, Types, Measurement and Significance of Elasticity of Demand. **Demand Forecasting**, Factors governing demand forecasting, methods of demand forecasting.

Unit II: PRODUCTION & COST ANALYSIS

Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. **Cost Analysis:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III: MARKETS AND FORMS OF BUSINESS ORGANIZATIONS

Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. **Pricing:** Objectives and Policies of Pricing. Methods of Pricing. **Business:** Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

Unit IV: CAPITAL BUDGETING

Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

Unit V: INTRODUCTION TO FINANCIAL ACCOUNTING

Accounting Concepts and Conventions - Double-Entry Book Keeping. **Accounting Cycle:** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Text /Reference Books:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Atmanand: Managerial Economics, Excel, 2008.
3. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
4. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 2009
5. Lipsey&Chrystel, Economics, Oxford University Press, 2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL ELECTRONICS LAB

Course Code: GR18A2033 **L/T/P/C : 0/0/4/2**

II Year II Semester

Course Objectives:

- Understand the types of logic gates and their families.
- Design the arithmetic and logic operations using digital IC's.
- Discuss, how the memory is created using sequential circuits.
- Classify the types of Flip-Flops and their applications.
- Discuss the importance of PLD with example.

Course Outcomes:

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Analyze the types of Flip-Flops used in designing the registers.
- Discuss the types of Memories and their advantages and application

Task-1: Simplify the given Boolean expression and to realize them using logic gates/universal gates.
Task-2: Design and implementation of half/full adder
Task-3: Design and implementation of half subtractor/full subtractor
Task-4: Design and implementation of parallel adder/subtractor
Task-5: Design and implementation of multiplexer
Task-6: Design and implementation of Decoder
Task-7: Design and implementation of one bit, two bit and magnitude comparators.
Task-8: Implementation of LED decoder driver circuit.
Task-9: Implementation and verification of truth table for R-S, J-K, D and T flip-flops.
Task-10: Implementation and verification of truth table for J-K flip-flop, Master-slave.
Task-11: Design and implementation of 3 bit DAC.
Task-12: Design and implementation of ADC.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL MACHINES-II LAB

Course Code: GR18A2034 **L/T/P/C : 0/0/4/2**

II Year II Semester

Course Objectives:

- Demonstrate various parts of three phase induction motors.
- Demonstrate various parts of single phase induction motors.
- Demonstrate various parts of alternators.
- Test for induction generator.
- Design any electrical machine.

Course Outcomes :

- Explain the concepts of rotating magnetic fields.
- Solve the parameters of equivalent circuit of single phase induction motor.
- Analyze performance characteristics of AC machines
- Illustrate various characteristics of three phase induction motor.
- Experiment with synchronous machine to find direct and quadrature axis reactance.

Task-1: Brake Test on Slip Ring Induction Motor.
Task-2: No load and Blocked rotor tests on Squirrel Cage Induction Motor.
Task-3: Equivalent Circuit of a Single Phase Induction Motor.
Task-4: Regulation of Alternator by Synchronous Impedance method and MMF Method.
Task-5: Regulation of Alternator by Zero Power Factor method.
Task-6: Determination of X_d and X_q of a Salient Pole Synchronous Machine from Slip Test.
Task-7:V and inverted V curves of a 3-Phase Synchronous Motor.
Task-8: Determination of sub-transient reactance of Salient Pole Synchronous Machine.
Task-9: Determination of sequence impedances of Salient Pole Synchronous Machine.
Task-10: Induction Generator.
Task-11: Rotor-resistance starter for Slip Ring Induction Motor.
Task-12: Star-delta starter for Squirrel Cage Induction Motor.
Task-13: Parallel operation of Alternators.

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CONTROL SYSTEMS LAB

Course Code: GR18A2035 **L/T/P/C : 0/0/2/1**

II Year II Semester

Course Objectives:

- Develop hands-on experience in analysing, designing and carrying out experiments in control systems.
- Familiarize the stability analysis techniques and their applications in control systems.
- Analyze and simulate different transfer functions with variety of inputs.
- Describe the principle of PID controller.
- Conduct experiments with dc servomotor and synchros.

Course Outcomes:

- Simulate simple control system programs using simulation packages.
- Understand the characteristics of synchros.
- Analyze the root locus and bode plots.
- Analyze the transfer function of DC motor/generator.
- Design the lead and lag compensators and Analyze and evaluate the performance of servomotor and PID controller.

Task-1: Transfer function from zeros and poles and vice versa.

Task-2: Step response of a given transfer function.

Task-3: Ramp response of a given transfer function.

Task-4: Impulse response of a given transfer function.

Task-5: Root Locus from a Transfer function.

Task-6: Bode Plot from a Transfer function.

Task-7: State Model from a Transfer function.

Task-8: Zeros and poles from state model.

Task-9: Transfer function of DC motor/Generator.

Task-10: Time Response of second order system.

Task-11:DC Servomotor.

Task-12:PID Controller.

Task-13: Characteristics of Synchros.

Task-14: Lag & Lead Compensator.

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ENVIRONMENTAL SCIENCE

Course Code: GR18A2001 **L/T/P/C : 2/0/0/2**

II Year II Semester

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations
- Integrate human ecology and science of environmental problems.
- The effect of human activities on atmospheric pollution

Course Outcomes:

Based on this course, the Engineering graduate will

- Understand the harmonious co-existence in between nature and human being
- Recognize various problems related to environment degradation.
- Develop relevant research questions for environmental investigation.
- Generate ideas and solutions to solve environmental problems due to soil, air and water pollution.
- Evaluate and develop technologies based on ecological principles and environmental regulations which in turn helps in sustainable development.

UNIT I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT II

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial

pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global

Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economic aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

Text/Reference Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela.2008 PHI Learning Pvt. Ltd.
5. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
6. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
7. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
8. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.