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

GokarajuRangaraju 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 marksshall be for internal evaluation and 70 marksfor 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 ofthe 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**

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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	COURSE	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	GR18A1009	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	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2084	Principles of 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	2	2	1	30	70	100
7	GR18A2034	Electrical Machines – II Lab	0	0	4	4	2	30	70	100
8	GR18A2035	Control Systems Lab	0	0	4	4	2	30	70	100
		Total	**15**	**0**	**10**	**25**	**20**	**240**	**560**	**800**
9	GR18A2001	Environmental Science	2	0	0	2	2	30	70	100
10	GR18A2083	Design Thinking	2	0	0	2	1	30	70	100

III YEAR I SEMESTER

S.NO	Course Code		Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A3013	Power Systems – I	3	0	0	3	3	30	70	100
2	GR18A3014	Power Electronics	3	0	0	3	4	30	70	100
3	GR18A3015	Microprocessors	3	0	0	3	3	30	70	100
4		Professional Elective I	3	0	0	3	3	30	70	100
5	GR18A2052	Signals and Systems	3	0	0	3	3	30	70	100
6	GR18A3115	Fundamentals of Management and Entrepreneurship	3	0	0	3	3	30	70	100
7	GR18A3020	Power Systems – I Lab	0	0	2	2	1	30	70	100
8	GR18A3021	Power Electronics Lab	0	0	2	2	1	30	70	100
9	GR18A3022	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	GR18A3073	Power Systems – II	3	0	0	3	3	30	70	100
2	GR18A3074	Measurements and Instrumentation	3	0	0	3	3	30	70	100
3	GR18A3075	Electric Drives	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	GR18A3080	Power Systems – II Lab	0	0	2	2	1	30	70	100
7	GR18A3081	Measurements and Instrumentation Lab	0	0	2	2	1	30	70	100
8	GR18A3116	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	GR18A4012	Power Systems – III	3	0	0	3	3	30	70	100
2	GR18A4013	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	GR18A4022	Electronics Design Lab	0	0	2	2	1	30	70	100
7	GR18A4061	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	GR18A4070	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	GR18A4108	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	Artificial Intelligence Techniques (GR18A3016)	Wind and Solar Energy Systems (GR18A3017)	Electrical Machine Design (GR18A3018)	Electromagnetic waves (GR18A3019)
2	Line-Commutated and Active PWM Rectifiers (GR18A3076)	Power System Protection (GR18A3077)	Control Systems Design (GR18A3078)	Computational Electromagnetics (GR18A3079)
3	Electrical and Hybrid Vehicles (GR18A4014)	HVDC Transmission Systems (GR18A4015)	Computer Architecture (GR18A4016)	Electrical Energy Conservation and Auditing (GR18A4017)
4	Advanced Electric Drives (GR18A4018)	EHVAC (GR18A4019)	Digital Control Systems (GR18A4020)	High Voltage Engineering (GR18A4021)
5	Power Quality and FACTS (GR18A4071)	Power System Dynamics and Control (GR18A4072)	Principles of Digital Signal Processing (GR18A4112)	Industrial Electrical Systems (GR18A4073)
6	Modern Power Electronics (GR18A4074)	Electric Smart Grid (GR18A4075)	Advanced Control Systems (GR18A4076)	Electrical Distribution Systems (GR18A4077)

OPEN ELECTIVES – THREADS

S. No.	THREAD 1	THREAD 2
1	Soft Skills and Interpersonal Skills (GR18A3117)	CSE: 1. Principles of E-Commerce (GR18A3129) 2. Database Management Systems (GR18A2068) 3. Java Programming (GR18A2075)
2	Human Resource Development and Organizational Behaviour (GR18A3118)	IT: 1. Multimedia and Application Development (GR18A3123) 2. Web Programming (GR18A3057) 3. Operating Systems (GR18A2074)
3	Cyber Law and Ethics (GR18A3119)	EEE: 1.Embedded Systems (GR18A4102) 2. Control Systems (GR18A2032) 3. Artificial Intelligence Techniques (GR18A3016)
4	History of Science (GR18A3120)	ECE:1.Artificial Neural Networks (GR18A3124) 2.Software Defined Radio and Cognitive Radio (GR18A3125) 3.Cloud Computing (GR18A3102)
5	Introduction to Art and Aesthetics (GR18A3121)	ME: 1.Operations Research (GR18A3126) 2. Automobile Engineering (GR18A3127) 3. Robotics (GR18A4079)
6	Economic Policies in India (GR18A3122)	CE: 1. Green Building Technology (GR18A3128) 2.Building Materials and Construction Planning (GR18A2007) 3. Introduction to Fluid Mechanics (GR18A2010)

I Year Syllabus

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.

UnitIV: 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, 9thedition,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

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.

UnitII: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.

UnitV: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.

UnitIV

'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 12: 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 StrongForms 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 –MakingRequests 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: 1/0/3/2.5**

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

UnitI: 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*

UnitII: 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

UnitIII: 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

UnitIV: 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

UnitV: 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

UnitI: 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.

UnitII: 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.

UnitV: 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.

UnitI: 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 / Apurbakumar 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, (3^{rd} 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 (16^{th} Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4^{th} Edition

II Year Syllabus

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 : 3/0/0/3**
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

UnitV: 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: GR18A1009 **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).

UnitV:

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, JaanKiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
5. Beer F.P & Johnston E.R Jr. "Vector Mechanics for Engineers", TMH, 2004.
6. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
7. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
8. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
9. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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 AstableMultivibrator 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: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: 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.

UnitIV: INTRODUCTION TO GENDER

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

UnitV: 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, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, 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

PRINCIPLES OF DIGITAL ELECTRONICS

Course Code: GR18A2084 **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.

UnitIII: 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

UnitV: 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.

UnitV: 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
On completion of this Course, the student shall be able to:

- 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
The expected outcomes of the Course are:

- 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.

Module 1: 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.

Module 2: 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 distributionand evaluation of statistical parameters for Binomial and Poisson distributions.

Module 3: 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.

Module 4: 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).

Module 5: 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 in small samples, Chi-square test for goodness of fit and independence of attributes.

Text / References:

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", UniversalBook 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.
8. S.C.Gupta and V.K.Kapoor , "Fundamentals of Mathematical Statistics",Sultan Chand &sons,2014

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.

Unit1: 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)

UnitV: 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 : 0/0/2/1**
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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONTROL SYSTEMS LAB

Course Code: GR18A2035 **L/T/P/C : 0/0/4/2**
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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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 ErachBharucha 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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR18A2083 **L/T/P/C : 2/0/0/1**
II Year II Semester

Course Objectives and Outcomes: Study a problem from multiple perspectives. Learn how to frame the design challenge properly. Ideate, prototype and Iterate solutions.Learn from the overall design process how to create value as entrepreneurs. Students will be equipped with all the skills in the design mindset

UNIT-I

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

UNIT-II

Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathise, Define (the problem), Ideate, Prototype, and Test, Ideation tools & exercises. Sample Design Challenge, Introduction to the Design Challenge Themes

UNIT-III

Story telling and Tools for Innovation: Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes- Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT-IV

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

References:

- Designkit.org
- Ideo.org
- Adobe Kickbox

III Year Syllabus

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

POWER SYSTEMS-I

Course Code: GR18A3013 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:

1. Concepts of Power Generation, Transmission and Distribution Systems
2. Concepts power transmission lines models
3. Basic concepts of Power Systems and its components
4. Generation of overvoltage and insulation coordination
5. Different protection Schemes

Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Deliver the basic concepts of Power Generation.
2. Recall various power system components.
3. Outline the different concepts related to Power Transmission and Distribution Systems
4. Illustrate the generation of over-voltages and insulation coordination.
5. Generalize basic protection schemes.

Unit 1: Concepts of Power Generation:
Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids.
Principles of Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage.

Unit 2: Power System Components:
Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Travelling-wave Equations.
Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power.
Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines.

Unit 3:Transmission and Distribution Systems:
Line diagrams, transmission anddistribution voltage levels and topologies (meshed and radial systems). Synchronous Gridsand Asynchronous (DC) interconnections.

Unit 4: Over-voltages and Insulation Requirements:

Generation of Over-voltages: Lightning and Switching Surges. Protection against Overvoltage, Insulation Coordination. Propagation of Surges. Voltages produced by travelling surges.

Unit 5: Basic Principles of Switchgear:

Basic principle and operations of Circuit Breaker, Types of Circuit Breakers, Oil CB, Air Blast, Vacuum and SF_6 Circuit Breakers.

Back-up Protection, Overview and basic operation of Protection schemes (Over-current, directional, distance protection, differential protection) and their application.

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Text books

1.C.L.Wadhwa " Electrical Power systems:New age Publishers 7th Edition 2017
2.V.K Mehtha ,RohitMehtha "Principles of Power systems" S chand Publishers 4th Edition 2008
3. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.
4. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.

References:

1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.

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POWER ELECTRONICS

Course Code: GR18A3014 **L:3 P:0 T:0 C:4**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:
1. Provide the students a deep insight in to the working of different switching devices with respect to their characteristics.
2. Study advanced converters and switching techniques implemented in recent technology.
3. Analyze different converters and control with their applications.
4. Familiarize the students with the utilization aspects of power engineering, more specifically the techniques of solid-state power conversions and their applications.
5. Evaluate the steady-state and transient state analysis of all the power converters

Course Outcomes: -
Students will be able to:
1. Understand the differences between signal level and power level devices
2. Understand the principle of operation, characteristics of commonly employed power electronic switching devices
3. Evaluate the performance of controlled rectifier circuits
4. Analyze the operation of DC-DC choppers
5. Analyze the operation of voltage source inverters

Syllabus

Unit I: Power switching devices
Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; R,RC,UJT firing circuits for thyristor;Line and forced commutation circuits of a thyristor; Gate drive circuits for MOSFET and IGBT.

Unit II: Thyristor rectifiers
Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor. AC Voltage controller (Elementary treatment only), Cycloconverter (Elementary treatment only).

Unit III: DC-DC Converters

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage. Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Unit IV: Single-Phase Voltage Source Inverter

Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.

Unit V: Three-Phase Voltage Source Inverter

Power circuit of a three-phase voltage source inverter(120 degree mode), switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.

Text Books

1. M. H. Rashid, “Power Electronics: Circuits, Devices, and Applications”, Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, applications and Design”, John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
4. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
5. P. S. Bimbhra, “Power Electronics”, Khanna Publishers

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MICROPROCESSORS

Course Code: GR18A3015 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:

- To compare the architecture of Microprocessors and Microcontrollers.
- To familiarize in programming the Microcontrollers.
- To understand Memory and I/O interfacing of 8051.
- To interface various devices with 8051.
- To apply various programming concepts to different applications.

Course Outcomes: -
Students will be able to:

- Understands the internal architecture, organization and assembly language programming of 8051 processors.
- Analyze the assembly language Programming.
- Do interfacing design of peripherals like Memory, I/O, A/D, D/A, timer etc.
- Communicate 8051 with Bluetooth and Zig-bee devices.
- Develop various programs to run applications.

Syllabus
Unit-I:
Fundamentals of Microprocessors: (7Hours)
Fundamentals of Microprocessor Architecture. 8-bit Microprocessor and Microcontroller architecture, Comparison of 8-bit, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.

Unit-II:
The 8051 Architecture (8 Hours)
Internal Block Diagram, CPU, ALU, address, data and control bus, working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Unit-III:

Instruction Set and Programming (8 Hours)

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Unit-IV:

Memory and I/O Interfacing (6 Hours):

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.

Unit-V:

External Communication Interface (6 Hours)

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

Applications (06 Hours)

LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

Suggested Text Books:

1. **"The 8051 Microcontroller and Embedded Systems using Assembly and C" –** Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
2. **"8051Microcontroller"**- K.J.Ayala,DelmarCengageLearning, 2004.
3. **"Embedded System"**- R. Kamal, McGraw HillEducation, 2009.

References:

1. **"Microprocessor Architecture: Programming and Applicationswith the 8085"**- R. S. Gaonkar, Penram International Publishing,1996.
2. **"Microprocessors&Interfacing"**-D.V. Hall,McGrawHillHigher Education,1991.

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SIGNALS AND SYSTEMS

Course Code: GR18A2052 **L:3 P:0 T:0 C:3**
III year I semester

Prerequisites:

• Calculus, Trigonometry, complex algebra

• Fundamentals of Fourier, Laplace and Z transforms

Course Objectives:

The Objective of this course is to provide the student

• To compare the concepts of continuous and discrete-time signals and systems, their properties, representations and analysis methods.

• To visualization of time-domain representation and analysis concepts as they relate to difference equations, impulse response and convolution, etc.

• To analyze the Skill of frequency-domain representation and analysis using Fourier analysis, Z-transforms.

• To apply the concepts of sampling process of analog signals and A/D and D/A conversions.

• To represent the mathematical and computational skills needed in application areas like communication, signal processing and control.

Course Outcomes:

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

• Explain the fundamentals of mathematical models and analyze deterministic CT signals and systems

• Analyze the effect of LTI systems on signals passing through them in frequency and time domains

• Explain effect of sampling in continuous-time signals and apply sampling theorem in signal processing problems

• Discriminate the Fourier, Laplace and Z-transforms as appropriate for various signals and systems

• Solve simple problems as applicable to the field of communication, signal processing and control

Unit-I:

Introduction to Continuous-time Signals and Systems:

Typical signals (impulse, step, ramp, sinusoid, exponential, signum, sinc); Time-domain scaling, shifting, and folding; Continuous-time signal characteristics (periodicity, frequency, deterministic, random, symmetry, energy and power); Properties of continuous-time systems (linearity, time invariance, causality and stability). Analogy between vectors and signals; Orthogonal signal space; Signal approximation using orthogonal functions; Mean squared error; Closed set of orthogonal functions; Orthogonality in complex functions.

Unit-II:

Fourier Series, Fourier Transform, and Laplace Transform:

Representation of continuous-time periodic signals by Fourier series; Dirichlet's conditions; Properties of Fourier series, Parseval's theorem; Trigonometric and Exponential Fourier series; Complex Fourier spectrum; Fourier transform via Fourier series; Fourier transform of periodic and aperiodic signals; Convergence of Fourier transform; Properties of Fourier transforms, Parseval's theorem; Fourier transforms involving impulse function and Signum function; Introduction to Hilbert Transform; Definition of two-& one-sided Laplace transform, Region of convergence (ROC); Relation between LT and FT.

Unit-III:

Signal Transmission through Linear Systems:

Continuous-time Linear Time-Invariant system, Representation by differential equations, Transforms and State-variables; Impulse response, Convolution; Transfer function, frequency response; Ideal vs. realizable LPF, HPF and BPF characteristics; Signal bandwidth, system bandwidth, rise-time, gain-bandwidth; Distortion; Causality and Paley-Wiener criterion for physical realization.

Unit-IV:

Sampling & Discrete-time Signals:

Sampling theorem – Graphical and analytical proof for Band Limited Signals; Impulse-train sampling; Natural and Flat-top Sampling; Reconstruction of signal 64 from its samples; Under-sampling and Aliasing; Band-pass Sampling Theorem; DT signal characteristics (periodicity, frequency, deterministic, random, symmetry, energy and power).

Unit-V:

Z-Transform:

Discrete time signal representation using complex exponential and sinusoidal components; z-Transform of a discrete sequence; Region of convergence of z-Transform, Constraints on ROC for various classes of signals; Relationship between z-Transform and DTFT (Fourier spectrum); Transfer function of a LTI system (No difference equations); Properties of z-Transform, Inverse z-Transform by Partial Fractions (simple poles only).

Suggested Text Books:

1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, "Signals and Systems",Second Edition, PHI Learning, New Delhi, 2007.

2. B. P. Lathi, Signals, Systems and Communications-B.S. Publications, 2003

Reference Books:

1.M. J. Roberts, “Signals and Systems”, Second Edition, Tata-McGraw Hill, 2012.

2.Simon Haykin and Barry Van Veen, “Signals and Systems”, Edition, John Wiley and Sons, 2002.

3. P.RamakrishnaRao,ShankarPrkriya,”Signals and Systems”,2e,Mc Graw Hill(India),2013.

4. HweiP.Hsu,” Signals and Systems”, 3e,McGraw Hill Education,2014.

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FUNDAMENTALS OF MANAGEMENT AND ENTREPRENEURSHIP

Course Code: GR18A3115 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Objective:

1. To provide engineering and science students with an accelerated introduction to the basics of management.
2. The course provides a framework that will enhance a person's effectiveness in the business world and make familiarize management language.
3. To understand the management concepts and applications of concepts in practical aspects of business and development of managerial skills.
4. To provide the student with a clear understanding of Entrepreneurship.
5. To give hands on experience on how to generate ideas, evaluate business model.

Course Outcome:

1. The students understand the significance of Management in their Profession.
2. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course.
3. To know and adopt motivational theories and leadership styles and apply controlling techniques at right time for better decision making.
4. The student will be exposed to the basic concepts of entrepreneurship and its development process.
5. The student will acquire the ability of developing a business plan / model.

UNIT–I: Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills; **Evolution of Management Thought**- Classical Approach- Scientific and Administrative Management; The Behavioural approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT– II: Planning and Organizing: Planning – Planning Process, Types of Plans, Decision making andSteps in Decision Making; Principles of Organization: Span of control, organizational Design & Organizational Structures; Departmentalization, Delegation; Centralization, Decentralization.

UNIT–III: Leading, Motivation and Controlling: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills. Motivation

– Types; Motivational Theories – Needs Hierarchy Theory, Two Factor Theory, Theory X and

Theory Y. - **controlling**– basic control process– control techniques.

UNIT–IV: Nature of Entrepreneurship: Characteristics and skillsof an entrepreneur, Entrepreneur scenario in India and abroad. Types of entrepreneur, types of ownership, Small

business in Indian economy. The entrepreneur and the law (Trademarks, patents, copy rights) Financial aspects: sources of rising capital, schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, APSFC, IFCI and IDBI.

UNIT–V: Creating and Starting the venture: Creativity and the business idea (Self-discovery, Opportunity discovery); Developing the business plan (Business model –Lean canvas by Alexander Osterwalder); Marketing plan (Customer & Solution- Value proposition, Marketing & Sales); Financial plan (Validation, money), Human Resource Plan (Team).

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
4. Entrepreneurship- Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.2009

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata Mc – Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
3. Entrepreneurship- Rajeev Roy, Oxford, 2011
4. Intellectual Property- Deborah E.Bouchoux,Cengage, 2012

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POWER SYSTEMS -I LAB

Course Code : GR18A3020 **L:0 P:2 T:0 C:1**
III year I semester

Course Objectives:

The objective of this course is to provide the student:

1. knowledge in the area of Various power systems hardware components
2. Demonstration of characteristics of various relays
3. Analyze various types of faults and its protection
4. Determine transmission line model parameters
5. Develop power management system in Real-time applications

Course Outcomes:

At the end of this course, students will able to

1. Illustrate different components related to power system hardware
2. Distinguish the characteristics of different relays.
3. Perform various types of faults and its protection
4. Design and analyse the transmission line.
5. Integrate various applications that provides intelligent power monitoring, energy management, system optimization, advanced automation, and real-time prediction.

LIST OF EXPERIMENTS

1. Characteristics of Over Current relay for Phase fault
2. Characteristics of Over Current relay for Earth fault
3. Characteristics of Induction Disc type relay

4. Testing of differential relay

5. Characteristics of Over Voltage Relay

6. Characteristics of Under Voltage Relay

7. Testing of Negative sequence Relay

8. Determination of Efficiency and Regulation for 3 Phase Transmission Line model

9. Determination of ABCD parameters for short, medium and long Transmission lines

10. Ferranti effect of Transmission line

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POWER ELECTRONICS LAB

Course Code: GR18A3021 **L:0 P:2 T:0 C:1**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:

1. Develop hands-on experience in analyzing, designing and carrying out experiments on various power converters.
2. Familiarize with switching devices and their applications in power control.
3. Familiarize with power converters in various systems for power control.
4. Analyze and simulate different Converters using Simulation.
5. Conduct experiments with converters and compare the results with theoretical concepts and simulations.

Course Outcomes: -
Students will be able to:
1. Choose appropriate switching devices & firing circuits based on their characteristics and application
2. Design and analyze the operation of power switching converters
3. Develop practical control circuits for various real time applications
4. Analyze and evaluate the operation of Inverters & Cycloconverters
5. Judge power electronic converter performance for various applications in virtual platforms

Syllabus

1. Simulation of characteristics of SCR, IGBT, MOSFET.
2. Simulation of R, RC and UJT firing circuits.
3. Single-phase Half Controlled Converter with R-load.
4. Single-phase Fully Controlled Converter with R-load.
5. Buck Converter.
6. Boost Converter.
7. Single-phase Full Bridge Inverter.
8. Single-phase Cyclo-converter.
9. Three Phase Fully Controlled Converter.
10. DC Jones chopper
11. Simulation of Single Phase AC Voltage Controller.
12. Simulation of Three phase Half Controlled Converter.

13. Simulation of Buck-Boost Converter.
14. Simulation of Speed Control of single-phase A.C Motor.

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Department of Electrical and Electronics Engineering

MICROPROCESSORS LAB

Course Code: GR18A3022 **L: 0 P: 2 T: 0 C: 1**
III year I semester

Course Objectives: -

The objective of this course is to provide the student:

3. To introduce the basics of microcontrollers and its applications.
4. To provide in depth knowledge of 8051 Microcontrollers.
5. To expertise working with programming.
6. To impart the I/O interfacing concepts for developing real time systems.
7. To encourage the students in building real time applications.

Course Outcomes: -

Students will be able to:

- Familiarize with the assembly level and embedded C programming using 8051.
- Judge the difference between Assembly language and Embedded C Programming
- Design circuits for interfacing different modules to microcontrollers.
- Experiment 8051 with different types of communicating devices.
- Execute various programs which can resemble to the real time applications.

List of Experiments

Task-1: Using 8051 Microcontroller Kit:

- Introduction to Keil IDE.
- Assembly Language Programs to Perform Arithmetic Logical Operations, Rotate, Shift and Branch Instructions.
- Time delay Generation Using Timer Registers of 8051.
- Serial Communication from / to 8051 to / from I/O devices.

Task-2: Interfacing I/O Devices to 8051

- LED’s to 8051.
- Interfacing LCD to 8051.
- Interfacing Matrix Keypad to 8051.

Task-3: Arduino Programming

- LEDs interfacing
- Switches and LED’s interfacing
- 2*16 LCD
- Serial Communication
- Device control
- Reading sensors using ADC
- DC Motor control
- Bluetooth
- Real Time Clock
- Secure Digital (SD) Card

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)
Department of Electrical and Electronics Engineering

ARITIFICAL INTELLIGENCE TECHNIQUES

(Professional Elective –I)

Course Code: GR18A3016 **L:3 P:0 T:0 C:3**

III year I semester

Course objectives:

The objective of this course is to provide the student:

1.Classify the difference between Biological Neuron and Artificial Neuron.

2. Understand basic foundation in designing the Intelligent Systems.

3. Differentiate between Neural Networks and Fuzzy Neural Networks

4. Identify the Systems which are designed using Fuzzy and Neural Networks.

5 .Describe the importance of the Genetic Algorithm and its applications.

Course outcome

At the end of this course, students will demonstrate the ability to

1. Describe the importance of designing the System with Artificial Neural Networks.

2. Learn different types of fuzzification and defuzzification methods.

3. Distinguish the various Neural Networks Architectures.

4. Identify a system using Fuzzy logic or Neural network

5. Analyze the parameters of Genetic Algorithm.

Unit I:

ANN: Biological Neuron and its foundations to Intelligent Systems, Artificial Neural Networks, Single layer Multi-Layer Feed Forward Neural Networks, LMS or Delta Learning Algorithm and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

Unit II:

Fuzzy Logic: Basic concepts of fuzzy logic,Properties of fuzzy sets, Knowledge base and Rule base representation, Inference Mechanism, Defuzzification Methods: Center of Sums Method (COS), Center of gravity (COG) / Centroid of Area (COA) Method,Center of Area / Bisector of Area Method (BOA), Weighted Average Method

Unit III:

Fuzzy Neural Networks: Fuzzy Concepts in Neural Networks, Basic principles of Fuzz-Neural Systems, and Neural-Fuzzy systems, Generating Fuzzy Rules

Unit IV:

Neural Networks in Indirect Neural Control: System Identification using Neural Networks.

Fuzzy Control Systems: Problem statements, Decision Surface and Assumptions inFuzzy Control System Design

Unit V:

Genetic Algorithms: Introduction, Representations, The Algorithm, Cross over, Mutation,Termination Criteria, Importance of Genetic Algorithms.

Text Books:

1. J M Zurada , “An Introduction to ANN”,Jaico Publishing House

2. Hung T. Nguyen, Nadipuram R. Prasad, Carol L. Walker and Elbert A. Walker, “A First Course in Fuzzy and Neural Control” Chapman & Hall, CRC.

3. Timothy J Ross, “Fuzzy Logic with Engg.Applications”, McGraw. Hill

4. Driankov, Dimitra, “An Introduction to Fuzzy Control”, Narosa Publication

5. Golding, “Genetic Algorithms”, Addison-Wesley Publishing Com

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

WIND AND SOLAR ENERGY SYSTEMS
(Professional Elective –I)

Course Code : GR18A3017 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives:

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

1. Introduction of the basic concepts of Solar and Wind Energies
2. Knowledge on the solar power extraction and collection
3. Information and installation of Wind and Photovoltaic systems
4. Knowledge of PV solar panels and wind generators
5. Applications of wind and Solar power technologies for hybrid power generation.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Justify the energy scenario and the consequent growth of the power generation from renewable energy sources
2. Describe the basic physics of solar power generation
3. Implement the power electronic interfaces for solar generation
4. Discuss the basic physics of wind power generation
5. Understand the power electronic interfaces for wind generation

Syllabus:

Unit – 1: Physics of Wind Power : History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

Unit – 2: Wind generator topologies: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters.

Unit – 3: Solar photovoltaic : Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control.

Unit – 4: Solar Resource : Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability, Hourly Global, Diffuse and Beam Radiation on Horizontal Surface under Cloudless Skies, Solar Radiation on Inclined Plane Surface.

Unit – 5: Solar thermal Power Generation : Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Text Books:

1. B.H.Khan, "Non- Conventional Energy Resources", 2nd edition, Tata McGraw-Hill, New Delhi
2. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
3. G.D Rai "Non – Conventional Energy Resources", 3rd Edition Khanna Publishers.
4. G. M. Masters, "Renewable & Efficient Electric Power Systems", John Wiley and Sons, 2004.

References :

1. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
2. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)
Department of Electrical and Electronics Engineering

ELECTRICAL MACHINE DESIGN
(Professional Elective –I)

Course Code: GR18A3018 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives:

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

1.Develop knowledge on principles of design of static machines.
2.Develop knowledge on principles of design of rotating machines.
3.Understand the design fundamental concepts.
4.Design of machines based on their applications.
5.Solve the problems related to design.

Course Outcomes:
At the end of this course, students will demonstrate the ability to
1. Understand the construction and performance characteristics of electrical machines.
2. Understand the various factors which influence the design: electrical, magnetic and thermal
3. Loading of electrical machines understand the principles of electrical machine.
4. Design and carry out a basic design of an ac machine
5. Use software tools to do design calculations.

UNIT 1: Introduction Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT 2: Transformers Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT 3: Induction Motors Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT 4: Synchronous Machines Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature

parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT 5: Computer aided Design (CAD): Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Text / References:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.

2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.

3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

ELECTROMAGNETIC WAVES
(Professional Elective –I)

Course Code: GR18A3019 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:

1. To know about transmission line parameters at different load conditions.
2. Remembering of various boundary conditions in waves.
3. Understand field equations for wave propagation in loss and low loss mediums.
4. Analyse different mode of patterns in TE Mode.
5. Analyse different mode of patterns in TEM Mode.

Course Outcomes: -
Students will be able to:

1. Analyse transmission lines and estimate voltage and current at any point on transmission line for different load conditions.
2. Provide solution to real life plane wave problems for various boundary conditions.
3. Analyse the field equations for the wave propagation in special cases such as loss and low loss dielectric media.
4. Visualize TE patterns of field distributions in a rectangular wave-guide.
5. Visualize TEM patterns of field distributions in a rectangular wave-guide

Syllabus

UNIT – I : Transmission Lines-Introduction, Concept of distributed elements, Equations of voltage andcurrent, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances.

UNIT – II : Maxwell's Equations-Basic quantities of Electromagnetics, Basic laws of Electromagnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.

.**UNIT – III** : Uniform Plane Wave-Homogeneous unbound medium, Wave equation for time harmonic fields,Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.

UNIT–IV: Plane Waves at Media Interface-Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection, Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, Lossy media interface, Reflection from conducting boundary.

UNIT –V: Waveguides-Parallel plane waveguide: Transverse Electric (TE) mode, transverse Magnetic(TM) mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides.

Suggested Text Books:

1. R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill, 2005.
2. D. K. Cheng, "Field and Wave Electromagnetics", Addison-Wesley, 1989

References:

1. M. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press, 2007.
2. C. A. Balanis, "Advanced Engineering Electromagnetics", John Wiley & Sons, 2012.
3. C. A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & Sons, 2005.

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Department of Electrical and Electronics Engineering

POWER SYSTEMS-II

Course Code: GR18A3073 **L:3 P:0 T:0 C:3**
III year II semester

Course Objectives: -

The objective of this course is to provide the student:

1. Concepts related to Synchronous Machines.
2. Basic concepts of Power flow analysis
3. Concepts related to Power flow equations and numerical analysis
4. Solve faults current for different types of faults
5. Stability constraints in a synchronous grid

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Recall various Synchronous Machines.
2. Formulate the Impedance and admittance matrices
3. Solve Power Flow equations using different numerical methods
4. Evaluate fault currents for different types of faults
5. Analyze a power system in steady state and Stability Constraints in a grid

Unit 1: Synchronous Machines:

Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical wave for under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits.

Unit 2: Power Flow Analysis-I:

Loads: Types, Dependence of Loads. Per-unit System and per-unit calculations Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Impedance and Admittance Matrix. Real and reactive power balance equations at a node.

Unit 3: Power Flow Analysis-II:

Load and Generator Specifications. Application of numerical methods for solution of non linear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations.

Unit 4: Fault Analysis:

Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents.

Unit 5: Stability Constraints in synchronous grids:
Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4th order methods), as well as the Equal Area Criterion. Impact of stability constraints on Power System Operation. Effect of generation rescheduling and series compensation of transmission lines on stability.

Text books

1.C.L. Wadhwa"Electrical Power systems: New age Publishers 7th Edition 2017
2. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003
3. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
4. P.Kundur, "Power System Stability and Control" McGraw Hill Education, 1994

References:
1. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
2. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
3. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.

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Department of Electrical and Electronics Engineering

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Course Code: GR18A3074 **L:3 P:0 T:0 C:3**

III year II semester

Course Objectives

The objective of this course is to provide the student:

1. To Memorize, monitor, analyze and control any physical system.
2. Demonstration on construction and working of different types of meters.
3. Interpret the use of modern tools necessary for electrical projects.
4. Compose different techniques for precise measurement of electrical and nonelectrical quantities.
5. Design and create novel products and solutions for real life problems.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Generalize the measurement of different electrical quantities.

2. Calculate unknown values in AC & DC Bridges.

3. Summarize Oscilloscopes and evaluate the usage of Digital voltmeters.

4. Distinguish different types Transducers &Non-electrical quantities.

5. Design a system and analyze the techniques, skills for electrical projects to meet desired needs in electrical engineering.

UNIT-I

Fundamentals of Electrical Measurements: Ammeters & Voltmeters PMMC & Moving Iron Instruments C.T.s and PTs Ratio and Phase angle errors. Measurement of Power and power factor. Measurement of Active and Reactive power.

UNIT-II

Measurement of Energy and Other Electrical Qualities: Single phase & Three phase energy meters, Crompton's Potentiometer AC potentiometers.

Measurement of resistance, Inductance and Capacitance by bridges. Wheatstone bridge, Meggar Kelvin Double Bridge, Maxwell's Bridge, Anderson's bridge, Schering Bridge.

UNIT-III

Oscilloscope and Digital Voltmeters: Cathode Ray Oscilloscope, Time base Horizontal & Vertical Amplifier, Measurement of phase and frequency. Sampling Oscilloscope, Digital storage Oscilloscope.

Digital Voltmeters- Successive Approximation, Ramp, Dual slope Integration.

UNIT-IV

Instrumentation Fundamentals: Transducers, Classification, Resistive Inductive and Capacitive type transducers, LVDT, Strain Gauge, gauge factor, Thermistors, Thermo couples, Piezo electric transducers, Photo- voltaic, photo conductive transducers, and photo diodes

UNIT-V

Measurement of non Electrical Quantities: Measurement Displacement, Velocity, Acceleration, Flow.

Text Books

1. Electrical & Electronic Measurement & Instruments by A.K.ShawneyDhanpat Rai & Sons Publications.

2. Electrical Measurements and measuring InstrumentsbyE.W.Golding andF.C.Widdis, FifthEdition, WheelerPublishing**.**

Reference Books

1. Electrical Measurementsby Buckingham and Price, PrenticeHall

2. D.V.SMurthy, "Transducers and Instrumentation", Prentice Hall of India, 2nd edition,2009.

3. A.S Morris, "Principles of Measurement and Instrumentation", Pearson/Prentice Hall of India, 2nd edition, 1994.

4. H.S.Kalsi, "Electronic Instrumentation", Tata McGraw-Hill Edition, 1995,1st Edition, 1995

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Department of Electrical and Electronics Engineering

ELECTRICAL DRIVES

Course Code: GR18A3075 **L:3 P:0 T:0 C:3**
III year II semester

Course Objective:
1. To know the characteristics of various motors and loads.
2. Analyse most of the widely used converters for DC motors
3. Understand performance of converter fed DC motors, its speed torque characteristics and various
control methods.
4. Gain the knowledge about operation of DC motor speed control using converters and choppers
5. To acquire the knowledge of different speed control methods in AC motors using thyristors-based
control schemes.
Course Outcomes:
Upon completing this course students are able to
1. Analyse 1Φ & 3Φ converters fed DC motors and categorise the electric drive system based on
the applications.
2. Understand the various mode of operations of electrical drives
3. Evaluate the performance characteristics of converter fed and chopper fed DC motor drives
4. Propose a speed control scheme of an induction motor drive for real life applications
5. Compare Separate control and self-control of synchronous motors drive.Course **Objectives:**

UNIT I : Phase Controlled Converter Fed DC motor

Introduction to Thyristor controlled Drives, single phase semi and full controlled converters connected to d.c. separately excited and d.c. series motors – continuous current operation – output voltage and current waveforms – speed and torque expressions – speed-torque – characteristics – problems on converter fed d.c. motors . Three phase semi and fully controlled connected to d.c. separately excited and d.c series motors - output voltage and current waveforms – speed and torque expressions – speed – torque characteristics – problems.

UNIT II : Four Quadrant operation of DC Drives

Introduction to four quadrant operation – motoring operations, electric braking – plugging , dynamic and regenerative braking operations. Four quadrant operation of D.C. motors by dual converters – Closed loop control of DC motor (block diagram only)

UNIT III: Control of DC motors by choppers

Single quadrant,two quadrant and four quadrant chopper fed dc separately excited and series motors – continuous current operation – voltage and current waveforms – speed torque expressions and characteristics – problems – closed loop operation (block diagram only)

UNIT IV :Control of Induction motor

Variable voltage characteristics – control of induction motor by Ac voltage controllers – waveforms – speed torque characteristics. Variable frequency characteristics – variable frequency control of induction motor by voltage source and current source inverter and cyclo converters – PWM control of VSI and CSI – comparison of VSI and CSI operations - speed torque characteristics – problems on induction motor drives - closed loop operation of induction motor drives (block diagram only). Static rotor resistance control – slip power recovery – static scherbius drive – static Kramer drive – their performance and speed torque characteristics – advantages -applications – problems.

UNIT V: Control of Synchronous motor

Separate control & self control of synchronous motors – operations of self controlled synchronous motors by VSI and CSI, Cycloconverters. Load commutated CSI fed synchronous motor – operation – waveforms – speed torque characteristics – applications- advantages and problems- Closed loop control operation of synchronous motor drives (block diagram only)

Text / References:

1. B. K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, Asia, 2003.
2. Dubey G. K. “Power semiconductor control drives” Prentice Hall, Englewood Cliffs, New Jersey, 1989.
3. R. Krishnan, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall, 2001.
4. G. K. Dubey, “Fundamentals of Electrical Drives”, CRC Press, 2002.

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POWER SYSTEMS -II LAB

Course Code: GR18A3080 **L:0 P:2 T:0 C:1**
III year II semester

Course Objectives: -

The objective of this course is to provide the student:

1. Compute different power system parameters
2. Analyse various load flow solutions
3. Outline distinct types of faults and its protection
4. Perform load flow, short circuit and transient stability analysis
5. Generalise power system problems and its solutions

Course Outcomes:

At the end of this course, students will able to

1. Mathematically model various parameters in power system
2.To solve different load flow problems
3. Summarise different protection scheme for the faults
4. Formulate the different algorithms for load flows and stability problems
5. To develop and design solutions for power system problems

LIST OF EXPERIMENTS

1.Computation of line parameters

2.Formation of bus Admittance matrix

3. Load Flow solution using Newton Raphson method.

4. Unsymmetrical fault Analysis: LG, LL, LLG Fault

5. Z–Bus Building Algorithm

6.a)Obtain Symmetrical Components of a set of Unbalanced currents.

b)Obtain the original Unbalanced phase voltages from Symmetrical Components

7. Zones Protection

8. Short circuit analysis

9. Tripping sequence of protective devices

10. Transient Stability analysis

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MEASUREMENTS AND INSTRUMENTATION LAB

Course Code: GR18A3081 **L:0 P:2 T:0 C:1**

III year II semester

Course Objectives:

The objective of this course is to provide the student:

1. Knowledge on various types of bridges for measurement of resistance, inductance capacitance etc.
2. The Scientific Techniques and necessary skills to create an instrumentation line.
3. Demonstrate the designing and conducting experiments for Voltage, Power, Energy & Position measurements with their hardware set ups.
4. Introduce the concepts to analyze and interpret data using basic programs.
5. An idea about the measuring instruments, the methods of measurement and the use of various types of Transducers/Sensors.

Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Solve and validate DC and AC bridges.
2. Analyze the dynamic response using instruments like DSO and Function Generator.
3. Estimate statistical data analysis for measurement.
4. Measure physical quantities like Voltage, Power, Energy & Position.
5. Construct basic programs for computer-controlled data acquisition, measurement and transfer of data across the sensor network for different types of sensors.

Experiments

1. Measurement of Resistance using a bridge technique.

2. Measurement of Inductance using a bridge technique.

3. Measurement of Capacitance using a bridge technique.

4. Measurement of one-cycle data of a periodic waveform using DSO and function generator to compute the RMS value.

5. Measurement of Voltage and Current Detection Circuitry

6. Measurement of Power and Energy

7. Position Indication using LVDT

8. Temperature and Pressure Detection Circuitry

9. Light sensor

10. Accelerometer sensor

11. Soil Moisture sensor

12. Water flow Detection Circuitry

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LINE-COMMUTATED AND ACTIVE PWM RECTIFIERS
(Professional Elective –II)

Course Code: GR18A3076 **L:3 P:0 T:0 C:3**
III year I semester

Course Objectives: -
The objective of this course is to provide the student:
1. A deep insight in to the working of diode rectifiers with passive filters
2. Understand of thyristor rectifiers with passive filters.
3. Analysis of various multi-pulse converters.
4. Knowledge on AC-DC Single Switch & Bidirectional Boost Converters.
5. Analysis of AC-DC flyback converters.

Course Outcomes: -
Students will be able to:
1. Analyze diode rectifiers with passive filters.
2. Analyze thyristor rectifiers with passive filters.
3. Articulate various multi-pulse converters.
4. Evaluate AC-DC Single Switch & Bidirectional Boost Converters.
5. Articulate AC-DC flyback converters.

Syllabus

Unit 1: Diode rectifiers with passive filtering
Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current waveshape, effect of source inductance; commutation overlap.

Unit 2: Thyristor rectifiers with passive filtering
Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape.

Unit 3: Multi-Pulse converter
Review of transformer phase shifting, generation of 6-phase AC voltage from 3-phase AC, 6pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

Unit 4: AC-DC Boost Converter
Single-phase ac-dc single-switch boost converter
Review of DC-DC boost converter, power circuit of single-switch AC-DC converter, steady state analysis, unity power factor operation, closed-loop control structure.

AC-DC bidirectional boost converter
Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase AC-DC boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams.

Unit 5: Isolated single-phase AC-DC flyback converter
DC-DC flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of AC-DC flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

Suggested Text Books
1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, "Principles of Power Electronics", AddisonWesley, 1991.
3. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
4. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007
5. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2001

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

POWER SYSTEM PROTECTION
(Professional Elective –II)

Course Code: GR18A3077 **L: 3 P: 0 T: 0 C: 3**
III year II semester

Course Outcomes:
At the end of this course, students will demonstrate the ability to
1.Identify the challenges and solutions to industrial power system protection problems gain knowledge about the operation of circuit breakers.
2. Select the appropriate protection schemes for various power system applications.
3.Understand the basic principles of numerical protection.
4Jjustifythe use of wide-area measurements for system protection.

Course Objectives:
1. Educate the need for protective systems
2. Impart knowledge on functioning of circuit breakers
3. Select proper relay schemes for protection
4. Introduce the application of numerical relays for various
5. ApplyWAMS for improving protection systems.

Unit 1: Introduction and Components of a Protection System
Principles of Power System Protection: Need for protective systems, Zones of Protection, Primary and Back-up Protection, Essential qualities of Protection. Relays and Circuit Breakers. Instrument transformers: Current Transformers, Voltage Transformers, Summation Transformers.

Unit 2: Circuit Breakers
Elementary principles ofarc interruption, Recovery, Restriking Voltage and Recovery voltages, RestrikingPhenomenon, Average and Max. RRRV, Numerical Problems, Current Chopping and
Resistance Switching-CB ratings and Specifications.
Description and Operation ofOil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers

Unit 3: Protection Schemes
Introduction to Overcurrent Protection. Time-current Characteristics, Current Settings, Time Settings, Over Current Protective Schemes, Directional Relay.

Distance Protection: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.
Differential protection: Basic Differential Protection, Percentage or Biased Differential Relay.

Unit 4: Numerical Protection
Block Diagram of Numerical Relay, Sampling Theorem, Correlation with a Reference Wave, Fourier Analysis of Analogue Signals, Least Error Squared (LES) Technique, Digital Filtering, Numerical Over-current Protection, Numerical Transformer Differential Protection, Numerical Distance Protection of Transmission Line.

Unit 5: System Protection
Effect of Power Swings on Distance Relaying. Out-of-step protection, Synchro-phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.

Text/References

1. Y. G.Paithankar and S. R. Bhide, "Fundamentals of power system protection", Prentice Hall, India, 2010.
2. Badri Ram, D.N.Viswakarma, "Power System Protection and Switch gear", TMH Publications,2011
3. A. G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", John Wiley & Sons, 1988.
4. J. L. Blackburn, "Protective Relaying: Principles and Applications", Marcel Dekker, New York, 1987.
5. A. G. Phadke and J. S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer, 2008.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

CONTROL SYSTEMS DESIGN
(Professional Elective –II)

Course Code: GR18A3078 **L:3 P:0 T:0 C:3**
III year II semester

Course Objectives: -
The objective of this course is to provide the student:
1. Outline of fundamental concepts of design.
2. Analyze the compensators in time domain.
3.Analyze the compensators in frequency domain.
4. Design of PID Controllers.
5. Apply the concepts of Controllability and Observability in pole placement.

Course Outcomes: -
Students will be able to:
1.Understand various design specifications.
2. Design of lag, lead and lag-lead compensators in time domain.
3. Construct the various compensators in frequency domain.
4 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
5. Analyze the controllers using the state-space approach.

Syllabus

Unit 1: Design Specifications
Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

Unit 2: Design of Classical Control System in the time domain
Introduction to compensator. Design of Lag, lead, lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

Unit 3: Design of Classical Control System in frequency domain
Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using Bode diagram.

Unit 4: Design of PID controllers
Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

Unit 5: Control System Design in state space&Nonlinearities and its effect on systemperformance
Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.
Various types of non-linearities. Effect of various non-linearities on system performance. Singular points. Phase plot analysis.

Suggested Text Books
1. N. Nise, "Control system Engineering", John Wiley, 2000.
2. I. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.
3. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
4. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

References:
1. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
2. J. J. D'Azzo and C. H. Houpis, "Linear control system analysis and design (conventional and modern)", McGraw Hill, 1995.
3.R. T. Stefani and G. H. Hostetter, "Design of feedback Control Systems", Saunders College Pub, 1994.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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COMPUTATIONAL ELECTROMAGNETICS
(Professional Elective –II)

Course Code: GR18A3079 **L:3 P:0 T:0 C:3**
III year II semester

Course Objectives: -
The objective of this course is to provide the student:

1. Interpret basic concepts of electromagnetic.
2. Interpret Computational techniques for computing fields.
3. Interpret Finite Difference methods.
4. Interpret Finite Element methods
5. Memories the applications and implement in real life.

Course Outcomes: students will demonstrate the ability to

1. Understand the basic concepts of electromagnetic.
2. Understand computational techniques for computing fields.
3. Understanding Finite Difference methods.
4. Understanding Finite Element methods.
5. Demonstrate the low frequency drives, Transformers and Machines.

UNIT-I: Introduction Conventional design methodology, Computer aided design aspects – Advantages. Review of basic fundamentals of Electrostatics and Electromagnetics. Development of Helmhotz equation, energy transformer vectors- Poynting and Slepian, magnetic Diffusion-transients and time-harmonic.

UNIT-II: Analytical Methods Analytical methods of solving field equations, method of separation of variables, Roth's method, integral methods- Green's function, method of images.

UNIT-III: Finite Difference Method (FDM) Finite Difference schemes, treatment of irregular boundaries, accuracy and stability of FD solutions, Finite-Difference Time-Domain (FDTD) method- Uniqueness and convergence.

UNIT-IV: Finite Element Method (FEM) Overview of FEM, Variational and Galerkin Methods, shape functions, lower and higher order elements, vector elements, 2D and 3D finite elements, efficient finite element computations.

UNIT-V: Applications Low frequency electrical devices, static / time-harmonic / transient problems in transformers, rotating machines.

Text/Reference Books:

1. P. P. Silvester and R. L. Ferrari "Finite Element for Electrical Engineers", Cambridge University press, 1996.

2. M. N. O. Sadiku, "Numerical Techniques in Electromagnetics", CRC press, 2001.

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SOFT SKILLS AND INTERPERSONAL SKILLS
(Open Elective-I)

Coursecode:GR18A3117 | **L T P C**
III year II sem | **2 1 0 3**

Course Objectives:

The learner will be able to:

- Know the importance of soft skills
- Identify good leadership skills /qualities
- Recognize the importance of interpersonal skills
- Demonstrate the significance of confidence building
- Define and differentiate between a report and a proposal

Course Outcomes:

After the end of the course the learners will be able to:

- Develop soft skills communication skills, leadership skills etc
- Implement goal setting techniques to build a promising career
- Design formal report and proposals with appropriate formal expressions
- Analyse their own experiences of leading and participating in teams with suitable examples
- Describe team dynamics and exchange ideas about the elements of positive teamwork
- Create healthy workplace environment by treating others with respect and dignity
- Evaluate the power of confidence building and self-esteem with examples

Unit 1: Soft Skills

- Introduction to soft skills, Definition of Soft skills, Importance of soft skills
- Communication skills, Usage of English in Business/Corporate scenario
- Nonverbal communication
- Presentation skills

Unit 2: Leadership development

- Qualities of a good leader
- Decision making and problem solving skills
- Strategic management
- Crisis management

Unit3: Confidence building

- Motivation
- Goal setting
- Self-esteem
- Team skills

Unit 4: Developing reports and proposals

- Understanding reports and proposals
- Planning reports and proposals
- Writing beginning, body and ending
- Formats of reports and proposals

Unit5: Interpersonal skills

- Understanding professional relationships
- Networking professionally
- Showing basic office courtesies
- Interview skills

Text Books:

1. Soft Skills-Key to success in workplace and life
   Meenakshi Raman, Raman Upadhyay, CENAGE

Reference books:

2. Soft skills for Everyone
   Jeff Butterfield, CENAGE Learning

3. Soft skills for Interpersonal Communication
   S.Balasubramaniam,ORIENT BLACKSWAN

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR

(Open Elective-I)

Course Code: GR18A3118 **L:3 P:0 T:0 C:3**
III year II sem

Course Objectives

1. To make student aware of the concepts, techniques and practices of human resource development.
2. This course is intended to make students capable of applying the principles and techniques as professionals for developing human resources in an organization.
3. OB provides perspectives and skills that enhance understanding of our own behaviour and our ability to influence the behaviour of others in organizational settings
4. OB and HRM together can instill sustainability deep within an organizations' culture.
5. To equip them with behavioural skills in managing people at work.

Course Outcomes

1. To familiarize the concepts, techniques and practices of human resource development in the current organizational view and to impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
2. Develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.
3. To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in organisational setting.
4. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
5. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the frame work of organization.

Unit I -Introduction to Human Resource Development: Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix;Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

Unit II-HRD Applications and Trends: Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organisations: Selected cases covering HRD practices in government organisations, manufacturing and service industries and MNCs.

Unit III - Introduction to OB : Organisational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organisational Behaviour, Challenges and Opportunities for Organisational Behavior;

Unit IV- Individual Behaviour: Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

Unit V-Inter-personal and Group Behaviour: Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window.Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management ofDysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

Text Books:

1. Robbins, Stephen P. and Timothy A. Judge, Organisational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

Reference Books:

1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.
3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.

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EMBEDDED SYSTEMS
(Open Elective-I)

Course Code: GR18A4102 **L:3 P:0 T:0 C:3**
III year II sem

COURSE OBJECTIVES:

1. To comprehend the different issues related to embedded systems and their design.
2. To train the students with a foundation in architecture of embedded processor.
3. To impart the knowledge of I/O devices used for embedded systems.
4. To provide the knowledge about various concepts related to real time operating systems.
5. To impart the basic knowledge of system design techniques.

COURSE OUTCOMES:

After completing this course, the student will be able to,

1. Understand various I/O devices and their communication.
2. Define the unique design problems and challenges of real-time systems Program an embedded system
3. Identify the unique characteristics of real-time operating systems and evaluate the need for real-time operating system
4. Explain the general structure of a real-time systemand how to use RTOS to build an embedded real-time system.
5. Gain knowledge and skills necessary to design and develop embedded applications based on real-time operating systems.

UNIT I

Introduction to Embedded Systems: Embedded Systems, Processor Embedded to a system, Embedded hardware units and devices in a system, Embedded software in a system, Examples of Embedded systems, Soc(System on chip) and use of VLSI circuit design technology, complex system design and processors, Design process in Embedded system, formalization of system design, design process and design examples, classification of embedded systems, skills required for embed system design.

UNIT II

Devices and Buses for Devices Network: I/O Devices:- Types and Examples of I/O devices, Synchronous, Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices:- SPI, UART, Parallel Port Devices - Timer and Counting Devices – Serial Communication using: 'I2C', 'USB', 'CAN'- Advanced I/O Serial high speed buses: ISA, PCI, PCI- X, cPCI and advanced buses

UNIT III

Real Time Operating Systems: Definitions of process, tasks and threads–Inter Process Communication, Shared data problem, Use of Semaphore(s), Priority Inversion Problem and Deadlock Situations, Message Queues, Mail boxes, Pipes, Virtual (Logical) Sockets, Remote Procedure Calls (RPCs).

UNIT IV

Operating System Services: Goals, Structures, Kernel, Process Management, Memory Management, Device Management- Real Time Operating System-RTOS Task scheduling models- Co-operative Round Robin Scheduling, Cyclic Scheduling with Time Slicing.

UNIT V

System Design Techniques: Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design. Design Examples: Telephone PBX-System Architecture, Inkjet printer-Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

TEXT BOOKS:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct.2003

REFERENCE BOOKS:

1.Steve Heath, Embedded Systems Design, Second Edition-2003,Newnes,

2.David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

3. FrankVahidandTony Givargis, Embedded Systems Design–Aunified Hardware/Software Introduction, John Wiley,2002.

4. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001.

IV Year Syllabus

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POWER SYSTEMS-III

Course Code: GR18A4012 **L:3 P:0 T:0 C:3**
IV year I semester

Course Objectives: -
The objective of this course is to provide the student:

1 Explain about the operation and control the voltage, frequency
2 Illustrate different methods of Reactive Power compensation
3 Monitoring and control of a power system.
4 Basics of power system economics
5. Basics of Demand Side-management

Course Outcomes:
At the end of this course, students will demonstrate the ability to

1.List methods to control the voltage, frequency and power flow.
2. Summaries about Reactive Power compensation
3.Compose monitoring and control of a power system.
4 Recall the basics of power system economics.
5.Write about Demand Side-management

Unit -1: Control of Frequency and Voltage:
Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control. Excitation System Control in synchronous generators, Automatic Voltage Regulators(AVR).

Unit 2 Reactive Power Compensation:
Generation and absorption of reactive power byvarious components of a Power System. Shunt Compensators, Static VAR compensatorsand STATCOMs. Tap Changing Transformers. Power flow control using embedded dc links, phase shifters

Unit 3: Monitoring and Control:
Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems. State-estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis. Preventive Control and Emergency Control.

Unit 4: **Power System Economics:**
Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale

competition, Retail Competition),

Unit 5:Power Management:
Demand Side-management, Transmission andDistributions charges, Ancillary Services. Regulatory framework.

Text Books:

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. P.Kundur, “Power System Stability and Control” McGraw Hill Education, 1994
3. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.
4. A. R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
5. D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education,2003.

References:

1. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”,Wiley, 2012.

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ELECTRONICS DESIGN

Course Code: GR18A4013 **L:2 P:0 T:0 C:2**
IV year I semester

Course Objectives: -
The objective of this course is to provide the student:

1. Define the basic concepts on measurements
2. Describe the design procedure of different system design.
3. Learn the design of Microcontroller.
4. Outline the design of CPLDs, FPGA.
5. Fabricate the PCB design and layout

Course Outcomes: -
Students will be able to:

1. Understanding of construction and working of different measuring instruments
2. Develop an ability to use measuring instruments
3. Understanding of construction and working of signal conditioning system
4. Develop an ability to use electronic instruments
5. Examine the architecture Microcontrollers

Syllabus

Unit 1: Basic concepts on measurements - Analog Voltmeter and ammeter – types
Unit 2: Signal conditioning circuits - DC and AC, Conditioning system
Unit 3: Electronic Instrumentation - Voltmeter and Ammeter – types
Unit 4: Introduction to technology of printed circuit boards (PCB), General lay out and rules and parameters, PCB design rules for Digital
Unit 5: Electronic system design - Analog system design (basics)

Book:

1. A.K. Sawhany, “Electrical and Electronics Measurements & Instrumentation”, Dhanpath Roy & Co, 2005
2. Walter C.Bosshart, “Printed circuit Boards – Design and Technology”, TATA McGraw-Hill, 1983
3. Bob Dobkin Jim Williams, “Analog Circuit Design” – A Tutorial Guide to Applications and Solutions.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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ELECTRONICS DESIGN LABORATORY

Course Code: GR18A4022 **L:0 P:2T:0 C:1**
IV year I semester

Course Objectives:

The Objective of this course, student will be able to

1. Define the basic concepts on measurements
2. List out the steps in design procedure of different system design.
3. Learn the design of Microcontroller.
4. Outline the design of CPLDs, FPGA.
5. Construct the PCB layout

Course Outcomes:

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

1. List the practical issues related to practical implementation of applications using electronic circuits.
2. Choose appropriate components, software and hardware platforms.
3. Design a Printed Circuit Board, get it made and populate/solder it with components.
4. Examine the architecture Microcontrollers,CPLD and FPGA
5. Work as a team with other students to implement an application.

List of Experiments:

1. To measure the Amplitude and frequency of a given signal.

2. To estimate and measure the Noise in the electronic signal.

3. To measure the parameters: Force, Pressure and Flow Measurements using appropriate Sensors.

4. Firing angle Control of Thyristor based AC drive connected to AC motor.

5. Closed loop Speed Control of Ac Motor using PI, PD and PID controllers.

6. To measure light intensity employing a microcontroller with internal ADC.

7. To measure temperature employing microcontroller.

8. Implementing a Half Adder, Full Adder, Half Subtractor and Full Subtractor using CPLD/FPGAs.

9. Study of EAGLE Software and PCB design and Layout.

10. Write a program to find out the Square of a number and show the result using a DSP.

11. Write a program to find out the Factorial of a number and show the result using a DSP

12. System assembly considerations. Any one application mentioning the required board and its requirements.

13 Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application. Developing one product oriented application using any one of the board.

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ELECTRICAL AND HYBRID VEHICLES
(Professional Elective –III)

Course Code: GR18A4014 **L:3 P:0 T:0 C:3**
IV year I semester

COURSE OBJECTIVES:

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

1. Explainbasic concepts of electric traction.
2. DemonstrateVehicle Brake Performance..
3. Analyze power flow control in hybrid drive-train topologies
4. Discuss electric components used in hybrid and electric vehicles.
5. Select the energy storage technology for Hybrid and Electric Vehicles.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Summarize various electric drive train topologies.
2. Explain Brake System of EV, HEV, and FCV.
3. Identify various hybrid drive-train topologies
4. Analyze the configuration and control of different motor drives.
5. Interpret the different possible ways of energy storage requirements in Hybrid and Electric Vehicles.

Syllabus:

UNIT 1: Introduction to Electric Traction:

Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT 2: Braking fundamentals and Regenerative braking in Electric Vehicles:

General Description of Vehicle Movement, Vehicle Resistance, Dynamic Equation, Tire–Ground Adhesion and Maximum Tractive Effort, Power Train Tractive Effort and Vehicle Speed, Vehicle Power Plant and Transmission Characteristics, Brake Performance.
Braking Energy Consumed in Urban Driving, Braking Energy on Front and Rear Axles, Brake System of EV, HEV, and FCV- Parallel Hybrid Braking System, Fully Controllable Hybrid Brake System.

UNIT 3: Introduction to Conventional and Electric Vehicles:

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Introduction to ICE vehicles, Introduction to pure EV's (BEV, FCV).

UNIT 4: Electric Propulsion unit:
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT 5: Energy Storage Requirements in Hybrid and Electric Vehicles:
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

Text/Reference Books:
1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.

2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.

4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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HVDC TRANSMISSION SYSTEMS
(Professional Elective –III)

Course Code: GR18A4015 **L:3 P:0 T:0 C:3**
IV year I semester

COURSE OBJECTIVES: The objective of this course is to provide

1. Evaluation of technical and economical aspects of HVDC transmission.
2. Development of HVDC converter analysis
3. Focusing on HVDC control
4. Analysis of harmonics and their rectification.
5. Impact of AC system performance on DC system

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

1.Compare the differences between HVDC and HVAC transmission.
2. Analyze the rectifier and inverter commutating circuits.
3. Discuss the different control strategies.
4. Estimate the requirement of HVDC filters.
5. Explain the role of AC system faults on HVDC system.

Unit-1:

HVDC Transmission: Introduction, equipment required for HVDC systems, Comparison of AC and DC Transmission, Limitations of HVDC transmission lines, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC convertors, HVDC –VSC transmission System: VSC system components, Control of Active and reactive power, Applications of VSC systems.

Unit-2:

HVDC Convertors operation and analysis: Thyristors and their characteristics, silicon rectifiers IGBT's ,HVDC voltage source converters principle and operation , 6 pulse convertor configuration, ideal communication process without gate control, DC output voltage , gate control of valves, analysis of voltage wave forms with overlap angle, analysis of communication circuits , equivalent circuit of rectifier, Inverter operation with overlap,

Equivalent circuit of inverter , complete equivalent circuit of HVDC link, power factor and reactive power of converters, analysis of 12 pulse converter, power flow in HVDC links, Power flow and current control , power loss in DC systems, operation and analysis of VSC converters, VSC inverter operation , power flow in VSC-DC transmission, comparison between CSC(classical HVDC) and VSC-HVDC system.

Unit-3:

HVDC Converter control :AC transmission and its control , necessary of dc link control, rectifier control , inverter control , constant beta control, constant gamma control, compounding of rectifiers, current compounding of inverter , complete HVDC system characteristics , power reversal in DC link, voltage dependent current order limit(VDCOL), system control hierarchy ,individual phase control, cosine control of phase delay, linear control phase delay , equidistance pulse control, pulse frequency control , constant current control, inverter exhibition angle control, constant power control, control system for HVDC converter ,inverter operation problem, control of VSC converters.

Unit-4:

Harmonics in HVDC system: Harmonics due to converter , characteristic current harmonics in the 12 pulse converter , harmonics in VSC converter , harmonic model and equivalent circuit ,design of AC filters , single tuned and double tuned high pass filters , second order filters and C-Type filter, Reactive power considerations of AC filters , Active filters and their applications, filters with VSC-HVDC schemes.

Unit-5:

Faults on AC side of converter station: 3-phase symmetrical fault and asymmetrical faults, commutation failure, DC circuit breaker, AC-DC system interaction short circuit rates and its effects

Grounding and Ground Electrodes: Advantages and Problems with ground return, hvdc systems-grounding, the current field in the earth near an electrode, resistance of electrodes.

TEXT BOOK

1. HVDC transmission by S Kamakshaiah and V Kamaraju, Tata McGraw Hills Publications.

REFERENCE BOOKS

1. K.R.Padiyar., HVDC Power Transmission System(English) 2nd edition.

2. Arillaga., High Voltage Direct Transmission,(London)Peter Peregrinus, 1981.

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COMPUTER ARCHITECTURE
(Professional Elective –III)

Course Code: GR18A4016 **L:3 P:0 T:0 C:3**
IV year I semester

Course Objectives:

The Objective of this course, student will be able to

1. Comprehend operational concepts and understand computer organization within a basic computer system
2. Analyze the basic computer organization and understand the concepts of Memory organization
3. Discuss the design aspects of Input – Output Organization
4. Describe the different types of microprocessor.
5. Examine pipelining techniques and different types of Architectures:

Course Outcomes:

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

1. Describe the concepts of microprocessors, their principles and practices.
2. Write efficient programs in assembly language of the 8086 family of microprocessors.
3. Outline modern computer system and relate it to real examples.
4. Discuss the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
5. Summarize embedded applications using ATOM processor.

Unit 1:Introduction to computer organization: Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organization.

Unit 2: Memory organization : System memory, Cache memory types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

Unit 3: Input – Output Organization: Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus.

Unit 4: 16 and 32 microprocessors: 80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86

Unit 5: Pipelining: Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set.

Text Books:

1. Computer System Architecture M.Morris Mano, IIIrd Edition, PHI / Pearson.

2. V. Carl, G. Zvonko and S. G. Zaky, "Computer organization", McGraw Hill, 1978.

3. J. L. Hennessy and D. A. Patterson, "Computer Architecture A Quantitative Approach", Morgan Kauffman, 2011.

4. Computer Organization and Architecture William Stallings Seventh Edition, PHI/Pearson, 2006.P. Barry and P. Crowley, "Modern Embedded Computing", Morgan Kaufmann, 2012.

5. N. Mathivanan, "Microprocessors, PC Hardware and Interfacing", Prentice Hall, 2004.

References:

1. Y. C. Lieu and G. A. Gibson, "Microcomputer Systems: The 8086/8088 Family", Prentice Hall India, 1986.

2. J. Uffenbeck, "The 8086/8088 Design, Programming, Interfacing", Prentice Hall, 1987.

3. B. Govindarajalu, "IBM PC and Clones", Tata McGraw Hill, 1991. 10. P. Able, "8086 ssembly Language Programming", Prentice Hall India.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

ELECTRICAL ENERGY CONSERVATION AND AUDITING
(Professional Elective –III)

Course Code: GR18A4017 **L:3 P:0 T:0 C:3**
IV year I semester

Course Objectives: -
The objective of this course is to provide the student:
1.To know about current scenario and importance of energy conservation.
2. To Evaluate the concepts of energy management
3.To observe improving of energy efficiency in different electrical systems.
4.To know about different energy efficient devices.
5.To know how assessment of cooling towers can be done

Course Outcomes: -
Students will be able to:
1.Understand the current energy scenario and importance of energy conservation.
2.Understand the concepts of energy management.
3.Remember the methods of improving energy efficiency in different electrical systems.
4.Understand the concepts of different energy efficient devices.
5. Evaluate the time and energy of cooling towers.

Syllabus

UNIT – I : Energy Scenario-Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT – II : Basics of Energy and its various forms- Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT – III : Energy Management & Audit-Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

UNIT–IV: Energy Efficiency in Electrical Systems-Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT –V: Energy Efficiency in Industrial Systems-Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities, Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers..

Suggested Text Books:

1. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.

References:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online).
3. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org).

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

ADVANCED ELECTRIC DRIVES
(Professional Elective –IV)

Course Code GR18A4018 **L:3 P:0 T:0 C:3**
IV year I semester

Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. Apply vector control strategies for Induction motor drives
2. Design vector control strategies for Synchronous motor drives.
3. Classify Speed and torque control in BLDC and PMSM.
4. Demonstrate the operation of switched reluctance motor drives.
5. Interpret the implementation of DSP based motion control.

Course Objectives:

1. To Knowledge on different power converters for AC drives
2. To Focus on modeling and different control strategies for Induction motor drives
3. To Information on modeling and different control strategies for synchronous motor drives, PMSM and BLDC.
4. To Evaluation of Closed loop speed and torque control of switched reluctance motor drives.
5. To Analysis of DSP based motion control.

Unit 1: Induction motor drives: Dynamic d-q model,voltage fed inverter control-v/f control, concepts of vector control, direct torque and flux control(DTC).
Synchronous motor drives: Dynamic $d^e - q^e$ model, open loop v/f control, vector control.

Unit 2: Permanent magnet synchronous machines and their control: Dynamic Modeling of Permanent Magnet Synchronous- Transformation to Rotor Reference Frames , Three-Phase to Two-Phase Transformation ,Evaluation of Control Characteristics of the PMSM, Design of Current and Speed Controllers, Applications of PMSM drive.

Unit 3: Permanent magnet brush less DC machines and their control: Modeling of PM Brushless dc Motor, The PMBDCM Drive Scheme, Design Considerations for the PMBDC Motor, Design of Current and Speed Controllers, Applications of PMBLDC drive.

Unit 4: Switched reluctance motor drives: Principle of Operation of the Switched Reluctance Motor, SRM Configurations, Closed-Loop, Speed-Controlled SRM Drive, Design of Current Controllers, Torque Control, Design of the Speed Controller, Applications of SRM drive.

Unit 5: Realization of BLDC Motor Drives Using DSP Based Control: Main Circuit, Driving Circuit, Microprocessor Control Circuit, DSP Control Circuit, Protecting Circuit, Sensor less Control Circuits, ASIC for BLDC Motor Drives.

Text / References:

1. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, Asia, 2003.
2. R. Krishnan, "Permanent Magnet Synchronous and Brushless DC motor Drives", CRC Press, 2009.
3. Ramu, Krishnan, "Switched reluctance motor drives: modeling, simulation, analysis, design, and applications" CRC Press, 2001.
4. Chang-liang Xia, "Permanent magnet brushless DC motor drives and controls" Science Press,2012..
5. H. A. Taliyat and S. G. Campbell, "DSP based Electromechanical Motion Control", CRC press, 2003.

Prerequisite: PEC-EE03 : Electrical Drives.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

EHV AC TRANSMISSION
(Professional Elective –IV)

Course Code: GR18A4019 **L:3 P:0 T:0 C:3**
IV year I semester

Course Objectives:

At the end of the course the student is expected to

1. Know the present trends of transmission lines and their aspects.
2. Acquire the knowledge of electrostatic fields and its effect.
3. Learn the procedures of measurement of field and voltage gradients.
4. Impart the knowledge of corona in EHV lines.
5. Familiarize about the design of EHV lines.

Course Outcomes:

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

1.State the importance of estimating the line parameters of EHV AC transmission lines.
2.Solve the calculations of electrostatic field of AC lines and to cite their effect on voltage gradients.
3.Differentiate energized & un-energized lines and able to point out the requirement of VAR compensation.
4.Evaluate the effect of corona with respect to its characteristics, properties and losses.
5.Identify the design of EHV lines with respect to steady & transient limits.

UNIT-I

E.H.V.A.C. Transmission line trends and preliminary aspect standard transmission voltages– Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines –positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

UNIT-II:

Electrostatic field and voltage gradients–calculations of electrostatic field of AC lines–effect of high electrostatic field on biological organisms and human beings-surface voltage gradients and maximum gradients of actual transmission lines–voltage gradients on sub conductor.

UNIT-III:

Electrostatic induction in un energized lines–measurement of field and voltage gradients for three phase single and double circuit line –un energized lines. Power Frequency Voltage control and over-voltages in EHV lines: No load voltage–charging currents at power frequency-voltage control– shunt and series compensation –static VAR compensation.

UNIT-IV:

CoronainE.H.V.lines–Coronalossformulae-attentionoftravelingwavesduetoCorona– Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona-properties –frequency spectrum of RI fields– Measurements of RI and RIV.

UNIT-V:

Design of EHV lines based on steady state and transient limits-EHV cables and their characteristics.

TEXTBOOKS:

1.EHVACTransmissionEngineeringbyR.D.Begamudre,NewAgeInternational(p)Ltd.

REFERENCEBOOKS:

1.RokoshDasBegamudre,"ExtraHighVoltageACTransmissionEngineering"–
WileyEasternLTD.,NEWDELHI–1987.

2.HVACandDCTransmissionbyS.Rao.

3.Edison,"EHVTransmissionline"-Electric Institution(GEC1968).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

DIGITAL CONTROL SYSTEMS
(Professional Elective –IV)

Course Code: GR18A4020 **L:3 P:0 T:0 C:3**
IV year I semester

COURSE OBJECTIVES:

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

1. Understand the fundamentals of digital control systems, z-transforms
2. Explain Discrete System Analysis and Stability of Discrete Time System
3. Study the State Space Approach for discrete time systems
4. Design the Discrete compensator
5. Summarize discrete output feedback control

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Demonstrate discrete representation of LTI systems.
2. Interpret the stability of open loop and closed loop discrete-time systems.
3. Analyze the State Space Approach for discrete time systems
4. Design of different digital controllers.
5. Model state feedback and output feedback controllers.

Syllabus:

UNIT 1: Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent. Z-Transform and Inverse Z Transforms.

UNIT 2: Discrete System Analysis and Stability of Discrete Time System: Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT 3: State Space Approach for discrete time systems: State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.

UNIT 4: Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT 5: Discrete output feedback control: Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems

Text/Reference Books:

1. K. Ogata, "Digital Control Engineering", Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
3. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley, 1998.
4. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

HIGH VOLTAGE ENGINEERING
(Professional Elective –IV)

Course Code: GR18A4021 **L:3 P:0 T:0 C:3**
IV year I semester

Course Objectives:

At the end of the course the student is expected to

1. Know the importance of high voltage engineering.
2. State the different dielectric materials and their break down mechanisms.
3. Acquire the knowledge of generation & measurement of high voltages and currents.
4. Impart the knowledge of insulation co-ordination.
5. Acquire the information on testing of electrical apparatus.

Course Outcomes:

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

1. Recall the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
2. Classify the different methods of breakdown mechanisms that occur on application of high voltages.
3. Explain the methods of generation of high voltages.
4. State the procedures for the measurement of D. C., A.C., & Impulse voltages.
5. Describe the various tests on H. V. equipment and on insulating materials.

Unit -I

Breakdown in Gases

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Stream ermechanism, Corona discharge.

Unit – II

Breakdown in liquid and solid Insulating materials

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

Unit – III

Generation of High Voltages

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

Unit-IV

Measurements of High Voltages and Currents

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

Unit-V

High Voltage Testing of Electrical Apparatus and High Voltage Laboratories

Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

Text Books

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education,

2015.

Reference Books

1. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers, 2007.

2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”,

Newnes Publication, 2000.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

CYBER LAW AND ETHICS

(Open Elective-II)

Course Code: GR18A3119 **L:3 P:0 T:0 C:3**
IV year I sem

Course Objectives

1. The course objective is to provide the fundamental skill to understand cyber laws.
2. It enable to understand the legal frameworks
3. It helps the student understand different cyber crimes
4. It provides overview on Intellectual Property, copy rights, patents rights etc.
5. Given rapid changes in technology and the corresponding changes in crime and the law

Courseoutcomes.

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices.
5. The student will be able to know and learn web technologies and related issues.
6. The student will be in position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc.
7. Overview of cybercrime and framework.

Unit I - The Legal System: Sources of Law and The Court Structure

Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules.The Court System in India and Foreign Courtiers. (District Court, District ConsumerForum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are indispute can agree that this will instead be referred to arbitration.

Unit II - Introduction cyber law

Computers and its Impact in Society, Overview of Computer and Web Technology,Need for Cyber Law, Cyber Jurisprudence at International and Indian Level.

Unit –III -Constitutional & Human Rights Issues in Cyberspace

Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

Unit –IVCyber Crimes & Legal Framework

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft& Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

Unit –VIntellectual Property Issues in Cyber Space

Interface with Copyright Law, Interface with Patent Law, Trademarks& Domain Names Related issues.

References

1. Chris Reed& John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. JonthanRosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
6. S. R. Bhansali, Information Technology Act, 2000
7. University Book House Pvt. Ltd. Jaipur (2003).
8. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

CONTROL SYSTEMS
(Open Elective-II)

Course Code: GR18A2032 **L:3 P:0 T:0 C:3**
IV year I sem

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.

UnitV: 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:

7. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
8. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.
9. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
10. Control Systems by A. Anand Kumar, 2nd edition, PHI Learning Private Limited.
11. Control Systems Engineering by Nise 3rd Edition John Wiley.
12. I.J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International,2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

PROGRAMMABLE LOGIC CONTROLLERS

Course Code: GR18A4070 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives:

The main objective of the course is designed for students

1.To familiarize students with the Architecture, I/O Modules and programming structure of PLC.

2.To learn ladder diagrams for process control applications.

3.To understand the working of Registers, Timers, Counters and different PLC functions.

4.To implement Data Handling functions, Bit functions and Robotic Control in PLC.

5. To implement PLC in analog operations.

Course Outcomes:

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

1. Understand the Architecture, I/O Modules and programming structure of PLC.
2. Develop the ability to implement ladder diagrams for process control applications.
3. Analyse the working of Registers, Timers, Counters and different PLC functions.
4. Implement Data Handling Functions, Bit functions and Robotic Control in PLC.
5. Extend knowledge of PLC in analog operations.

Unit I:

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/0 modules.

Unit II:

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

Unit III:

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers PLC Functions Timer functions and industrial applications counters counter function industrial applications. Architecture functions, Number comparison functions, number conversion functions.

Unit IV:

Data Handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications.

Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

Unit V:

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples. PID principles position indicator with PID control, PID modules, PID tuning, PID functions

REFERENCE BOOKS

I. Programmable Logic Controllers — Principle and Applications by John W Webb and Ronald A Reiss Filth edition, PHI

2. Programmable Logic Controllers — Programming Method and Applications by JR Hackworth and ED Hackworth — Jr- Pearson, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

POWER QUALITY and FACTS
(Professional Elective –V)

Course Code: GR18A4071 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives: -
The objective of this course is to provide the student:

1. Analyse the transmission interconnections and relative importance of FACTS controllers.
2. Determine the operating characteristics of Shunt compensators.
3. Understand the working principles of Series compensators.
4. Analyse the basic concepts of Power Quality.
5. Understand the working principle of DVR, DSTATCOM.

Course Outcomes: -
Students will be able to:

1.Analyse the characteristics of ac transmission and know basic types of FACTS controllers.

2.Adapt FACTS devices for power-flow control, and Discuss the working principles of Shunt compensators and their operating characteristics.

3.Discuss the working principles of Series compensators.

4.Interpret the basic concepts of power quality.

5.Determine the working principles of devices DVR and DSTATCOM, to improve power quality.

Unit 1: FACTS Concepts
Transmission Interconnections, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, Relative Importance of Controllable Parameters, Basic Types of FACTS Controllers -Shunt Connected Controllers, Series Connected Controllers, Combined Shunt and Series Connected controllers.

Unit 2: SHUNT COMPENSATORS
Objectives of shunt compensation, Mid point voltage regulation, Improvement of Transient stability, power oscillation damping, Principle of operation of FC-TCR(SVC) compensator,

characteristic of FC-TCR and control diagram, Basic concept of voltage source converter, principle of operation of STATCOM, characteristic of STATCOM, control diagram.

Unit 3: SERIES COMPENSATORS

Objectives of series compensation, Improvement of Transient stability, power oscillation damping, Principle of operation of Thyristor controlled series compensator(TCSC), operating characteristics, TCSC control diagram, Principle of operation voltage source converter type series compensator(SSSC). Basic principle of operation of UPFC, transmission control capabilities of UPFC.

Unit 4: POWER QUALITY Measurements

Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement. Tolerance of Equipment: CBEMA curve.

Unit 5: Working Principle of DVR, DSTATCOM

Three phase three wire and three phase four wire D STATCOM topologies description, Principle of operation of DSTATCOM, Control in UPF mode of operation and zero voltage regulation mode, Full bridge single phase DVR and Three phase three wire DVR topology description, Principle of operation of active series compensator(DVR).

TEXT BOOKS

1. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems" , Wiley-IEEE Press, 1999.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.

REFERENCE BOOKS

1. Bhimsingh, Ambrishchandra and Kamal AL-Haddad, "Power Quality Problems and Mitigation Techniques" John wiley and sons Ltd 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Department of Electrical and Electronics Engineering

POWER SYSTEM DYNAMICS AND CONTROL
(Professional Elective –V)

Course Code: GR18A4072 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives: -
The objective of this course is to provide the student:

2. To understand the problem of power system stability.
3. To model the different power system components for study of the system.
4. To analyse the linear dynamical system.
5. To formulate the methods to improve power system stability.
6. To simulate power system models.

Course Outcomes:

At the end of the course, students will learn the ability to

1. Understand the problem of power system stability.
2. Model the different power system components for study of the system.
3. Analyse the linear dynamical system
4. Suggest the methods to improve power system stability.
5. Simulate power system models

Module 1: Power system general background: Introduction, structure of power system, control of power system, basic concepts of power system stability, rotor angle stability, Power Vs Angle relationship, Stability Phenomena, basic description of Small Signal Stability and Transient Stability, Voltage Stability and Voltage Collapse.

Module 2: Synchronous Machine Modelling: Mathematical Description of Synchronous machine, dqo transformation, per unit representation, equivalent circuits, steady state analysis, steady state value calculations, direct axis and quadrature axis transient and sub-transient inductances and time constants.

Module 3: Excitation Systems: Types of Excitation Systems and their representations, excitation system modelling.

Module 4: Dynamic Stability Concepts: Linearization, State Matrix, Eigen Values, small signal stability of single machine infinite bus system, generator represented by classical model, effect of field circuit dynamics, network equations, calculation of k-constants, block diagram representation with constant field voltage.

Module 5: Block Diagram Representation of SMIB system with flux decay and Excitation system: Concept of damping torque and synchronizing torque, effect of exciter gain on small signal stability of system, Power System Stabilizer and its effects.

Text Book:

1. Power System Stability and Control by P.Kundur, Mc Graw Hill Publications.

2. Power System Dynamics Stability and Control by K.R.Padiyar, B.S.Publications.

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PRINCIPLES of DIGITAL SIGNAL PROCESSING
(Professional Elective –V)

Course Code: GR18A4112 **L:3 P:0 T:0 C:3**
IV year II semester

COURSE OBJECTIVES:

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

1. Distinguish the basic concepts and techniques for processing signals.
2. Analyze discrete time signal processing and characterization of random signals
3. Demonstrate the important methods in DSP, including digital filter design.
4. Evaluate the transform-domain processing and importance of Signal Processors.
5. Apply engineering problem solving strategies for DSP applications.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
2. Analyse discrete-time systems using z-transform.
3. Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
4. Design digital filters for various applications.
5. Solve problems in digital signal processing for the analysis of real-life signals.

Syllabus:

UNIT 1: Discrete-time signals and systems

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals- aliasing; Sampling theorem and Nyquist rate.

UNIT 2: Z-transform

z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

UNIT 3: Discrete Fourier Transform

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

UNIT 4:Designof Digital filters

Design of FIR Digital filters: Window method ,Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-Pass, Band-Stop and High Pass Filters.

UNIT 5: Applications of Digital Signal Processing

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMAModel, Linear Mean-Square Estimation, Wiener Filter.

Text/Reference Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications",Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons, 1988.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

INDUSTRIAL ELECTRICAL SYSTEMS
(Professional Elective –V)

Course Code: GR18A4073 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives: -
The objective of this course is to provide the student:

1. To Develop Knowledge on electrical systems wiring for Residential and Commercial Systems
2. Students able to understand various components of Industrial systems
3. Able to drawing and SLD
4. To Develop Knowledge on Earth design and KVAR Calculations
5. Understand the PLC and SCADA based control Systems design.

Course Outcomes:
At the end of this course, students will demonstrate the ability to
1.Understand the electrical wiring systems for residential, commercial and industrial
2.Consumers, representing the systems with standard symbols and drawings, SLD.
3.Understand various components of industrial electrical systems.
4.Analyze and select the proper size of various electrical system components.
5. Identify the role of automation in present industrial systems.

UNIT 1: Electrical System Components (8 Hours) LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT 2: Residential and Commercial Electrical Systems (8 Hours) Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT 3: Illumination Systems (6 Hours) Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and

modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT 4: Industrial Electrical Systems I (8 Hours) HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT 5: Industrial Electrical Systems II & Automation (12 Hours) DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks, Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Page Text/Reference Books

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
3. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
4. Web site for IS Standards.
5. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

MODERN POWER ELECTRONICS
(Professional Elective –VI)

Course Code: GR18A4074 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives: -
The objective of this course is to provide the student:
1. A deep insight in to the working of different switching devices with respect to their characteristics.
2. Analysis of different resonant converters and control with their applications.
3. Knowledge on Multilevel Inverters and switching techniques implemented in recent technology.
4. Analysis of DC power supplies.
5. Knowledge on AC power supplies.

Course Outcomes: -
Students will be able to:
1. Define the advances in power electronic devices.
2. Articulate power electronic resonant converters in power control applications.
3. Evaluate the design and control of multi-level inverters.
4. Articulate DC power supplies in Power electronic applications
5. Evaluate the design and control of AC power supplies and uninterruptable power supplies.

Syllabus

UNIT I Modern power semiconductor devices: Modern power semiconductor devices- MOS turn Off Thyristor (MTO) - Emitter Turn Off Thyristor (ETO) Integrated Gate- Commutated Thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

UNIT II Resonant Pulse Inverters: Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches.

UNIT III Multilevel Inverters: Multi level concept-Classification of multilevel inverters-Diode clamped multilevel inverter- principle of operation-main features improved diode

Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

UNIT IV DC Power Supplies: DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional dc power supplies-Applications.

UNITV AC Power Supplies: AC power supplies classification-switched mode ac power supplies. Resonant AC power supplies-bi directional ac power supplies-multi stage conversions-control circuits-applications. Introduction-power line disturbances-power conditioners-uninterruptible Power supplies applications.

Suggested Text Books

1. Power Electronics—Mohammed H.Rashid Pearson Education—Third Edition
2. Power Electronics—Ned Mohan, Tore M.Undeland and William P. Robbins —John Wiley and Sons Second Edition.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

ELECTRIC SMART GRID
(Professional Elective –VI)

Course Code: GR18A4075 **L:3 P:0 T:0 C:3**
IV year II semester

Course Outcomes:
At the end of this course, students will demonstrate the ability to

1. understand the concepts and design of smart grid
2. illustrate suitable communications and measurement technology for smart grid
3. make use of various performance analysis tools for smart grid design
4. perform stability analysis for smart grid
5. identify sustainable energy options for the smart grid

Course Objectives:

1.understand the concepts and design of Smart grid
2.acquire knowledge about various communication and measurement technologies in smart grid
3.analyze smart grid under steady state.
4.evaluate the stability of smart grid.
5.utilize renewable energy resources and storage facilities for the sustenance of smart grid

UNIT I - Smart Grid Architectural Designs
Introduction – Comparison of Power grid with Smart grid – power system enhancement – communication and standards - General View of the Smart Grid Market Drivers - Stakeholder Roles and Function - Measures -Representative Architecture - Functions of Smart Grid Components Wholesale energy market in smart grid-smart vehicles in smart grid.

UNITII - Smart Grid Communications and Measurement Technology
Communication and Measurement - Monitoring, Phasor Measurement Unit(PMU), Smart Meters, Wide area monitoring systems (WAMS) – Advanced metering infrastructure- GIS and Google Mapping Tools.

UNIT III - Performance Analysis Tools for Smart Grid Design
Introduction to Load Flow Studies - Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods - Load Flow State of the Art: Classical, Extended

Formulations, and Algorithms –Load flow for smartgrid design-Contingencies studies for smart grid.

UNIT IV - Stability Analysis Tools for Smart Grid

Voltage Stability Analysis Tools-Voltage Stability Assessment Techniques Voltage Stability Indexing-Application and Implementation Plan of Voltage Stability in smart grid-Angle stability assessment in smart grid-Approach of smart grid to State Estimation-Energy management in smart grid.

UNIT V - Renewable Energy and Storage

Renewable Energy Resources-Sustainable Energy Options for the Smart Grid-Penetration and Variability Issues Associated with Sustainable Energy Technology-Demand Response Issues-Electric Vehicles and Plug-in Hybrids PHEV Technology-Environmental Implications-Storage Technologies-Grid integration issues of renewable energy sources.

Text/Reference:

1. James Momoh, “Smart Grid: Fundamentals of design and analysis”,John Wiley & sons Inc, IEEE press 2012.
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, JianzhongWu,Akihiko Yokoyama, “Smart Grid: Technology and Applications”, JohnWiley& sons inc, 2012.
3. Fereidoon P. Sioshansi, “Smart Grid: Integrating Renewable,Distributed& Efficient Energy”, Academic Press, 2012.
4. Clark W.Gellings, “The smart grid: Enabling energy efficiency anddemand response”, Fairmont Press Inc, 2009.
5. Krzysztof Iniewski, “Smart Grid Infrastructure & Networking”. McGraw Hill Education Pvt. Ltd., 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

ADVANCED CONTROL SYSTEMS
(Professional Elective –VI)

Course Code: GR18A4076 **L:3 P:0 T:0 C:3**
IV year II semester

COURSE OBJECTIVES:

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

1. Understand the basics of advanced control systems.
2. Analyze different types of compensators in frequency domain.
3. Summarize phase-plane analysis of nonlinear control systems.
4. Understand the describing function analysis of nonlinear control systems.
5. Solve the Time invariant state Equations using State Space Analysis.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Design lag, lead and lag lead compensators in frequency domain.
2. Find the stability of Linear and Nonlinear continuous time systems..
3. Relate the concepts of phase-plane analysis to nonlinear control systems.
4. Apply the concepts of describing function analysis to nonlinear control systems.
5. Apply the concepts of controllability and observabilty to real-world electrical and electronics problems and applications.

Syllabus:

UNIT – I: Stability Analysis-I: Frequency Domain: Polar Plots-Nyquist Plots-Stability Analysis. Lag, Lead, Lead-Lag Controllers design in frequency Domain.
UNIT –II: Stability Analysis-II: Stability in the sense of Lyapunov. Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.
UNIT –III: Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT – IV: Describing Function Analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.
UNIT – V: State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS: 1. Advanced Control Systems, B. N. Sarkar, PHI Learning Private Limited.
2. Advanced Control Theory, Somanath Majhi, Cengage Learning.
3. Nonlinear Systems by Hassan K Khalil , Prentice Hall Publications.

REFERENCE BOOKS: 1. Control Systems theory and applications, S.K Bhattacharya, Pearson.
2. Control Systems, N.C.Jagan, BS Publications.
3. Control systems, A.Anand Kumar, PHI.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Department of Electrical and Electronics Engineering

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective –VI)

Course Code: GR18A4077 **L:3 P:0 T:0 C:3**
IV year II semester

Course Objectives: The objectives of this course is to provide

1. Introduction of distribution system planning and load modeling concepts.
2. Design considerations of primary and secondary systems.
3. Knowledge on substation bus schemes and SCADA concepts.
4. Objectives of distribution system protection and knowledge on Coordination of protective devices.
5. Applications of capacitors and methods to improve power factor and concepts of voltage Control and how to achieve it.

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

1. Perform load modeling and analyze the characteristics of loads.
2. Articulate the design concepts of primary and secondary systems.
3. Understand substation bus schemes and know the difference between 4&6 feeder patterns and Apply Knowledge of SCADA concepts for functioning of substations.
4. Understand the coordination procedure of various protective devices.
5. Determine the optimum capacitor location, understand the applications of capacitors and know the equipment used for voltage control in distribution systems.

UNIT-I
Distribution system planning: Introduction to distribution system, Distribution system planning, Factors effecting the system planning, Load modeling and characteristics: Coincidence factor, contribution factor, Loss factor, Relationship between the load factor and loss factor. Load growth, Classification of loads-Residential, commercial, Agricultural and Industrial, and their characteristics.

UNIT-II
Design Considerations of primary systems: Distribution feeders, Types of feeders, primary feeder voltage levels, feeder loading, Radial feeders with uniformly andnon uniformly distributed loads, Applications of general circuit constants to radial feeders.
Design Considerations of secondary systems: Secondary voltage levels,secondary banking, one line diagram of secondary network system, secondary mains, limiters, network protectors.

UNIT-III

Distribution Substations: Substation bus schemes, substation location, Rating of distribution substation-Square and Hexagonal shaped substation service area, substation service area with 'n' primary feeders, comparison of 4&6 feeder patterns for thermally limited and voltage drop limited feeders.

Supervisory Control& Data Acquisition system (SCADA): Substation functions by SCADA, advanced SCADA concepts-substation controllers.

UNIT-IV

Distribution system Protection: Objectives of distribution system protection, over current Protective Devices-Fuses, Automatic Circuit Re-closer, Automatic Line sectionalizers and Automatic circuit breakers.

Coordination of protective devices: Objectives of co-ordination, general coordination procedure, Fuse to Fuse coordination, Re-closer to fuse coordination, fuse to circuit breaker coordination, Re-closer to circuit breaker coordination.

UNIT-V

Applications of capacitors to Distribution systems: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors(Fixed and switched), effect of series capacitors, Power factor correction, capacitor allocation- Economic justification of capacitors, Procedure to determine the optimum capacitor location.

Distribution system Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, AVB/ AVR for voltage control, Line drop compensation, voltage fluctuations.

Text Books

1. TuranGonen, Electric Power Distribution system Engineering– CRC Press.
2. V.Kamaraju, Electrical Power Distribution Systems, Tata McGraw Hill Publishing company, 2nd edition,2010.

Reference Books

1. A.S.Pabla, Electric Power Distribution, Tata McGraw-Hill Publishing company,5th edition, 1997..
2. G. RamMurthy, Electrical Power Distribution hand book, 2nd edition,University press.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

Department of Electrical and Electronics Engineering

ECONOMIC POLICIES IN INDIA
(Open Elective -III)

Course Code: GR18A3122 **L:3 P:0 T:0 C:3**

IV year II sem

Course Objective:

1. To analyse the overall business environment and evaluate its various components in business decision making.
2. To Provide an analysis and examination of significant contemporary ethical issues and challenges.
3. To Emphasesthe manager's social and environmental responsibilities to a wide variety of stakeholders.
4. To know the various Government policies governing industry.
5. To know economic terms and its scope.

Course Outcomes:

1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

Unit 1: Business environment-factors effecting Business Environment-need for industrial policies-Overview of Indian Economy, Trends towards market economy, problems of underdevelopment – meaning, Main problems, reasons, of underdevelopment. Development-

Unit :2 n Factors and measure, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

Unit 3: Planning in India, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self-sufficiency, employment etc, foreign aid, Employment. Allocation of Resources,

Unit 4: Private and Public Sector, Public Sector – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

Unit 5: Present Economic Policy, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policy – 1948, 1956, 1977, 1980, 1990, 1991, 2000-2001 Industrial Licensing, Monetary and Fiscal Policy.

References:

1.Indian Economy- A. N. Agarwal

2.Indian Economy – Mishra &Puri

3. Indian Development and planning – M. L. Jhingan

4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

Department of Electrical and Electronics Engineering

ARITIFICAL INTELLIGENCE TECHNIQUES
(Open Elective -III)

Course Code: GR18A3016 **L:3 P:0 T:0 C:3**

IV year II sem

Course objectives:

The objective of this course is to provide the student:

1.Classify the difference between Biological Neuron and Artificial Neuron.

2. Understand basic foundation in designing the Intelligent Systems.

3. Differentiate between Neural Networks and Fuzzy Neural Networks

4. Identify the Systems which are designed using Fuzzy and Neural Networks.

5.Describe the importance of the Genetic Algorithm and its applications.

Course outcome

At the end of this course, students will demonstrate the ability to

1. Describe the importance of designing the System with Artificial Neural Networks.

2. Learn different types of fuzzification and defuzzification methods.

3. Distinguish the various Neural Networks Architectures.

4. Identify a system using Fuzzy logic or Neural network

5. Analyze the parameters of Genetic Algorithm.

Unit I:

ANN: Biological Neuron and its foundations to Intelligent Systems, Artificial Neural Networks, Single layer Multi-Layer Feed Forward Neural Networks, LMS or Delta Learning Algorithm and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

Unit II:

Fuzzy Logic: Basic concepts of fuzzy logic, Properties of fuzzy sets, Knowledge base and Rule base representation, Inference Mechanism, Defuzzification Methods: Center of Sums Method (COS), Center of gravity (COG) / Centroid of Area (COA) Method ,Center of Area / Bisector of Area Method (BOA), Weighted Average Method

Unit III:

Fuzzy Neural Networks: Fuzzy Concepts in Neural Networks, Basic principles of Fuzz-Neural Systems, and Neural-Fuzzy systems, Generating Fuzzy Rules

Unit IV:

Neural Networks in Indirect Neural Control: System Identification using Neural Networks.

Fuzzy Control Systems: Problem statements, Decision Surface and Assumptions in Fuzzy Control System Design

Unit V:

Genetic Algorithms: Introduction, Representations, The Algorithm, Cross over, Mutation, Termination Criteria, Importance of Genetic Algorithms.

Text Books:

1. J M Zurada , "An Introduction to ANN",Jaico Publishing House

2. Hung T. Nguyen, Nadipuram R. Prasad, Carol L. Walker and Elbert A. Walker, "A First Course in Fuzzy and Neural Control" Chapman & Hall, CRC.

3. Timothy J Ross, "Fuzzy Logic with Engg.Applications", McGraw. Hill

4. Driankov, Dimitra, "An Introduction to Fuzzy Control", Narosa Publication

5. Golding, "Genetic Algorithms", Addison-Wesley Publishing Com