Academic Regulations
Programme Structure
&
Detailed Syllabus

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

Department of Electrical and Electronics Engineering

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachupally, Kukatpally, Hyderabad, Telangana, India

500 090

Academic Regulations

**GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING (B. Tech)
GR17 REGULATIONS**

Gokaraju Rangaraju Institute of Engineering and Technology 2017 Regulations (GR17 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Electrical and Electronics Engineering with effect from the students admitted to the programmes in 2017-18 academic year.

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

4. **Programme Pattern:**
   a) Each Academic year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) **Student is introduced to "Choice Based Credit System (CBCS)"**
   d) **Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).**
   e) The total credits for the Programme is 192. Typically each semester has 24 credits.
   f) **A student has a choice of registering for credits from the courses offered in the programme ensuring the total credits in a semester are between 20 and 28.**
   g) **All the registered credits will be considered for the calculation of final CGPA.**
   h) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester

System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

i) **Subject / Course Classification** All subjects/ courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes mathematics, physics and chemistry subjects
2		ES - Engineering Sciences	Includes fundamental Engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OE – Open Electives	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
7	Core Courses	Project Work	B.Tech. project or UG project or UG major project
8		Industrial training/ Mini- project	Industrial training/ Internship/ UG Mini-project/ Mini-project
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor courses	-	1 or 2 Credit courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory courses Credits/Marks are not counted for grading/pass percentage

5. **Award of B. Tech Degree:** A student will be declared eligible for the award of B. Tech Degree if he/she fulfills the following academic requirements:
   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 192 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, for 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 for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.
   c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.
   d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.
   e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek re-registration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

7. **Paper Setting, Evaluation of Answer Scripts, Marks and Assessment**
   a) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.

   b) **Distribution and Weightage of marks**

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Practical	25	50	75
3	Engineering Graphics	30	70	100
4	Industry Oriented Mini Project	25	50	75
5	Comprehensive Viva	-	100	100
6	Seminar	50	-	50
7	Major Project	50	150	200

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 Exams & Continuous Evaluation	1) Two mid semester examinations shall be conducted for 20 marks each for a duration of 2 hours. Average of the two mid exams shall be considered **i) Subjective - 15 marks** **ii) Objective - 5 marks** **2) Tutorials/Assignments - 5 marks** **3) Continuous Assessment – 5 marks**
		70	Semester-end examination	The semester-end examination is for a duration of 3 hours
2	Practical	25	Internal Exams & Continuous Evaluation	**i) Internal Exam-10 marks** **ii) Record - 5 marks** **iii) Continuous Assessment - 10 marks**
		50	Semester-end examination	The semester-end examination is for a duration of 3 hours

d) Industry Oriented Mini Project: The Mini Project is to be taken up with relevance to Industry and is evaluated for 75 marks. Out of 75 marks, 25 marks are for internal evaluation and 50 marks are for external evaluation. The supervisor continuously assesses the students for 15 marks (Continuous Assessment – 10 marks, Report – 5 marks). At the end of the semester, Mini Project shall be displayed in the road show at

the department level for the benefit of all students and staff and the same is to be evaluated by Mini Project Review Committee for 10 marks. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 50 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

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

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

g) Major Project: The project work is evaluated for 200 marks. Out of 200, 50 marks shall be for internal evaluation and 150 marks for the external evaluation. The supervisor assesses the student for 25 marks (Continuous Assessment – 15 marks, Report – 10 marks). At the end of the semester, projects shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Project Review Committee for 25 marks. The external evaluation for Project Work is a Viva-Voce Examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 150 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor.

h) Engineering Graphics:

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

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

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

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

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

12. Academic Requirements and Promotion Rules:

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

b) A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous 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	Regular course of study of first year second semester. (ii) Must have secured at least 24 credits out of 48 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	Regular course of study of second year second semester. (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 86 credits out of 144 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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

Letter Grade	Grade Point	Percentage of marks
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-C. 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 kth 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 ith course and G_i is the grade point scored by the student in the ith 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 192 credits.

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

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

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

b) A student should register for all 144 credits and secure all credits. The marks obtained in all 144 credits shall be considered for the calculation of the final CGPA.

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

2. Academic Requirements and Promotion Rules:

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

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

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 29 credits out of 48 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
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**	**(i) Regular course of study of third year**

	fourth year first semester.	**second semester.**
		(ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	**Fourth year first semester to fourth year second semester.**	**Regular course of study of fourth year first semester.**

3. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 144 credits.

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

Group	Subject code	Name of subject	Credits L	Credits T	Credits P	Total credits	Hours L	Hours T	Hours P	Total Hours	Total Marks
EEE I. B.Tech										**I-SEMESTER**	
BS	GR17A1001	Linear Algebra and Single Variable Calculus	2	1		3	2	2		4	100
BS	GR17A1002	Advanced Calculus	2	1		3	2	2		4	100
BS	GR17A1007	Engineering Physics	2	1		3	2	2		4	100
ES	GR17A1009	Computer Programming	2	1		3	2	2		4	100
ES	GR17A1018	Basic Electrical Engineering	2	1		3	2	2		4	100
HS	GR17A1005	English	2	1		3	2	2		4	100
ES	GR17A1025	Engineering Workshop			2	2			4	4	75
BS	GR17A1029	Engineering Physics lab			2	2			4	4	75
ES	GR17A1027	Computer Programming lab			2	2			4	4	75
		Total credits/Hours/Marks	**12**	**6**	**6**	**24**	**12**	**12**	**12**	**36**	**825**

Group	Subject code	Name of subject	Credits L	Credits T	Credits P	Total credits	Hours L	Hours T	Hours P	Total Hours	Total Marks
EEE I. B.Tech										**II-SEMESTER**	
BS	GR17A1003	Transform Calculus and Fourier Series	2	1		3	2	2		4	100
BS	GR17A1004	Numerical Methods	2	1		3	2	2		4	100
BS	GR17A1008	Engineering Chemistry	2	1		3	2	2		4	100
ES	GR17A1010	Data Structures	2	1		3	2	2		4	100
ES	GR17A1023	Engineering Graphics	1		2	3	1		4	5	100
ES	GR17A1019	Fundamentals of Electronics Engineering	2	1		3	2	2		4	100
HS	GR17A1024	Business Communication and Soft Skills			2	2			4	4	75
ES	GR17A1026	IT Workshop			2	2			4	4	75
BS	GR17A1030	Engineering Chemistry lab			2	2			4	4	75
		Total credits/Hours/Marks	**11**	**5**	**8**	**24**	**11**	**10**	**16**	**37**	**825**

EEE   II. B.Tech   **I-SEMESTER**

Group	Subject code	Name of subject	Credits			Total credits	Hours			Total Hours	Total Marks
			L	T	P		L	T	P		
BS	GR17A2058	Special functions and Complex variables	2	1		3	2	2		4	100
PC	GR17A2034	Electromagnetic Fields	3	1		4	3	2		5	100
PC	GR17A2035	Network Theory	3	1		4	3	2		5	100
PC	GR17A2036	DC Machines and Transformers	3	1		4	3	2		5	100
PC	GR17A2076	Computer Organization	2	1		3	2	2		4	100
PC	GR17A2037	DC Machines Lab			2	2			4	4	75
PC	GR17A2038	Electrical Networks Lab			2	2			4	4	75
PC	GR17A2039	Electrical Simulation Lab			2	2			4	4	75
		Total credits/Hours/Marks	**13**	**5**	**6**	**24**	**13**	**10**	**12**	**35**	**725**
MC	GR17A2001	Environmental Science			2	2			2	2	100

EEE   II. B.Tech   **II-SEMESTER**

Group	Subject code	Name of subject	Credits			Total credits	Hours			Total Hours	Total Marks
			L	T	P		L	T	P		
HS	GR17A2104	Managerial Economics and Financial Analysis	2	1		3	2	2		4	100
PC	GR17A2040	Power Generation and Distribution	3	1		4	3	2		5	100
PC	GR17A2041	AC Machines	3	1		4	3	2		5	100
PC	GR17A2042	Control Systems	3	1		4	3	2		5	100
PC	GR17A2105	Principles of Digital Electronics	2	1		3	2	2		4	100
PC	GR17A2044	AC Machines Lab			2	2			4	4	75
PC	GR17A2045	Control Systems Lab			2	2			4	4	75
PC	GR17A2046	Analog and Digital Electronics Lab			2	2			4	4	75
		Total credits/Hours/Marks	**13**	**5**	**6**	**24**	**13**	**10**	**12**	**35**	**725**
MC	GR17A2002	Value Education and Ethics			2	2			2	2	100
MC	GR17A2106	Gender sensitization Lab			2	2			2	2	75

Group	Subject code	Name of subject	Credits L	Credits T	Credits P	Total credits	Hours L	Hours T	Hours P	Total Hours	Total Marks
III B Tech											**I Semester**
PC	GR17A3016	Power Transmission System	2	1		3	2	2		4	100
PC	GR17A2055	Microcontrollers	3	1		4	3	2		5	100
PC	GR17A3018	Power Electronics	2	1		3	2	2		4	100
Open elective 1			**3**	**1**		**4**	**3**	**2**		**5**	**100**
Professional Elective 1			**3**	**1**		**4**	**3**	**2**		**5**	**100**
PE	GR17A3015	Operational Amplifiers									
PE	GR17A3017	Electrical Measurements and Instrumentation									
PE	GR17A2049	Signals & Systems									
PC	GR17A3019	Sensors, Measurements and Instrumentation Lab			2	2			4	4	75
PC	GR17A3020	Power Electronics Lab			2	2			4	4	75
PC	GR17A2059	Microcontrollers Lab			2	2			4	4	75
		TOTAL	**13**	**5**	**6**	**24**	**13**	**10**	**12**	**35**	**725**

Group	Subject code	Name of subject	Credits L	Credits T	Credits P	Total credits	Hours L	Hours T	Hours P	Total Hours	Total Marks
III B Tech											**II Semester**
PC	GR17A3021	Computer Methods in Power Systems	2	1		3	2	2		4	100
PC	GR17A3022	Switch Gear and Protection	2	1		3	2	2		4	100
PC	GR17A3102	Management Science	3	1		4	3	2		5	100
Open Elective 2			**3**	**1**		**4**	**3**	**2**		**5**	**100**
Professional Elective 2			**3**	**1**		**4**	**3**	**2**		**5**	**100**
PE	GR17A3023	Utilization of Electrical Energy									
PE	GR17A3024	Non Conventional Sources of Energy									
PE	GR17A3106	Neural and Fuzzy Systems									
PC	GR17A3025	Power Systems Lab			2	2			4	4	75
PC	GR17A3100	Advanced English Communication Skills Lab			2	2			4	4	75
PC	GR17A3101	Industry Oriented Mini Project			2	2			4	4	75
		TOTAL	**13**	**5**	**6**	**24**	**13**	**10**	**12**	**35**	**725**

Group	Subject code	Name of subject	Credits			Total credits	Hours			Total Hours	Total Marks
			IV B Tech **I Semester**								
			L	T	P		L	T	P		
PC	GR17A4022	Power Semiconductor Drives	2	1		3	2	2		4	100
PC	GR17A4023	Power System Operation And Control	2	1		3	2	2		4	100
PC	GR17A4024	HVDC Transmission	3	1		4	3	2		5	100
Open Elective 3			**3**	**1**		**4**	**3**	**2**		**5**	**100**
Professional Elective 3			**3**	**1**		**4**	**3**	**2**		**5**	**100**
PE	GR17A4147	High Voltage Engineering									
PE	GR17A4026	Electrical Distribution Systems									
PE	GR17A4148	Principles of signal processing									
PC	GR17A4027	DSP Based Electrical Lab			2	2			4	4	75
PC	GR17A4028	Power System Simulation Lab			2	2			4	4	75
PC	GR17A4029	Power Electronics And Drives Lab			2	2			4	4	75
		TOTAL	**13**	**5**	**6**	**24**	**13**	**10**	**12**	**35**	**725**

Group	Subject code	Name of subject	Credits			Total credits	Hours			Total Hours	Total Marks
IV B Tech											**II Semester**
			L	T	P		L	T	P		
PC	GR17A4030	Programmable Logic Controllers	2	1		3	2	2		4	100
Professional Elective 4			**3**	**1**		**4**	**3**	**2**		**5**	**100**
PE	GR17A4032	Flexible AC Transmission Systems									
PE	GR17A4035	EHV AC Transmission									
PE	GR17A4031	Power System Automation									
Professional Elective 5			**2**	**1**		**3**	**2**	**2**		**4**	**100**
PE	GR17A4036	Modern Power Electronics									
PE	GR17A4149	DSP Based Electromechanical Systems									
PE	GR17A4037	Advanced Control Systems									
PC	GR17A4038	Programmable Logic Controllers Lab			2	2			4	4	75
SPW	GR17A4143	Seminar			1	1			2	2	100
SPW	GR17A4142	Comprehensive Viva			1	1			2	2	100
SPW	GR17A4144	Major Project			10	10			14	14	200
		TOTAL	**7**	**3**	**14**	**24**	**7**	**6**	**22**	**35**	**775**

Open Elective 1		Course Title	Department Offering
OE - I	GR17A3151	Water Resources Engineering	CE
	GR17A3152	Solar & Wind Energy Systems	EEE
	GR17A3153	Applied Thermodynamics	ME
	GR17A3154	Principles of E- Commerce	CSE
	GR17A3155	Datamining and Applications	IT
	GR17A3156	Computer Architecture and Organization	ECE
Open Elective 2		Course Title	Department Offering
OE - II	GR17A3161	Transportation Engineering	CE
	GR17A3162	Sensors & Transducers	EEE
	GR17A3163	Automobile Engineering	ME
	GR17A3164	Human Computer Interaction	CSE
	GR17A3165	Essentials of Big Data Analytics	IT
	GR17A3166	Principles of Operating Systems	ECE
Open Elective 3		Course Title	Department Offering
OE - III	GR17A4161	Green Building Technology	CE
	GR17A4162	Soft Computing Techniques	EEE
	GR17A4163	Operations Research	ME
	GR17A4164	Mobile Computing and Applications	CSE
	GR17A4165	Business Intelligence	IT
	GR17A4166	Principles Of Satellite Communications	ECE

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER TRANSMISSION SYSTEM

Course Code: GR17A3016   **L T P C**
III Year I Sem   2 1 0 3

UNITI

TRANSMISSION LINE PARAMETERS: Types of conductors-calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR &GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNITII

PERFORMANCE OF SHORT &MEDIUM LENGTH TRANSMISSION LINES:

Classification of Transmission Lines - Short, medium and long line and their model representations- Nominal-T, Nominal-πand A,B,C,D Constants for symmetrical &Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines -Numerical Problems.

UNITIII
PERFORMANCE OF LONG LENGTH TRANSMISSION LINES:

Long Transmission Line-Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves-Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves- Representation of Long Lines - Equivalent-T and Equivalent π- network models (numerical problems).

Skin, Proximity and Ferranti effects - Charging Current - Effect on Regulation of the Transmission Line.

UNITIV
POWER SYSTEM TRANSIENTS, CORONA & SAG:

Types of System Transients- Travelling or Propagation of Surges- Attenuation, Distortion, Reflection and Refraction Coefficients- Termination of lines with different types of conditions- Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions(Numerical Problems).
Corona-Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

SAG AND TENSION CALCULATIONS: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems.

UNITV
OVER HEAD LINE INSULATORS: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

UNDER GROUND CABLES: Types of Cables, Construction, Types of Insulating materials, Calculation of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems.
Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter- sheath grading, HV cables.

TEXT BOOKS:

1. M.L. Soni, P.V.Gupta, U.S. Bhatnagar, A. Chakrabarthy, "Power System Engineering", Dhanpat Rai &Co Pvt.Ltd.

2. C.L.Wadhwa, "Electrical power systems" New Age International (P) Limited, Publishers, 1998.

REFERENCES

1. I.J.Nagarath &D.P Kothari, "Power System Engineering", TMH2/e, 2010

2. B.R.Gupta, "Power System Analysis and Design", Wheeler Publishing.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICROCONTROLLERS

Course Code: GR17A2055   **L T P C**
III Year I Sem   3 1 0 4

UNIT- I

Microprocessors: Introduction to microprocessors, 8086 Architecture, Register organization ,Memory segmentation, Programming Model, Timing diagrams, Interrupts, Instruction formats, Addressing modes, Instruction set, Macros Program, 8255 PPI, Various modes of operation, Interfacing to 8086.

Interfacing: keyboard, Display, stepper Motor, D/A converter, Memory, Interrupt structure of 8086, Interrupt service routine, Serial communication standards .

UNIT-II

Introduction and 8051 Architecture: Introductiontomicrocontrollers,comparing microprocessors and microcontrollers, 4,8,16 and 32 bit microcontrollers, Development systems for Microcontrollers, Architecture;Architectureof8051, pin configuration of 8051microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input/output and interrupts.

UNIT-III

Moving Data and LogicalOperations: Introduction,Addressingmodes,External Data moves, Code Memory Read-only Data Moves, PUSH and POPOp codes, Data Exchanges, Logical Operations ;Introduction, Byte-Level Logical Operations, Bit- Level Logical Operations, Rotate and Swap Operations

UNIT-IV

Arithmetic Operations, Jump and Call Opcodes: Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Jump and Callop codes; introduction, The jump and call program range, Jumps, Calls and Subroutines, call and returns, Interrupts and Returns

UNIT-V

8051 Microcontroller Design: Introduction, Microcontroller specification, Microcontroller Design, Testing the Design, Timing subroutines, Serial Data Transmission.

Applications and Serial Data Communication: Keyboards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts, Serial data Communication;

Teaching methodologies:
- Power Point presentations
- Tutorial Sheets
- Assignments

TEXTBOOKS
1. D.V.Hall, Microprocssors and Interfacing, TMH, 2nd edition 2006.
2. KennethJ.Ayala,The 8051 Microcontroller Architecture Programming and Applications, 2ndEdition,PenramInternationalPublishers(I), 1996.

REFERENCES
1. A.K.Ray and K.M. Bjurchandani, TMH, 2nd edition, Advanced Microprocessors and Peripherals TMH, 2006.
2. Mohammed Ari Mazidi and JanciGillispie,The 8051 Microcontroller and EmbeddedSystems,PearsonEducationAsia,NewDelhi,2003.

POWER ELECTRONICS

Course Code: GR17A3018   **L T P C**
III Year I Sem   2 1 0 3

UNIT I
POWER SEMI CONDUCTOR DEVICES
Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times-Salientpoints

Two transistor analogy of SCR, SCR - UJT firing circuit ––– Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems–Line   Commutation   and   Forced   Commutation   circuits.

UNIT II

SINGLE PHASE HALF CONTROLLED CONVERTERS

Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half wave controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with   Freewheeling   Diode–Numerical   problems

SINGLE PHASE FULLY CONTROLLED CONVERTERS

Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters -semi-converters, Active and Reactive power inputs to the converters, Effect of source inductance – Expression for load   voltage   and   current,   Dual   converters–Numerical   problems.

UNIT III
THREE PHASE LINE COMMUTATED CONVERTERS
Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads ,Semi converters,– Effect of Source inductance– - Waveforms –Numerical Problems.
INVERTERS
Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter, bridge inverter – Waveforms – Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems, Basics of Resonant Inverters.

UNIT IV
AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS
AC voltage controllers – Single phase two SCR's in antiparallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms -Numerical problems -Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only)–Waveforms.

UNIT V
CHOPPERS
Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Morgan's chopper – Jones chopper (Principle of operation only) Waveforms —AC-Chopper-Problems.

TEXT BOOKS
1. P.S.Bhimbra,"Power Electronics",Khanna publications.

2. M.D.Singh & K.B.Kanchandhani, Power Electronics, Tata McGrawHill Publishing company, 1998.

REFERENCES

1. Vedam Subramanyam, Power Electronicsby New Age International (P) Limited, Publishers

2. P.C.Sen, Power Electronics, Tata McGraw-Hill Publishing.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONAL AMPLIFIERS
(Professional Elective- I)

Course Code: GR17A3015   **L T P C**
III Year I Sem   3 1 0 4

UNIT I

Integrated Circuits: Classification, Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics. 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential.

UNIT II

OP-AMP Applications: Basic Applications of Op-Amp, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converters, Sample & Hold Circuits. Differentiators and Integrators. Comparators. Schmitt Trigger. Multi vibrators, Introduction to Voltage Regulators Features of 723 Regulators.

UNIT III

Active Filters & Oscillators: Introduction. First Order and Second Order Low Pass. High Pass and Band Pass Filters. Active Band Reject and All Pass Filters. Principle of Operation and Types of Oscillators RC, Wien Bridge and quadrature type. Wave form Generators- Triangular, Saw Tooth, Square Wave.

UNIT IV

Timers & Phase Locked Loops: Introduction to 555 Timer, Functional Diagram,Monostable and Astable Operations and Applications, Schmitt Trigger, PLL- Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO

UNIT V

D-Aand A-D Converters: Introduction, Basic DAC Techniques- Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type. Different types of ADCs- Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications.

TEXT BOOKS:

1. Linear Integrated CircuitsD Roy Chowdhury. New age International (P) Ltd.2003
2. Op Ams and Linear ICs Ramakanth A Gayakwad PHI1987

REFERENCES

1. Operational Amplifiers and Linear Integrated Circuits: William D Stanely PEI 2009

2. Operational Amplifiers and Linear Integrated Circuits K Lal Kishore pearson 2008

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
(Professional Elective- I)

Course Code: GR17A3017   **L T P C**
III Year I Sem   3 1 0 4

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, Carey Foster Bridge, Maxwell's Bridge, De sauty bridge, Schering Bridge.
UNIT III
CRO and Digital Voltmeters: Cathode Ray Oscilloscope, Time base Horizontal & Vertical Amplifier, Measurement of phase, frequency, Sampling Oscilloscope, Digital storage Oscilloscope. Digital Voltmeters- Successive Approximation, Ramp, Dual slope Integration, Micro processor based Ramp type DVM, Digital Frequency and phase Angle Meters.
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 of Displacement, Velocity, RPM, Acceleration, Flow.
TEXT BOOKS
1. Electrical & Electronic Measurement & Instruments by A.K.Shawney Dhanpat Rai & Sons Publications.
2. Electrical Measurements and measuring Instrumentsby E.W.Golding and F.C.Widdis, FifthEdition, WheelerPublishing.
REFERENCES
1. D.V.SMurthy, "Transducers and Instrumentation", Prentice Hall of India, 2nd edition,2009.
2. H.S.Kalsi, "Electronic Instrumentation", Tata McGraw-Hill Edition, 1995,1st Edition, 1995

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SIGNALS AND SYSTEMS

(Professional Elective- I)

Course Code: GR17A2049   **L T P C**

III Year I Sem   **3 1 0 4**

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-timeperiodic 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 BandLimited Signals; Impulse-train sampling; Natural and Flat-top Sampling; Reconstruction of signal 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 sinusoidalcomponents; 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) .

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.

REFERENCES

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SENSORS MEASUREMENTS AND INSTRUMENTATION LAB

Course Code: GR17A3019   **L T P C**
III Year I Sem   0 0 2 2

List of Experiments

Task1: Voltage and Current Detection Circuitry
Task2: Temperature and Pressure Detection Circuitry
Task3: Water flow and Level detection Circuitry
Task4: Position Indication (LVDT,Pot)
Task5: Proximity sensors(inductive)
Task6: Distance(Ultrasonic) sensor
Task7: Light sensor
Task8: Humidity sensor
Task9: Rainfall sensor& Soil moisture sensor
Task10: Motion sensor
Task11: Measurement of Power and Energy
Task12: Accelerometer sensor
Task13: Measurement of Resistance by bridge
Task14: Measurement of Inductance by bridge
Task15: Measurement of Capacitance by bridge

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONICS LAB

Course Code: GR17A3020   **L T P C**
III Year I Sem   0 0 2 2

LIST OF EXPERIMENTS:

SIMULATION CIRCUITS

Task1: 1-Phase Half Wave Controlled Converter With R, RL& RLE Load
Task2: 1-Phase Semi Converter With R, RL & RLE-Load
Task3: 1-Phase Full Controlled Converter With R, RL & RLE–Load
Task4: 1-Phase Ac Voltage Controller With R, RL &RLE – Load
Task5: 1-Phase Cycloconverter
Task6: Phase Half & Full Bridge Inverter
Task7: 3- Phase Full Controlled Converter with R, RL & RLE –Load
Task8: 3- Phase Bridge Inverter
Task9: Buck converter
Task10: Boost converter

HARDWARE

Task11: Thyristorised Drive for PMDC Motor with Speed Measurement and Closed Loop Control
Task12: IGBT Based 4 Quadrant Drive for PMDC Motor with Speed Measurement & Closed Loop Control
Task13: Three Phase Input Thyristorised Drive For Dc Motor With Closed Loop Control
Task14: Closed Loop control of Dc Motor Using Three Phase Fed Four Quadrant Chopper Drive
Task15: Speed Control of Three Phase Wound Induction Motor
Task16: Single Phase Fully Controlled Bridge Converter
Task17: Single Phase Half Controlled Bridge Converter
Task18: Single Phase Cyclo Converter

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICROCONTROLLERS LAB

Course Code: GR17A2059   **L T P C**
III Year I Sem   0 0 2 2

Listofexperimentson2Gkit

Task1.LEDpatterns

    a)BlinkingLEDs, b)Seriallights, c)Half on/Half off, d)Alternate on/off

Task2. Switches&LEDs

    a) Press switch to make corresponding LED on, b)Press switch to make corresponding LEDoff c)First switch press, last LED on, d)First switch press, last LED off

Task3.LCD

    a)Character & string display on LCD, b)SW1-Display strring1 on first line of LCD, c)SW2-Display strring1 on first line of LCD, SW2

Task4.UART

    a)Echo Program, b) Take command from PC & glow corresponding LED, c)Press Switch & display switch number on PC, d)Display data received by UART on LCD

Task5.TRIAC

    a)220VAC bulb switch on /off, b)220VAC fan speed control with fixed step size,

Task6.ADC

    a)Raw ADC value display on LCE, b)Raw ADC value display on Hyper Terminal, c)Engineering unit conversion and display on LCD, d)Engineering unit conversion and display on Hyper Terminal e)Limit checking for temperature value and switching on fan using triac f)Limit checking for ambient light value and switching on light using triac.

Task7.DAC

    a) Fixed step incremented DAC, output seen on multi-meter, b)DAC input value received from Hyper Terminal c)DAC input value taken from switches

Task8.DCmotor

    a)DC motor control-CW, CCW and stop using switches, b)DC motor control- CW, CCW and stop using commands received from Hyper Terminal

Task9.ZigBee

    a)Receive data on Zig Bee from PC Zig Bee dongle and display data on LEDs b)Receive data on Zig Bee from PC Zig Bee dongle and display data on LCD c)Read ADC and transmit data using Zig Bee d) TRIAC based control off and light using data received on Zig Bee

Task10.RF433MHz

a)Receive data on RF from another kit with RF transmitter. Connect PCs to bothkits.TypeindatainHyperTerminalofTransmitterkit&seeonHyperTerminal of Receiver kit b) Read switches on transmitter kit, send their status on RF to receiver kit and control motor using switch status

Task11. Bluetooth

a) Transfer data to PC using Blue link ,b)Receive data from PC using Blue Link &display on LCD c)Transfer data from mobile phone(using aJ2ME app) and receive using Blue link and control motor operation d)Transfer data from mobile phone(using a J2ME app) and receive using Blue Link and control electrical appliance operation

Task12. Ethernet

a)Transfer data to PC using WIZI05SR and display on Hyper Terminal, b)Implement an embedded web server

Task13.RTC

a)Read and display RTC data on LCD, b)Read and display RTC data on Hyper Terminal, c)Set RTC using Hyper terminal and display data on Hyper Terminal, d)Implement an Event Logger with Time Stamp display

Task14.SDcard

a) Transfer data to PC, store on SDcard and retrieve it back(block transfer) b)ImplementFATfilesystemonSDcardc)Implementdataacquisitionsystemand store data ina CSV file on SD card with time stamp

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Practical Examination

Lab methodologies:
- Assignments
- Lab experiments with Arduino software

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
WATER RESOURCES ENGINEERING

(Open Elective-1)

Course Code: GR17A3151   **L T P C**
III Year. I Semester   **3 1 0 4**

UNIT I
Introduction to Engineering Hydrology and its applications: Hydrologic Cycle, types and forms of precipitation, rainfall measurement, types of Rain gauges, computation of average rainfall over a basin, processing of rainfall data-adjustment of record-Rainfall Double Mass Curve. Runoff-Factors affecting Runoff over a Catchment- Empirical and Rational Formulae.

Abstraction from rainfall: Evaporation, factors effecting evaporation, Measurement of evaporation-Evapotranspiration- Penman and Blaney & Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices'.

UNIT II
Distribution of Runoff: Hydrograph Analysis Flood Hydrograph – Effective Rainfall - Base Flow-Base Flow Separation - Direct Runoff Hydrograph– Unit Hydrograph, definition and limitations of application of Unit hydrograph, Derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa S- hydrograph, Synthetic Unit Hydrograph.

UNIT III
Ground water Occurrence: Types of aquifers, aquifer parameters,' porosity' Specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of wells, Well Construction - Well Development.

UNIT IV
Necessity and importance of irrigation: Advantages and ill-effects of irrigation, Types of irrigation, Methods of application of irrigation water, Indian Agriculture soils, Methods of improving soil fertility-Crop rotation, preparation land for irrigation, Standards of quality for irrigation water.

Soil-water-plant relationship: Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors Affecting duty- design discharge for a water course. The depth and frequency of Irrigation, Irrigation efficiencies-Water Logging.

UNITV
Classification of canals: Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for canal design canal lining.

Design discharge over a catchment: computation of design discharge–rational formula, SCS curve number method, flood frequency analysis introductory part only. Stream gauging-measurement and estimation of stream flow.

TEXT BOOKS
1. A text book of hydrology by P. Jaya Rami Reddy, laxmi publications pvt limited
2. Irrigation and water power engineering- B.C. Punmia, PandeB. B.Lal, Ashok kumarjain, Arun kumarjain- Laxmi publications 16ᵗʰ edition

REFERENCE
l. Elementary hydrology by V.P. Singh PHI publications
2. Irrigation and Water- Resources &Water Power by P'N 'Modi' StandardBook House.
3. Irrigation Water Management by D'K' Majundar' Printice Hall ofIndra.
4. Irrigation and Hydraulic structures by S'K'Grag'
5. Applied Hydrology by VenTe Chow' David R' Maidmentlarry W'MaysTataMC. GrawHill'
6. Introduction to Hydrology by Warren Viessman' Jr' Garyl' Lewis'
7. Irrigation and Water Power Engineering – Dr. B. C. Punmia, Dr.Lal et.al
8. Water Resources engineering – Larry W. Mays, John Willey & Sons
9. Irrigation engineering theory and practice – A. M. MichealVikas Publishers
10. NPTEL web and video courses

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOLAR AND WIND ENERGY SYSTEMS
(Open Elective- I)

Course Code:GR17A3152   **L T P C**
III Year I Sem   **3** 1 0 4

UNIT I

Solar Energy Basics: The sun as a source of energy, The Earth Sun, Earth Radiation Spectrums,Extra-terrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Solar Radiation Data, Measurement of Solar Radiation, Solar Time(Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation Availability on Horizontal Surface For Cloudy skies, Hourly Global, Diffuse and Beam Radiation on Horizontal Surface Under Cloudless Skies, Solar Radiation on Inclined Plane Surface

UNIT II

Solar Thermal Systems: Solar Collectors, Solar Water Heater, Solar Passive Space-Heating andCooling Systems, Solar Ustrial Heating Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation(or Desalination of Water), Solar Thermo-Mechanical Systems.

UNIT III

Solar Photovoltaic Systems: Solar Cell Fundamentals, Solar Cell Characteristics, Solar CellClassification, Solar Cell, Module, Panel and Array Construction, Maximizing The Solar PV Output and Load Matching, Maximizing Power point tracker(MPPT),Balance of System Components, Solar PV Systems, Solar PV Applications

UNIT IV

Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of WindPower, Basics of Fluid Mechanics, Wind Turbine Aerodynamics.

UNIT V

Wind Energy Conversion Systems: Wind Energy Conversion Systems (WECS), Wind-DieselHybrid System, Effects of Wind Speed and Grid Condition (System Integration), Wind Energy Storage, Environmental Aspects.

TEXT BOOKS

- B.H.Khan, "Non- Conventional Energy Resources", 2nd edition, Tata McGraw-Hill, New Delhi
REFERENCE

1. SP Sukhatme, Solar Energy - Principles of thermal collection and storage, 2nd edition, Tata McGraw-Hill, New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
APPLIED THERMODYNAMICS

(Open Elective-I)

Course Code:GR17A3153   **L T P C**

III B. Tech I Semester   **3 1 0 4**

UNIT I

Steam Power Cycles: Carnot cycle, Rankine cycle, Modified Rankine - Schematic layouts, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration &Reheating. Binary vapour cycle

Combustion: Fuels and combustion, basic chemistry, combustion equations, stochiometric air fuel ratio, volumetric and mass basis conversion, Flue gas analysis by Orsat apparatus.

UNIT II

Boilers : Classification – Working principles – with sketches including H.P. Boilers, L.P. Boilers and Modern H.P. Boilers – Mountings and Accessories – Working principles, Boiler horse power, equivalent of evaporation, efficiency and heat balance. Draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – Artificial draught: induced, forced, balanced and steam jet draught,

UNIT III

Steam Nozzles: Function of a nozzle – applications - types, Flow through nozzles, thermodynamic analysis, assumptions -velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – working Principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, Air pump- cooling water requirement. Cooling towers.

UNIT IV

Steam Turbines: Classification – Impulse turbine ,De-Laval Turbine its features; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency.-.

Reaction Turbine: Mechanical details – principle of operation, thermodynamic analysis of a stage.- Degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

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

UNIT V

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – actual cycle –methods for improvement of performance - regeneration, inter cooling and reheating –Closed and Semi-closed cycles – merits and demerits, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

Jet Propulsion: Principle of Operation –Classification of jet propulsive engines – Working Principles with Schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency– Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

TEXT BOOKS:

1.Thermal Engineering / R.K. Rajput / Lakshmi Publications
2.Thermal Engineering-P.L.Ballaney/ Khanna publishers
3. Thermal Engineering/R.S.Khurmi/JS Gupta/S.Chand.

REFERENCES:

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot

2. Gas Turbines and Propulsive Systems – P.Khajuria&S.P.Dubey - /Dhanpatrai

3. Gas Turbines / Cohen, Rogers and SaravanaMuttoo / Addison Wesley – Longman

4. Thermal Engineering-M.L.Marthur& Mehta/Jain bros

5. Gas Turbines – V.Ganesan /TMH

Teaching Methodology: Power Point Presentations, Working models, White Board & Marker

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF E-COMMERCE

(OPEN ELECTIVE- I)

Course Code: GR17A3154   **L T P C**

III Year I Semester   **3 1 0 4**

UNIT I

INTRODUCTION TO E-COMMERCE

E-commerce, Difference between E-commerce and E-business, Purpose of E-Commerce, Eight Unique Features of E-commerce Technology, Web 2:0, Types of E-commerce, Growth of the Internet and the Web, Origins and Growth of E-commerce, Understanding E-commerce.

UNIT II

E-COMMERCE BUSINESS MODELS AND CONCEPTS

E-commerce Business Models, Business-to-Consumer (B2C) Business Models, Business-to-Business (B2B) Business Models, Business Models in Emerging E-commerce Areas.

UNIT III

BUILDING AN E-COM WEB SITE

Building an E-commerce Web Site, Choosing Software, Choosing the Hardware, E-commerce Site Tools.

UNIT IV

ONLINE SECURITY AND PAYMENT SYSTEMS

Security Threats in the E-commerce Environment, Technology Solutions, payment systems, E-commerce Payment System, Electronic Billing Presentment and Payment.

UNIT V

ONLINE CONTENT AND MEDIA

Online Content, Online Publishing Industry, Online Entertainment Industry.

TEXT BOOKS:

Kenneth C. Laudon Carol GuercioTraver, "E-commerce: business, technology, society", Fifth edition, Pearson Prentice Hall, 2009. (Unit-1:Chapter -1, Unit-II: Chapter-2, Unit-III: Chapter-4, Unit-IV: Chapter-5, Unit-V:Chapter-10)

REFERENCES
1. Dave Chaffey, "E-Business and E-Commerce Management: Strategy, Implementation and Practice", Fifth edition, Pearson Education, 2013.
2. K.K. Bajaj, Debjani Nag, "E-Commerce: The Cutting Edge of Business", Second edition, McGraw Hill Education (India) Private Limited, 2005.
3. David Whiteley ,"E-Commerce: Strategy, Technologies And Applications", McGraw Hill Education (India) Private Limited, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA MINING AND APPLICATIONS

(Open Elective – I)

Course Code: GR17A3155   **L T P   C**
III Year I Semester   **3 1 0   4**

UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint- Based Association Mining

UNIT III

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor.

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Outlier Analysis - Distance-Based Outlier Detection, Density-Based Local Outlier Detection

UNIT IV

Mining World Wide Web: Mining web page layout structure, Identification of authoritative web pages using web link structures, Automatic Classification of Web Documents, Web Usage Mining.

Spatial Mining: Mining spatial association and colocation patterns, spatial clustering methods, spatial classification and spatial trend analysis.

UNIT V

Text Mining: Text Data analysis and Information retrieval, Dimensionality reduction for text, text mining approaches.

Applications and trends in Data Mining : Data Mining for Financial Data Analysis, , Data Mining for Telecommunication Industry, Data Mining for Intrusion Detection, Various themes on Data Mining, Social impacts of data mining

TEXT BOOKS

1. Data Mining – Concepts and Techniques - Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
3. Data Mining – Introductory and advanced topics – Margaret H. Dunham &S.Sridhar, Pearson Education.

REFERENCES

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Anahory and Dennis Murray, Pearson Edn Asia.

COMPUTER ARCHITECTURE AND ORGANIZATION
(OPEN ELECTIVE-I)

Course Code: GR17A3156   **L T P C**

III Year I Semester   **3   1 0 4**

UNIT I
Introduction

Computing and Computers, Evolution of Computers, VLSI Era, System Design;
Register Level, Processor Level, CPU Organization, Data Representation, Fixed Point Numbers
, Floating Point Numbers, Instruction Formats, Instruction Types, addressing modes.

UNIT II
Data Path Design

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequ
entialALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-
restoring division algorithm,Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline de
sign, Modified booth's Algorithm

UNIT III
Control Design

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline
ControlInstruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV
Memory Organization

Random Access Memories, Serial Access Memories, RAM Interfaces, Magnetic Surface Record
ing,Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associa
tive Memory.

UNIT V
System Organization

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and   system
control, IOinterface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupt
s, pipelineinterrupts, IOP organization, operation systems, multiprocessors, fault tolera--
nce, RISC and CISC processors, Superscalar and vector processor.

TEXT BOOKS:

1. John P.Hayes, 'Computer architecture and Organisation', TMHThird edition, 1998.
2. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, Prentice Hall, 1992.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER METHODS IN POWER SYSTEMS

Course Code:GR17A3021　　　　　　　　　　　　　　　　**L T P C**
III Year II Sem　　　　　　　　　　　　　　　　　　　　2　1　0　3

UNIT I

Power flow Studies-1: Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Ybus formation by Direct Transformation Method, Numerical Problems.

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

UNIT II

Power flow Studies-2: Newton Raphson Method in Rectangular and Polar Co-Ordinates Form, Load Flow Solution with and without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC load Flow.

UNIT III

Formation of Zbus: Partial network, Algorithm for the Modification of Zbus Matrix for addition of an element for the following cases: Addition of an element from a new bus and reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old buses (Derivations and Numerical Problems)-Modification of Zbus for the changes in network (Problems).

Short Circuit Analysis: Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNITIV

Steady State Stability Analysis: Elementary concepts of Steady State, Dynamic and Transient Stabilities.

Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

UNIT V

Power System Transient State Stability Analysis: Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation - Solution of Swing Equation: Point-by-Point Method and Modified Euler's method. Multi machine stability. Methods to improve Transient Stability.

TEXT BOOKS:

1. Electric Power Systems by C. L. Wadhwa, New Age International.
2. Modern Power System Analysis by I.J.Nagrath & D.P.Kothari, Tata McGraw-Hill.

REFERENCES

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Power System Analysis by Hadi Saadat, TMH Edition.

SWITCH GEAR AND PROTECTION

Course Code:GR17A3022   **L T P C**
III Year II Sem   **2** 1 0 3

UNIT I

INTRODUCTION TO CIRCUIT BREAKERS: Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems- Current Chopping and Resistance Switching-CB ratings and Specifications.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNITII
ELECTRO MAGNETIC AND STATIC RELAYS:

Electromagnetic Relays: Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. **Application of relays:**Over current, Under voltage relays, Directional relays, Differential Relays.

Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays:Static Relays verses ElectromagneticRelays.

Static Relays: static Vs Electromagnetic relays, static over current relays.

UNITIII
PROTECTION OF GENERATORS & TRANSFORMERS:

Protection of generatorsagainst Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on Percentage Winding Unprotected.

Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

Protection of lines: Over Current, Carrier Current and Zonal Protection,Transley Relay.

Protection of Bus bars: Differential protection, Frame Leakage Protection.

UNIT IV

NEUTRAL GROUNDING: Grounded and Ungrounded Neutral Systems.-Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance-Arcing Grounds and Grounding Practices.

UNIT V

PROTECTION AGAINST OVER VOLTAGES: Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages-Valve type and Zinc- Oxide Lightning Arresters-Insulation Coordination-BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. Sunil S Rao, Switch gear and Protection–Khanna Publishers.

2. Badri Ram, D.N.Viswakarma, Power System Protection and Switch gear, TMH Publications.

REFERENCES

1. C.L.Wadhwa, Electrical Power Systems–New Age international (P) Limited, Publishers, 6thedition

2. B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, A Text book on Power System Engineering, Dhanpat Rai &Co.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MANAGEMENT SCIENCE

Course Code: GR17A3102 **L T P C**
III Year   II Semester **3 1 0 4**

UNIT I

Introduction to Management &Organisation: Concepts of Management and Organization: Nature, Importance, Functions and Theories of Management; Systems Approach to Management; Leadership Styles; Social Responsibilities of Management. *Designing Organisational Structures:* Basic concepts relating to   Organisation; Departmentation and Decentralisation, Types and Evolution of mechanistic and organic structures of organisation and suitability.

UNIT II

Operations &Marketing Management: Principles and Types of Plant Layout, Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.*Statistical Quality Control*: Control Charts for Variables and Attributes (Simple Problems) and Acceptance Sampling, Deming's contribution to quality. Objectives of InventoryControl, EOQ, ABC Analysis, Purchase Procedures, Stores Management and Stores Records - Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of Distribution.

UNIT III

Human Resources Management (HRM): Concepts of Personnel Management, HRM and HRD and Industrial Relations (IR), HRM vs. PMIR. Basic functions of HR Manager: Manpower planning, Recruitment and Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Analysis, Job Description, and Job Evaluation.

UNIT IV

Project Management *(PERT/CPM)***:** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

UNIT V

Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Contemporary Management Practices: Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six Sigma and Capability Maturity Model (CMM) Levels, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process

Outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

Teaching Methodologies:

    a) Lecture Method
    b) Use of OHP
    c) Power Point Presentation
    d) Tutorials and Assignments

TEXT BOOKS:

    1. Aryasri: *Management Science*, TMH, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective – II)

Course Code: GR17A3023   **L T P C**
III Year II Sem   3 1 0 4

UNIT I

ELECTRIC DRIVES
Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT II

ELECTRIC HEATING
Advantages and methods of electric heating, resistance heating induction heating and dielectric heating .

ELECTRIC WELDING
Electric welding, resistance and arc welding , electric welding equipment, comparison between A.C and D.C Welding.

UNIT III
ILLUMINATION
Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light., Various Illumination Methods: Discharge lamps, MV and SV lamps, comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of street lighting and flood lighting.

UNIT IV
ELECTRIC TRACTION – I
System of electric traction and track electrification, Review of existing electric traction systems in India, Special features of traction motor, methods of electric braking, plugging rheostatic braking and regenerative braking., Mechanics of train movement, Speed-time curves for different services, trapezoidal and quadrilateral speed time curves.

UNIT V
ELECTRIC TRACTION-II
Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1) J.B.Gupta ,Utilization of Electric Power & Electric Traction
2) Partab,Art & Science of Utilization of Electrical Energy Dhanpat Rai & Sons

REFERENCES

1) N.V.Suryanarayana, Utilization of Electric Power including Electrical Drives & Electric Traction, New Age International(P) Limited, Publishers,1996.
2) C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International(P) Limited, Publishers, 1997.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NON CONVENTIONAL ENERGY SOURCES
(Professional Elective – II)

Course Code: GR17A3024   **L T P C**
III Year II Sem   3 1 0 4

UNIT I

Fundamentals of Solar Energy-Solar spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion-Flat plate collectors- concentrated collectors- construction and thermal analysis- Solar applications-Solar ponds-Heliostat systems-water heater-air heater-solar still.

UNITII

Solar-Electric Power generation-Photo voltaic cells-Equivalent circuit- V-I Characteristics-Photovoltaic modules – constructional details- design considerations-Tracking-Maximum power point tracking–algorithms-PV solar system design with energy backup-Solar Thermo electric conversion.

UNITIII

Wind Energy-Fundamentals of wind energy-power available in wind-BetzLimit- Aero dynamics of wind turbine-Wind turbines-Horizontal and vertical axis turbines
–their configurations-Wind Energy conversion systems.

UNITIV

Energy from Bio Mass- Various fuels-Sources-Conversion technologies-Wet Processes–Dry Processes-Bio Gas generation–Aerobic and an aerobic digestion- Factors affecting generation of bio gas –Classification of bio gas plants-Different Indian digesters- Digester design considerations-Gasification process-Gasifiers – Applications. Geo thermal Energy-sources-Hydro thermal convective-Geo-pressure resources-Petro-thermal systems (HDR)-Magma Resources-Prime Movers.

UNIT V

OTEC Systems-Principle of operation-Open and closed cycles, Energy from Tides- Principle of Tidal Power- Components of tidal Power plants-Operation Methods- Estimation of Energy in Single and double basin systems-Energy and Power from Waves-Wave energy conversion devices-Fuel Cells-Design and Principle of operation-Types of Fuel Cells-Advantages and disadvantages-Types of Electrodes- Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

TEXT BOOKS

1. John Twidell &Wier, Renewable Energy Resouces, CRC Press,2009.

2. D.P. Kothari, Singal, Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

REFERENCES

1. G.D. Rai–Non Conventional Energy sources, Khanna publishers.
2. B.H.Khan, Non Conventional Energy Sources, PHI

NEURAL AND FUZZY SYSTEMS
(Professional Elective – II)

Course Code: GR17A3106   **L T P C**
III Year II Sem   3 1 0 4

UNIT I

INTRODUCTION TO NEURAL NETWORKS: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and- Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT II

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

FEED FORWARD NEURAL NETWORKS: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT III

MULTILAYER FEED FORWARD NEURAL NETWORKS: Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

ASSOCIATIVE MEMORIES: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT IV

SELF-ORGANIZING MAPS (SOM) AND ADAPTIVE RESONANCE THEORY (ART): Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks,

Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability-Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.

CLASSICAL AND FUZZY SETS: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V

FUZZY LOGIC SYSTEM COMPONENTS: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

APPLICATIONS:

NEURAL NETWORK APPLICATIONS: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting.

FUZZY LOGIC APPLICATIONS: Fuzzy logic control and Fuzzy classification.

TEACHING METHODOLOGIES:
1. White board
2. PPTs
3. Seminars

TEXT BOOKS:
1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

REFERENCES
1. Neural Networks – Simon Hykins , Pearson Education
2. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
3. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEMS LAB

Course Code: GR17A3025   **L T P C**
III Year II Sem   0 0 2 2

Task1: Tripping Characteristics of an MCB of 1Ampere rating

Task2: Tripping sequence of protective devices

Task3: Tripping characteristics of protective devices

Task4: Testing of Instantaneous Over Current relay

   a) Phase Faults

   b) Earth Faults

Task5: a) Testing of differential relay

b) Testing of percentage biased differential Relay

Task6: Testing of Negative sequence Relay

Task7: Model of a Transmission Line with Lumped Parameters

Task8: a) Testing of Over Voltage Relay

      b) Testing of Under Voltage Relay

Task9: Current time Characteristics of Induction Disc type relay

Task10: Short circuit Analysis

Task11: Protection of Motor, transformer and bus

Task12: Protection of generator in parallel configuration

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Course Code: GR15A3100   **L T P C**
III Year I Semester   **0 0 2 2**

Task-I

Functional English

Introduction to public speaking, analyzing and assimilating ideasrole play, formal and informal expressions and conversations

Task-II

Vocabulary

Synonyms and Antonyms**,** Word Roots**,** One word substitutes**,** Prefixes and Suffixes**,** Idiomatic expressions and Phrasal verbs**,** Analogy.

Task- III

Group Discussion

Assimilation of ideas, analysis, sharing of ideas, initiation, leadership skill, team spirit and conclusion.

Task-IV

Presentation Skills

Scope, features, sources to be explored, role of non-verbal communication, audience perspective, feedback .

Task-V

Résumé Writing and Letter Writing

Types and formats, tips to draft resume manual and emailing, types and formats for letter writing, content and body of the letter, email etiquette.

Task-VI

Interview Skills

Introduction, types of interviews, model questions and answering strategies, mockinterviews,
check list for preparing for an interview.

Task-VII

Reading comprehension

Types of reading, techniquesqualities of a good reader.

Task-VIII

Report Writing

Introduction, importance, structure, formats and types of reports.

Reference Books:

1. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw Hill.
2. Business Communication; HorySankarMukerjee;OUP.
3. Business Communication; Meenakshi Raman, Praksh Sing; Oxfor University Press.
4. English and Soft Skills; SP Dhanavel; Orient Black Swan.
5. Soft Skills for everyone; Jeff Butterfield; Cengage Learning.
6.Communication Skills;Viva Careers Skills Library.
7. Personality Development and Soft Skills; Barun K Mitra; Oxford University Press.
8. English for Engineers Made Easy, AedaAbidi, Ritu Chaudhry, Cengage Learning.
9. Communication Skills, Sanjay Kumar, PushpLatha, Oxford Higher Education.
10. Professional Presentations; Malcom Goodale; Cambridge University Press.

TRANSPORTATION ENGINEERING
(Open Elective-II)

Course Code: GR17A3161		**L T P C**
III Year II Semester		**3 1 0 4**

UNIT I

Highway development and planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II

Highway geometric design: Importance of Geometric Design- Design controls and Criteria-Highway Cross Section Elements- Sight Distances- Stopping sight Distance, Overtaking Sight Distance, intermediate Sight Distance and Head light sight distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

UNIT III

Traffic engineering: Traffic flow parameters-Volume, Speed, Density and headway- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies, Parking types and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

Traffic regulation and management: Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals – Webster Method –IRC Method.

UNIT IV

Intersection design: Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria-Advantages and Disadvantages of Rotary Intersection.

UNIT V

Introduction to railway and airport engineering: Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs.

Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 9th edition (2011).

2. Railway Engineering – A text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd. – (2001).

3. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.

4. Airport Planning and Design- S.K.Khanna and Arora,Nemchand Bros.

5. Railway engineering- A Textbook of Railway Engineering- Subhash C. Saxena, Satyapal Arora – DhanpatRai S Sons – (2012)

REFERENCES:

1. Highway Engineering – S.P.Bindra ,DhanpatRai& Sons. – 4th Edition (1981)

2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 8th Edition – 2011.

3. Railway Engineering –Prabha& Co., 15th Edition – August 1994.

4. 4. Air Transportation Planning & design – Virendhra Kumar &StatishChandhra – Gal Gotia Publishers (1999).

SENSORS AND TRANSDUCERS

(Open Elective – II)

Course Code: GR17A3162   **L T P C**
III Year II Sem   3 1 0 4

UNIT I

Introduction: Sensors / Transducers, principles, classification, parameters, characterizations

UNIT II

Introduction to mechanical & Electro Mechanical Sensors: Resistive Potentiometer, Inductive sensors, Capacitive Sensors, Ultrasonic Sensors

UNIT III

Basics of Thermal and Magnetic Sensors: Gas thermometric sensors, Thermal expansion type thermometric sensors, acoustic temperature sensors, dielectric constant and refractive index thermo sensors. Sensors and principles: Yoke coil sensor, coaxial type sensor, Force and displacement sensor

UNIT IV

SMART Sensors: Introduction, Primary sensors, Excitation, Amplification, Filters, Converters, Compensation, Information coding / processing, Data Communication, The Automation

UNIT V

Sensors their Applications: Flow - rate sensors, Pressure Sensors, Temperature Sensors, Torque & Position Sensors, Home Appliance Sensors - Distance Sensing Medical Diagnostic sensors, Sensors for Environmental Monitoring

TEXT BOOKS:

1.Sensors & Transducers By D. Patranabis , PHI Publications

AUTOMOBILE ENGINEERING
(Open Elective-II)

Course code:GR17A3163   **L T P C**

III B. Tech II Semester   **3 1 0 4**

UNIT I

INTRODUCTION, ENGINE AND LUBRICATION SYSTEM

Components of four wheeler automobile – chassis and body – power unit –power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, Engine construction, turbo charging and super charging, Engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

Emissions : Emission from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Energy alternatives – Photovoltaic, hydrogen, Biomass, alcohols, LPG and CNG.

UNIT II

FUEL SYSTEM AND COOLING SYSTEM

Fuel System in S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pump – filters– carburetor – types – air filters – petrol injection-Multi point fuel injection(MPFI).

Fuel System in C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. CRDI engines.

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – anti freeze solutions.
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UNIT III

IGNITION SYSTEM AND ELECTRICAL SYSTEM

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and sparkplug – Magneto

coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Electrical System : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT IV

TRANSMISSION AND STEERING SYSTEM

Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, constant mesh, synchro mesh gear boxes, epicyclic gear box, over drive, torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

Steering System: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT V

SUSPENSION AND BRAKING SYSTEM

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel Cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS:

1.Automobile Engineering -R B Gupta

2.Automotive Mechanics – William Crouse

3.Automobile Engineering Vol. 1 & Vol. 2 / Kripal Singh

REFERENCES

1. Automotive Engineering / Newton Steeds & Garrett
2. Automotive Mechanics / G.B.S. Narang
3. Automotive Mechanics / Heitner
4. Automotive Engines / Srinivasan
5. Automobile Engineering – K.K. Ramalingam / Scitech Publications (India) PVT.

Teaching Methodology:

Power point Presentations, Working models, white board & marker

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN COMPUTER INTERFACE
(Open Elective-II)

Course Code: GR17A3164   **L T P C**
IIIYear II Semester   **3 1 0 4**

UNIT I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT III

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow.

UNIT IV

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls,Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors,Software tools – Specification methods, interface – Building Tools.

UNIT V

Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.

2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

REFERENCES:

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.

2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

3. User Interface Design, Soren Lauesen Pearson Education

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESSENTIALS OF BIG DATA ANALYTICS
(Open Elective – II)

Course Code: GR17A3165	**L**	**T**	**P**	**C**
III Year II Semester	**3**	**1**	**0**	**4**

UNIT I

INTRODUCTION TO BIG DATA AND HADOOP: Introduction to Big Data Platform – Big Data definition, Challenges of Conventional Systems: Enterprise/structured data, Social/unstructured Data, Unstructured data needs for Analytics, Analytics vs Reporting, Data Analytic Tools, History of Hadoop, Components of Hadoop, Analyzing the Data with Hadoop, Different Echo systems of Hadoop, IBM Big Data Platform Strategy and Introduction to Infosphere Big Insights.

UNIT II

HDFS (Hadoop Distributed File System): Significance of HDFS in Hadoop, Design of HDFS, HDFS Architecture overview, 5 daemons of Hadoop: Name Node, Data Node, Secondary Node, Job Tracker and Task Tracker, their functionality, Data Storage in HDFS: Introduction about Blocks, Data replication, Accessing HDFS: CLI (Command Line Interface) and admin commands, How to store various types of data in HDFS using CLI-command.

UNIT III

Map Reduce Map Reduce Architecture, Map Reduce Programming Model, Map Reduce Java API, Anatomy of Map Reduce Job run, Failures, Job Scheduling, Sort & Shuffle phase, Task Execution. Map Reduce Program using IBM BigInsights. Adaptive Map Reduce.

Introduction to Oozie: Overview of Managing job Execution.

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Pig Latin : Structure, statements, Expressions, Types, Schemas,

Functions and Macros. Pig User Defined Functions, Data Processing operators.

UNIT IV

Data Stores on Hadoop Hive: Introduction, architecture, Integration with Hadoop, Hive Tables: Managed Tables, External Tables, Hive Query Language (Hive QL) Hbase: Introduction to HBase, Architecture, HBaseVs RDBMS, HBaseUseCasesHmaster. Introduction to Zookeeper.

UNIT V

BM APPLICATIONS ON HADOOP

Big SQL: Introduction to Big SQL, Datatypes, Big SQL Statistics.

Big Sheets: Introduction, Processing and Accessing BigSheets, Big SQL Integration.

TEXT BOOKS

 1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
 2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015

REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for

Hadoop",   McGraw-Hill/Osborne Media (2013), Oracle press.

4. AnandRajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
7. Pete Warden, "Big Data Glossary", O'Reily, 2011.
8. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. ArvindSathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", MC Press, 2012
10. Paul Zikopoulos, Dirk De Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF OPERATING SYSTEMS

(OPEN ELECTIVE-II)

Course Code: GR17A3166   **L T P C**
III Year II Semester   **3 1 0 4**

UNIT I
Computer System and Operating System Overview: Overview of computer operating systems, operating systems functions, operating systems structures and systems calls, Evaluation of Operating Systems.

UNIT II
Process Management – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT III
Concurrency: Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors and Synchronization examples
Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

UNIT IV
Virtual Memory Management: virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing
Principles of deadlock – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock,

UNIT V
File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.
File System implementation- File system structure, allocation methods, free-space management
Mass-storage structure overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Introduction to Storage Area Networks (SAN), Introduction to Network Attached Storage.

TEXT BOOKS:
1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

REFERENCES:
1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.