Academic Regulations
Program Structure
and
Detailed Syllabus

Master of Technology
in
Power Electronics

(Two Year Regular Programme)
(Applicable for Batches admitted from 2020)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Bachupally, Kukatpally, Hyderabad- 500 090

Academic Regulations

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
For all Post Graduate Programmes (M.Tech)
GR20 REGULATIONS

Gokaraju Rangaraju Institute of Engineering & Technology - GR20 Regulations are given here under. These regulations govern all the Post Graduate programmes offered by various departments of Engineering with effect from the students admitted to the programmes in 2020-21 academic year.

1. **Programme Offered:** The Post Graduate programme offered by the department is M.Tech in Power Electronics, a two-year regular programme in that discipline.
2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

3. **Admissions:** Admission into the M.Tech Programme in any discipline shall be made subject to the eligibility and qualifications prescribed by the University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in PGCET conducted by the APSCHE for M. Tech Programmes or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

4. **Programme Pattern:**
    a) A student is introduced to "Choice Based Credit System (CBCS)" for which he/she has to register for the courses at the beginning of each semester as per the procedure.
    b) Each Academic year of study is divided into two semesters.
    c) Minimum number of instruction days in each semester is 90.
    d) The total credits for the Programme is 68.
    e) 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).
    f) A student has a choice of registering for credits from the courses offered in the programme.
    g) All the registered credits will be considered for the calculation of final CGPA.

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

    a) A student shall be declared eligible for the award of M.Tech degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.
    b) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech course.
    c) The Degree of M.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. **Attendance Requirements**
   a) A student shall be eligible to appear for the semester end examinations if he/she puts in a minimum of 75% of attendance in each course concerned in the semester.
   b) Condonation of shortage of attendance 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) Students whose attendance is less than 65% in any course are detained and are not eligible to take their end examinations of that course. They may seek re-registration for that course 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 of the College from time to time.

   b) The following is the division of marks between internal and external evaluations.

Particulars	Internal Evaluation	External Evaluation	Total
Theory	**30**	**70**	**100**
Practical	**30**	**70**	**100**
Mini Project	**30**	**70**	**100**
Dissertation	**30**	**70**	**100**

   c) The marks for internal evaluation per semester per theory course are divided as follows:

i.	**Mid Examinations:**	**20 Marks**
ii.	**Tutorials/Assignment:**	**5 Marks**
iii.	**Continuous Assessment:**	**5 Marks**
	Total:	**30 arks**

   d) **Mid Examination:** There shall be two mid examinations during a semester. The first mid examination shall be conducted from the first 50 per cent of the syllabus and the second mid examination shall be conducted from the remaining 50 per cent of the syllabus. The mid examinations shall be evaluated for **20 marks** and average of the marks scored in the two mid examinations shall be taken as the marks scored by each student in the mid examination for that semester.
   e) **Assignment:** Assignments are to be given to the students and marks not exceeding 5 (5%) per semester per paper are to be awarded by the teacher concerned.

   f) **For Internal Evaluation in Practical/Lab Subjects:** The marks for internal evaluation are 30. Internal Evaluation is done by the teacher concerned with the help of the other staff members nominated by Head of the Department. Marks Distribution is as follows:

i.	Internal Exam:	10 Marks
ii.	Record:	05 Marks
iii.	Continuous Assessment:	15 Marks
	Total:	30 Marks

g) **For External Evaluation in Practical/Lab Subjects:** The semester end examination shall be conducted by an external examiner and a staff member of the department nominated by Head of the Department.

h) For approval and evaluating mini project, Dissertation-I and Dissertation-II, a Project Review Committee (PRC) will be constituted by the Head of the Department. The composition of PRC is as follows

i) Head of the Department

ii) One senior faculty relevant to the specialization

iii) Coordinator of the specialization.

i) **Mini Project:** The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation.

Internal Evaluation: For internal evaluation,10 Marks are given by PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (30)			
1	First week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and Literature review
2. Schematic/Block diagram which gives the broad idea of the entire project
3. Timeline or milestone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost
5. References
6. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The mini project report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the mini project report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report: Project report should be written as per IEEE guidelines.	Verified by PRC	20
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

j) **Dissertation (Phase I & Phase II):**

Internships/Seminars/Dissertation :

i.Dissertation Phase I:

The Dissertation Phase I, the department help the students to do the projects supported by the industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation.

Internal Evaluation: For internal evaluation,10 Marks are given by the PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the Dissertation Phase I.

S.No	Date	Review	Marks
Internal Marks (30)			
1	lst week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and the literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Time line or mile stone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost.
5. Possibility to develop Product.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase I report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase I report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

ii. Dissertation Phase II:

The Dissertation Phase II, the department help the students to do the project a industry and is evaluated for 100marks.Outof100marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. It is expected that along with the project he will be placed in the company.

Internal Evaluation: For internal evaluation, 10 Marks are given by the PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15marks.Tentative presentation dates and marks distribution of the Dissertation Phase II.

S.No	**Date**	**Review**	**Marks**
Internal Marks (30)			
1	1st week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and the literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Timelineormilestoneoftheproject.Itshouldclearlyindicatedeliverables/outcomes of the project.
4. Components required with approximate cost.
5. Possibility to develop Product and IPR.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase II report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase II report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC and External Examiner	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC and External Examiner	30
4	Results and Discussion	Verified by PRC and External Examiner	10

Rules and regulations related to Internships/Seminars/Mini Project/Dissertation Phase I and II:

The student must work under the guidance of both internal guide (one faculty member of the department) and external guide (from Industry not below the rank of an officer). Internal guide is allotted by the Head of the Department or Program Coordinator, where as external guide is allotted by the industrial organization in which the project is undertaken.

- After approval from the PRC, the final thesis is to be submitted along with ANTI-PLAGIARISM report from the approved agency with a similarity index not more than 24%.
- Two hardcopies and one soft copy of the project work (dissertation) certified by the research supervisors shall be submitted to the College/Institute.
- The thesis shall be adjudicated by one external examiner selected by the Institute out of 3-member panel, submitted by the department.

- In external evaluation, the student shall score at least 40% marks and an aggregate of 50% marks to pass in the project work. If the project report is satisfactory, Viva-voce examination shall be conducted by a Board consisting of the Supervisor, Head and the External Examiner who adjudicated the project work. The Board shall jointly evaluate the student's performance in the project work.
- In case the student doesn't pass through the project work, he/she must reappear for the viva-voce examination, as per the recommendations of the Board. If he fails succeed at the second Viva-voce examination also, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit the Project by the Board. Head of the Department and program coordinator shall coordinate and make arrangements for the conduct of viva-voce examination. When one does get the required minimum marks both in internal and external evaluations the candidate has to revise and resubmit the dissertation in the time frame prescribed by the PRC. If the report of the examiner is unfavorable again, the project shall be summarily rejected.
- If a student gets a chance to work in industry for one year (placement through internship) then he/she should take permission from Principal, Dean of examinations, Dean of Placements, Dean Academics, Department HOD and program coordinator. He/she should complete the credits in 3rdsemester in consultation with course instructor and program coordinator.

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-evaluationof his/her answer book on payment of a prescribed fee.
10. **Supplementary Examinations:** A student who has failed in an end semester examination can appear for a supplementary examination, as per the schedule announced by the College/Institute.
11. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices duringMid/ End-examinations as per the rules framed by the Academic Council.
12. **Academic Requirements:**
    - **a)** A student shall be deemed to have secured the minimum academic requirement in a subject if he / she secures a minimum of 40% of marks in the Semester-end Examination and a minimum aggregate of 50% of the total marks in the Semester-end examination and Internal Evaluation taken together.
    - **b)** A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous semesters.
    - **c)** In order to qualify for the award of M.Tech Degree, the student shall complete the academic requirements of passing in all the Courses as per the course structure including Seminars and Project if any.
    - **d)** In case a Student does not secure the minimum academic requirement in any course, he/she has to reappear for the Semester-end Examination in the course, or re-register for the same course when next offered or re-register for any other specified course, as may be required. However, one more additional chance may be provided for each student, for improving the internal marks provided the internal marks secured by a student are less than 50% and he/she failed finally in the course concerned. In the event of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In case of re-registration, the student has to pay the re-registration fee for each course, as specified by the College.

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

Letter Grade	Grade Points	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 (Above Average)	6	Marks >= 50 and Marks < 60
F (Fail)	0	Marks < 50
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) Skthe SGPA of kthsemester(1 to 4) 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.,

$$\text{SGPA (Sk)} = \sum_{i=1}^{n} (Ci * Gi) / \sum_{i=1}^{n} Ci$$

Where Ci is the number of credits of the ith course and Gi 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 a student over all the semesters of a programme, i.e., upto and inclusive of Sk, where k ≥ 2.

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

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

13. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of M. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes:

	Class Awarded	CGPA Secured
13.1	First Class With Distinction	CGPA □ 7.75
13.2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
13.3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

14. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against him, the result of the student (for that Semester) may be withheld and he will not be allowed to go into the next Semester. The award or issue of the Degree may also be withheld in such cases.
15. **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.
16. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the PG degree Programme, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.

17. **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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad-500090,India

Power Electronics

M. Tech(PE) GR20 Course Structure

I YEAR - I SEMESTER

S.No	Group	Course Code	Subject	Credits			Total Credits	Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PC	GR20D5025	Modelling and Analysis of Electrical Machines	3	0	0	3	3	30	70	100
2	PC	GR20D5026	Power Electronic Converters	3	0	0	3	3	30	70	100
3	PE I	GR20D5027	Power Quality	3	0	0	3	3	30	70	100
		GR20D5028	Modelling and Simulation of Power Electronic Converters								
		GR20D5029	Flexible AC Transmission Systems								
4	PE II	GR20D5030	Optimal and Adaptive Control	3	0	0	3	3	30	70	100
		GR20D5031	PWM Techniques for Power Electronic Converters								
		GR20D5032	Electric and Hybrid Vehicles								
5	PC	GR20D5033	Power Quality Lab	0	0	2	2	4	30	70	100
6	PC	GR20D5034	Power Electronics Lab	0	0	2	2	4	30	70	100
7	BS	GR20D5011	Research Methodology and IPR	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**18**	**22**	**210**	**490**	**700**
8	AC		Audit Course I	2	0	0	2	2	30	70	100

I YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PC	GR20D5035	Electric Drives System	3	0	0	3	3	30	70	100
2	PC	GR20D5036	Digital Control of Power Electronic and Drive Systems	3	0	0	3	3	30	70	100
3	PE III	GR20D5037	Advanced Power Electronic Converters	3	0	0	3	3	30	70	100
		GR20D5038	Dynamics of Electrical Machines								
		GR20D5039	Advanced Digital Signal Processing								
4	PE IV	GR20D5040	AI and Machine Learning Techniques for Power Electronic Applications	3	0	0	3	3	30	70	100
		GR20D5041	Distributed Generation								
		GR20D5042	Smart Grids								
5	PC	GR20D5043	Electrical Drives Lab	0	0	2	2	4	30	70	100
6	PC	GR20D5044	DSP and Microcontroller Lab	0	0	2	2	4	30	70	100
7	PW	GR20D5143	Mini Project	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**18**	**22**	**210**	**490**	**700**
8	AC		Audit Course II	2	0	0	2	2	30	70	100

II YEAR - I SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PE V	GR20D5045	Wide Bandgap Power Devices	3	0	0	3	3	30	70	100
		GR20D5046	High Voltage DC Transmission								
		GR20D5047	Design and Development of LED Lighting								
2	OE	GR20D5146	1. Cost Management of Engineering Projects	3	0	0	3	3	30	70	100
		GR20D5147	2. Industrial Safety								
		GR20D5148	3. Operations Research								
		GR20D5149	4. Artificial Neural Networks and Fuzzy Systems								
		GR20D5150	5. Cyber Security								
		GR20D5151	6. Internet of Things Architecture and Design Principles								
3	PW	GR20D5144	Dissertation Phase – I	0	0	10	10	20	30	70	100
Total				**6**	**0**	**10**	**16**	**26**	**90**	**210**	**300**

II YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P				
1	PW	GR20D5145	Dissertation Phase – II	0	0	16	32	30	70	100
			Total			16	**32**	**30**	**70**	**100**

Audit Courses I & II

1	GR20D5152	English for Research Paper Writing
2	GR20D5153	Disaster Management
3	GR20D5154	Sanskrit for Technical Knowledge
4	GR20D5155	Value Education
5	GR20D5156	Indian Constitution
6	GR20D5157	Pedagogy Studies
7	GR20D5158	Stress Management by Yoga
8	GR20D5159	Personality Development through Life Enlightenment Skills

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

Course Code: GR20D5025 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. Understand the principle of Electromagnetic Energy Conversion
2. Explain the operation of an electrical machine mathematically.
3. Recognize how a machine can be represented as its mathematical equivalent.
4. Develop mathematical model of AC & DC machines and perform transient analysis on them.
5. Compare modelling aspects of special machines.

Course outcomes

1. Demonstrate the concept of Electromagnetic energy conversion and its storage
2. Evaluate the transformation techniques
3. Analyse the dynamic behaviour rotating machines.
4. Understand equivalent circuit of synchronous machines.
5. Design Mathematically model special electrical machines

Unit I

Principles of Electromagnetic Energy Conversion, General expression of stored magnetic energy. Co-energy and force/torque, example using single and doubly excited system. Basic Concepts of Rotating Machines-Calculation of air gap mmf and per phase machine inductance using physical machine data; Voltage and torque equation of dc machine.

Unit II

Three phase symmetrical induction machine and salient pole synchronous machines in phase variable form, Application of reference frame theory to three phase symmetrical induction and synchronous machines, Dynamic direct and quadrature axis model in arbitrarily rotating reference frames.

Unit III

Determination of Synchronous machine dynamic equivalent circuit parameters, Analysis and dynamic modeling of two phase asymmetrical induction machine and single-phase induction machine.

Unit IV

Modelling of Permanent magnet synchronous machine, Surface permanent magnet (square and sinusoidal back emf type) and interior, permanent magnet machines, Construction and operating principle, dynamic modelling and self-controlled operation.

Unit V

Analysis of Switch Reluctance Motors, Doubly salient PM Motor for space and other electrification Applications.

Text Books

1.Charles Kingsle,Jr., A.E. Fitzgerald, Stephen D.Umans, “Electric Machinery”, Tata Mcgraw Hill

2.R. Krishnan, “Electric Motor & Drives: Modeling, Analysis and Control”, Prentice Hall of India

3.Miller, T.J.E., “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendon Press

4.P.C. Krause “Analysis of Electric Machine” Wiley IEEE Press 3rd Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONIC CONVERTERS

Course Code: GR20D5026 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. To understand the characteristics and principle of operation of different power electronic devices.
2. To articulate the working of different converters
3. To apply the different PWM and SVM control techniques
4. To elaborate the working of matrix converters with the switching control strategy
5. To demonstrate the feedback control strategy for different converters

Course Outcomes:

Upon the completion of the course the student will be able to

1. Discuss the advances in power electronic devices.
2. Design & analyze the different converter topologies with their applications.
3. Articulate & apply the different modulation techniques.
4. Design & analyze the different matrix converters.
5. Apply the dynamic modeling, control and analysis of different converters.

UNIT I

MODERN POWER SEMICONDUCTOR DEVICES: Modern power semiconductor devices-MOS turn Off Thyristor (MTO)-Emitter Turn off Thyristor (ETO)-Integrated Gate-Commutated thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Insulated Gate Bipolar Transistor (IGBT)-MOSFET-comparison of their features.

UNIT-II

D.C. TO D.C. CONVERTERS: Analysis of step-down and step-up dc to dc converters with resistive and Resistive, inductive loads-Switched mode regulators -Analysis of Buck Regulators-Boost regulators- buck and boost regulators-Cuk regulators-Condition for Continuous inductor current and capacitor voltage-comparison of regulators-Multi-output boost converters-Advantages-Applications.

UNIT III

PWM TECHNIQUES: single PWM-Multiple PWM-sinusoidal PWM-modified PWM-phase displacement Control-Advanced modulation techniques for improved performance-Trapezoidal, staircase, stepped, harmonic injection and delta modulations-Advantage-application. Third Harmonic PWM-60-degree PWM-space vector modulation-Comparison of PWM techniques-harmonic reductions.

UNIT IV

MATRIX CONVERTER: principle-matrix converter switches - 3phase matrix converter-switching control strategy-Venturini control method-principle-switching duty cycles-modulation matrix-realization of input filter-commutation and protection issues in matrix converter

UNIT V

CONVERTER DYNAMICS / SIMULATIONS: Feedback control for converters: regulation and control problem, control principles, model for feedback, P and PI control. Nonlinear dynamic

modeling, Control and analysis of choppers, voltage mode and current mode control. Simulation: process, mechanics, techniques, PSPICE simulator. EMI and Power Quality Problems. Power conditioning. PLL/Micro computer based converters and choppers.

TEXT BOOKS:

1 Power Electronics – Mohammed H. Rashid – Pearson Education Third Edition – First Indian reprint 2004.
2 Power Electronics – Ned Mohan, Tore M. Undeland and William P. Robbins – John Wiley and Sons – Second Edition.
3 Modern Power Electronics and AC Drives PHI- Bimal K Bose,
4 Elements of Power Electronics- P. T. Krein
5 Power Electronics, Advanced Conversion Technologies, CRC Press-Fang Lin Luo & Hong Ye.
6 Power Electronics, Converters and Regulators, Springer-Branko L Dokic & Branko Blanusa,

REFERENCE BOOKS:

1 Power Electronics – Daniel W. Hart, McGraw Hill Publications.
2 Power Electronics Devices, Circuits and Industrial applications, V. R. Moorthi, Oxford University Press
3 Power Electronics, Dr. P. S. Bimbhra, Khanna Pubishers.
4 Elements of Power Electronics, Philip T. Krein, Oxford University Press.
5 Power Electronics, M. S. Jamil Asghar, PHI Private Limited.
6 Principles of Power Electronics, John G. Kassakian, Martin F. Schlect, Geroge C. Verghese, Pearson Education.
7 Fundamentals of Power Electronics, Robert W. Erickson, Dragan and Maksimobic, Springer.
8 Principles and Elements of Power Electronics-Barry Williams, University of Strathclyde.
9 Power Converter Circuits, Marcel Dekker Inc- William Shepherd & Li Zhang.
10 Introduction to Modern Power Electronics-A.M. Trzynadlowski, Wiley, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY

(Professional Elective I)

Course Code: GR20D5027 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. To provide the students a deep insight in to the various Power Quality (PQ) problems.
2. To analyse the PQ problems and their causes.
3. To study the various compensation techniques
4. To analyse the various control algorithms of shunt compensators
5. To analyse the various control algorithms of series compensators

Course Outcomes:

1. Understand the different power quality issues and standards
2. Understand the causes of various PQ issues and mitigation techniques
3. Understand the Active and Passive compensations for 1-ph and 3-ph systems
4. Analyse the Shunt and Series Compensators like DSTATCOM and DVR
5. Understand the UPQCs

Unit I:INTRODUCTION AND POWER QUALITY STANDARDS

Introduction - Classification of Power Quality Problems - Causes, Effects and Mitigation Techniques of Power Quality Problems – Power Quality Terminology, Standards, Definitions, Monitoring and Numerical Problems.

Unit II: CAUSES OF POWER QUALITY PROBLEMS

Introduction to Non-Linear Loads, Power Quality Problems caused by Non-Linear Loads, Analysis of Non-Linear Loads, Numerical Problems.

Unit III: PASSIVE SHUNT AND SERIES COMPENSATION

Introduction – Classification and Principle of operation of Passive Shunt and Series Compensators - Analysis and Design of Passive Shunt Compensators for Single-Phase System, Three-Phase Three Wire System and Three-Phase Four Wire System.

Unit IV: ACTIVE SHUNT AND SERIES COMPENSATION

Introduction to Shunt compensators; Classification of DSTATCOMs – Principle of Operation of DSTATCOM – Different Control Algorithms of DSTATCOM: PI Controller, I Cosφ Control Algorithm, Synchronous Reference Frame Theory, Single-Phase PQ theory and DQ Theory Based Control Algorithms. Analysis and Design of Shunt Compensators, Numerical Problems.

Introduction to Series Compensators; Classification of Series Compensators – Principle of Operation of DVR – Different Control Algorithms of DVR: Synchronous Reference Frame Theory-Based Control of DVR. Analysis and Design of Active Series Compensators, Numerical Problems.

Unit V: UNIFIED POWER QUALITY COMPENSATORS

Introduction to Unified Power Quality Compensators (UPQC) – Classification of UPQCs – Principle of Operation of UPQC – Control of UPQCs: Synchronous Reference Frame Theory-Based UPQC – Analysis and Design of UPQCs, Numerical Problems.

Text Books

1. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, "Power Quality Problems and Mitigation Techniques" Wiley Publications, 2015.

Reference Books

1. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000
2. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
3. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODELLING AND SIMULATION OF POWER ELECTRONIC CONVERTERS

(Professional Elective I)

Course Code: GR20D5028 **L/T/P/C: 3/0/0/3**
I YEAR I SEMESTER

Course Objectives:

1. Understand the need of Simulation tools for power electronic converters
2. Analyze different modelling aspects power electronic devices
3. Learn modelling and simulation aspects of rectifiers and choppers
4. Understand modeling and simulation aspects of Inverters and AC to AC converters
5. Explain the concept of real time simulation used in Power electronic converters

Course Outcomes:

At the end of the course student will be able to

1. Explain the need of simulation tools for power electronic devices
2. Develop mathematical models for different power electronic converters
3. Simulate various power converters using PSPICE and MATLAB
4. Analyze power electronic circuits for different loads
5. Integrate Power electronic converters real time with the DSP and MATLAB

UNIT I
INTRODUCTION
Need for Simulation - Challenges in simulation - Classification of simulation Programmes, Overview of PSPICE, MATLAB and SIMULINK and Need for interactive modelling.

UNIT II
MODELING & SIMULATION OF POWER SEMICONDUCTOR DEVICES
Modelling and simulation of diode, SCR, TRIAC, IGBT and Power Transistors numerical methods to power electronic switches-simulation of gate/base drive circuits and snubber circuits (using MATLAB, PSPICE and LTSPICE)

UNIT III
MODELING & SIMULATION OF RECTIFIERS AND CHOPPERS
Mathematical modelling and simulation of single phase and three phase semi and fully controlled rectifiers with R, R-L and R-L-E Loads using MATLAB/SIMULINK
Mathematical modelling and simulation of buck, boost and buck-boost converters with R, R-L and R-L-E Loads using MATLAB/SIMULINK.

UNIT IV

MODELING & SIMULATION OF INVERTERS AND AC TO AC CONVERTERS

Mathematical modelling and simulation of single phase and three phase half and full bridge inverter with R, R-L and R-L-E Loads using MATLAB/SIMULINK.

Modelling and Simulation of different AC to AC converters with R, R-L and R-L-E Loads using MATLAB/SIMULINK.

Modelling and simulation of high frequency inverter with different PWM techniques.

UNIT V

Real time simulation of Power electronics converters using MATLAB embedded coder toolbox. Generation of EPWM, configuration of ADC, Configuration of DAC. Real time simulation of single phase and three phase inverters using TI processor and Embedded coder toolbox in MATLAB/SIMULINK.

Textbooks:

1. Power Electronic Converters- Interactive Modelling Using Simulink By Narayanaswamy P. R. Iyer, CRC Press, 2018

2. M.H.Rashid," SPICE for circuits and Electronics using PSPICE", Prentice Hall,2011

3. Robert Ericson, "Fundamentals of Power Electronics", Springer Publication,

Reference Books:

1. Issa Batarseh, "Power Electronic Circuits", John Wiley, July 2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective I)

Course Code: GR20D5029 **L/T/P/C: 3/0/0/3**
I YEAR I SEMESTER

Course objectives

1. Basic concepts of FACTS.
2. Knowledge on Voltage source converters.
3. Concepts of static shunt compensation.
4. Knowledge on SVC, STATCOM in improving dynamic performance of power system.
5. Concepts of series compensation and controlling methods of TCSC, TSSC, GSC.

Course outcomes

1. Understand the operating principles of various FACTS devices.
2. Know the importance of compensation methods in power system network.
3. Relate the performance and applications of VSI & CSI.
4. Extend the knowledge of active & reactive power and voltage control with FACTS devices.
5. Analyze role of SVC&STATCOM in improving the power system dynamics.

UNIT I

Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System. Power flow control -Constraints of maximum transmission line loading,

Benefits of FACTS Transmission line compensation. Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation. Shunt and Series compensation principles – Reactive compensation at transmission and distribution level.

UNIT II

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control. Comparison between SVC and STATCOM.

UNIT III

Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC, TSSC, TCSC and Static synchronous series compensators and their Control.

UNIT IV

Circuit Arrangement, Operation and control of UPF. Basic Principle of P and Q control- Independent real and reactive power flow control- Applications. Introduction to interline power flow controller.

UNIT V

Power quality problems in distribution systems, harmonics. Loads that create harmonics, modelling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt, series and hybrid and their control.

TEXTBOOKS

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, 2007**.**
2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control",Springer Verlag, Berlin, 2006.
3. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.
4. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.

Reference Books

1. G. T.Heydt, "Power Quality", McGraw-Hill Professional, 2007.
2. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMAL AND ADAPTIVE CONTROL

(Professional Elective II)

Course Code:GR20DD5030 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. To know the operation of closed and open loop optimal control.
2. Understand the adaptive control strategies.
3. Learn dynamic programming method.
4. To impart knowledge on parameter estimation methods.
5. To introduce stability, Robustness and Applications of adaptive control method.

Course Outcomes:

1. Apply the mathematical area of calculus of variation for solving optimal control problems.
2. Analyze performance measure and mathematical treatment of optimal control problems.
3. Acquire knowledge on solving optimal control design problems by taking into consideration the physical constraints on practical control systems.
4. Apply advanced control theory to practical engineering problems.
5. Design controllers using optimal control theory.

Unit I :Optimal Control Problem and Dynamic Programming

Problem formulation - Mathematical model - Physical constraints - Performance measures Optimal control problem. Form of optimal control. Selection a performance measure.
Dynamic Programming - Optimal control law - Principle of optimality. An optimal control system. A recurrence relation of dynamic programming - computational procedure. Characteristics of dynamic programming solution. Hamilton - Jacobi - Bellman equation. Continuous linear regulator problems.

Unit II : Variational Approach for Solving Optimal Control Problems

Calculus of variations - Fundamental concepts. Functionals. Piecewise - smooth extremals Constrained extrema
Necessary conditions for optimal control - Linear regulator problems. Linear tracking problems. Pontryagin's minimum principle and state inequality constraints.
Minimum time problems - Minimum control - effort problems. Singular intervals in optimal control problems. Numerical determination of optimal trajectories - Two point boundary - valve problems. Methods of steepest decent, variation of extremals. Quasilinearization. Gradient projection algorithm.

Unit III: Introduction to Adaptive Control and Real-Time Parameter Estimation

Introduction to Adaptive Control, Linear Feedback, Effects of Process Variations, Adaptive Schemes, the Adaptive Control Problem Real-Time Parameter Estimation - Least Squares and Regression Models, Estimating Parameters in Dynamical Systems, Experimental Condition, Simulation of Recursive Estimation.

Unit IV: Self-Tuning Regulators (STR)
Pole Placement Design, Indirect Self-tuning Regulators, Continuous-Time Self-tuners, Direct Self tuning Regulators, Disturbances with Known Characteristics, Stochastic Self-tuning Regulators, Unification of Direct Self-tuning Regulators, Linear Quadratic STR, Adaptive Predictive Control.

Unit V: Model-Reference Adaptive Systems (MRAS)
Introduction, The MIT Rule, Determination of the Adaptation Gain, Lyapunov Theory, Design of MRAS Using Lyapunov Theory, Bounded-Input, Bounded-Output Stability, Applications to Adaptive Control, Output Feedback, Relations between MRAS and STR.

Text Books

1. Donald E. Kirk, “Optimal Control Theory, An introduction”, Prentice Hall Inc., 2004
2. A.P. Sage, “Optimum Systems Control”, Prentice Hall, 1977
3. HSU and Meyer , “Modern Control, Principles and Applications”, McGraw Hill, 1968
4. Yoan D. Landu, “Adaptive Control (Model Reference Approach)”, Marcel Dekker. 1981
5. Astrom K. J., Wittenmark B - "Adaptive Control", Addison Wesley, 1995
6. K.K.D.Young, “Design of Variable Structure Model Following Control Systems”, IEEE Transactions on Automatic Control, Vol. 23, pp 1079-1085, 1978

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PWM FOR POWER ELECTRONIC CONVERTER

(Professional Elective II)

Course Code: GR20DD5031 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Objectives:

1. Discuss various PE converters
2. Interpret Zero space vector placement modulation strategies
3. Determine programmed modulation strategies
4. Adapt pulse width modulation for multilevel inverters
5. Interpret the necessity and Importance of PWM techniques

Course Outcomes:

1. Analyze modulation of single phase VSI and 3 phase VSI
2. Control CSI and VSI using PWM
3. Implement PWM using different strategies
4. Analyze PWM for multilevel inverters
5. Interpret the Continuing developments in modulation.

Unit I

Introduction to PE converters, Modulation of one inverter phase leg, Modulation of Single Phase VSI-Topology, Analytic calculation of harmonic losses, Three Phase VSI-Topology, Analytic calculation of harmonic losses

Unit II

Zero space vector placement modulation strategies, Space vector modulation- Naturally sampled SVM, Analytical solution for SVM, Harmonic losses for SVM, Discontinuous modulation, Modulation of CSI

Unit III

Over modulation of converters- Over modulation region, Naturally and regular sampled over modulation of one phase leg of an inverter, programmed modulation strategies-optimized space vector modulation, Harmonic elimination PWM, Optimum PWM.

Unit IV

Pulse width modulation for multilevel inverters, Implementation of modulation controller, Overview of Power electronic conversion systems, Elements of a PWM converter system

Unit V

Continuing developments in modulation as random PWM, PWM for voltage unbalance, Effect of minimum pulse width and dead time

Text Books

1. D. Grahame Holmes, Thomas A. Lipo, “Pulse width modulation of Power Converter: Principles and Practice”, John Wiley & Sons
2. Bin Vew, “High Power Converter”, Wiley Publication
3. Marian K. Kazimicrczuk, “Pulse width modulated dc-dc power converter”, Wiley Publication.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC AND HYBRID VEHICLES

(Professional Elective II)

Course Code: GR20DD5032 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Objectives:

1. To understand upcoming technology of electric and hybrid electric vehicles
2. Analyze different aspects of drive train topologies
3. learn different energy management strategies
4. To understand different communication systems used in electric and Hybrid electric vehicles
5. Explain the concept of vehicle to grid configurations

Course Outcomes:

1. Impact of conventional vehicles on the society and different types of drive train topologies
2. Load modelling based on the road profile and braking concepts
3. Different types of motors used in electric and hybrid electric vehicles
4. Different types of energy storage systems
5. The concept vehicle to grid (V2G) and grid to vehicle (G2V).

Unit I : HISTORY OF HYBRID AND ELECTRIC VEHICLES

Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance.

Unit II: BASIC CONCEPT OF HYBRID TRACTION

Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis, braking fundamentals and regenerative braking in EVs.

Unit III: INTRODUCTION TO ELECTRIC COMPONENTS USED IN HYBRID AND ELECTRIC VEHICLES

Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives, configuration and control of Permanent Magnet Motor Drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit IV: MATCHING THE ELECTRIC MACHINE AND THE INTERNAL COMBUSTION ENGINE (ICE)

Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology, Communications, supporting subsystems

Unit V: INTRODUCTION TO ENERGY MANAGEMENT AND THEIR STRATEGIES USED IN HYBRID AND ELECTRIC VEHICLE

Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and G2V fundamentals.

Text Books

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011

Reference Books

1. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
2. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER QUALITY LAB

Course Code: GR20D5033 **L/T/P/C: 0/0/2/2**

I YEAR I SEMESTER

Course objectives

1. To provide the students deep insight of Power Quality problems
2. To study the causes of PQ problems
3. To familiarize the effects of voltage and current harmonics
4. To study the switching transients
5. To describe the effects of voltage disturbances in a power system network

Course outcomes

1. Demonstrate the effects Voltage &Current disturbances and Illustrate the effects of harmonics with the filter
2. List the causes of voltage sag and its effect on electrical equipment
3. Relate the effects of non-linear load in a three-phase circuit
4. Interpret the effects of voltage flicker and ground loop and Study the harmonics effect on energy meter
5. Discuss the power quality problems using simulation tools.

List of experiments:

a) To study the effect of nonlinear loads on power quality.
b) To study the voltage and current distortions experimentally.
c) Design the filters for LED lighting application.
d) To study the voltage sag due to starting of large induction motor.
e) To study the capacitor and ultracapacitors switching transients.
f) To study the effect of nonlinear load on neutral current, in a three-phase circuit
g) To Study the performance of a STATCOM when the power system network is drawing unbalanced currents.
h) To study the effect of voltage flicker and electrical appliances
i) Study the effect of harmonics on the grid due to advanced machines like PMBLDC motor and PMSM used in home appliances.
j) To study effect of voltage sag and swell on electrical equipment.
k) To obtain the current harmonics drawn by power electronics interface using Simulation

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONICS LAB

Course Code: GR20DD5034 **L/T/P/C: 0/0/2/2**
I Year I Semester

Course Objectives:

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

Course Outcomes:

Upon the completion of this course, the student will be able to

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

List of Experiments:

1 Dynamic Performance of Separately Excited DC motor load (RLE load) with the step change in load torque using Simulation.
2 Dynamic Performance of Three Phase Induction motor load with the step change in load torque using Simulation.
3 Thyristorized Converter for PMDC Motor load for Speed Measurement & Closed loop Control
4 Hardware Implementation of Buck converter with the R load.
5 Hardware Implementation of Boost converter with the R load.
6 Simulation of Buck-Boost converters with RL load.
7 Hardware implementation of Single-Phase Inverter using PWM Controller with Induction Motor Load.
8 Practical experimentation of Three Phase PWM Inverter fed Induction Motor Load.
9 Practical implementation of Multi Level Inverter fed Induction Motor Load.
10 Hardware Implementation of Single-Phase Cyclo-converter.
11 Design & Analysis of DC Jones chopper using MATLAB Simulation/Aurdino/Pspice/Multisim
12 Hardware Performance of a Single Phase Full Bridge Controlled Converter.
13 Simulation of Single Phase AC Voltage Controller.
14 Simulation of Three Phase Full Bridge Controlled Converter.
15 Simulation of Three Phase Semi-Controlled Converter.
16 Dynamic Performance of three phase synchronous motor load with the step change in load torque using Simulation.
17 Hardware Implementation of an IGBT Based 4-Quadrant Chopper Converter for PMDC motor load.
18 Practical implementation of a Single Phase Semi-controlled Converter.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code : GR20D5011 **L/T/P/C: 2/0/0/2**

I Year I Semester

Course Objectives:

1. To familiarise students with the different aspects of research.
2. To provide an idea of good scientific writing and proper presentation skills.
3. To provide an understanding of philosophical questions behind scientific research.
4. To provide a brief background on the historical legacy of science.
5. To provide an insight of nature of Intellectual Property and new developments in IPR.

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

1. Understand research problem formulation.
2. Analyze research related information and follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering.
5. Understand the nature of Intellectual Property and IPR in International scenario.

Unit I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Unit II

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations, Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc.

Traditional knowledge Case Studies, IPR and IITs.

TEXT / REFERENCE BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. RanjitKumar, 2 ndEdition , "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall , "Industrial Design", McGraw Hill,1992.
6. Niebel , "Product Design", McGraw Hill,1974.
7. Asimov , "Introduction to Design", Prentice Hall,1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in the New Technological Age",2016. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,2008

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC DRIVE SYSTEM

Course Code: GR20D5035 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives:

1. Understand Basic electrical drives and their analysis.
2. Learn Design of controller for drives.
3. Understand Scalar control of electrical drives.
4. Understand the starting and braking methods of electrical drives.
5. Learn to work in teams while working on engineering problems

Course Outcomes:

1. Model and simulate electric drive systems.
2. Design appropriate open loop or closed loop control systems in electric drives.
3. Gain the knowledge of DC motor drives.
4. Understand the operation in IM in motoring and braking modes with respect to stator and rotor side control.
5. Understand the performance PMBLDC motor in motoring and braking modes

Unit I: DYNAMICS OF ELECTRIC DRIVES

Fundamentals of torque equation. Speed torque convention and multi-quadrant operation, components of load torque.

Unit II

Classification of load torques steady state stability. Load equation, Speed control and drive classification. Close loop control of drives.

Unit III: DC MOTOR DRIVES

Modelling of DC machines. Steady state characteristics with armature and speed control. Phase controlled DC motor drives, chopper-controlled DC motor drives.

Unit IV: THREE PHASE INDUCTION AND SYNCHRONOUS MOTOR DRIVES

Dynamic modelling of induction machines. Small signal equations, control characteristics of induction machines. Phase-controlled induction machines. Stator voltage control. Slip energy recovery scheme, frequency control and vector control of induction motor drives.

Wound field and cylindrical rotor synchronous motor fed from constant frequency voltage source, braking and starting operation fed from constant voltage source, operation permanent magnet synchronous and reluctance motors

Unit V:

Self-controlled Synchronous motor drives (PM brushless dc motor): operation of PM BLDC motor in motoring and braking modes.

Traction motor: Starting. Speed-Time characteristics. Braking. Traction motors used in practice
Industrial Drives: Digital Control of Electric Drives. Stepper motor. Servo motor and their Applications.

Text Books

1. G.K, Dubey, "Power semiconductor-controlled Drives", Prentice Hall international, New Jersey, 1989.
2. R.Krishanam, “Electric motor drives modeling, analysis and control”, PHI-India-2009.
3. G. K. Dubey,“Fundamentals of electric Drives, Narosa Publishing House”, 2nd edition, 2011.
4. W. Leonhard, “Control of Electrical drives”, Springer, 3rd edition, 2001.

References Books

1. P.C. Krause –, “Analysis of Electric Machine”, Wiley-IEEE press 3rdedition.

2. B.K. Bose, “Modern Power Electronics and AC Drives”, Prentice Hall publication, 1st edition, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL CONTROL OF POWER ELECTRONIC AND DRIVE SYSTEMS

Course Code: GR20D5036 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives:

1. To knowledge on Basic Mathematics of Digital Control Systems.
2. To focus on Digitally Controlled AC/DC and DC/AC converters.
3. To development of Digitally Controlled DC/DC and AC/AC Converters.
4. To Information on Open-loop and Closed-Loop Control for Digital Power Electronics.
5. To analysis application in AC and DC Motor Drives.

Course outcomes

1. Evaluate Mathematical Modeling of Digital Power Electronics.
2. Analyze AC/DC and DC/AC converters.
3. Design DC/DC converters.
4. Compare Open-loop and Closed-Loop Control for Digital Power Electronics.
5. List the Application in AC and DC Motor Drives.

Unit I: BASIC MATHEMATICS OF DIGITAL CONTROL SYSTEMS

Introduction, Digital Signals and Coding, Shannon's sampling theorem, Sample-and-hold devices, Analog-to-digital conversion, Digital-to-analog conversion, Energy quantization, The Laplace transform (the *s*-domain), The *z*-transform (the *z*-domain).

Mathematical Modeling of Digital Power Electronics: Introduction, A zero-order hold (ZOH) for AC/DC controlled rectifiers, A first-order transfer function for DC/AC pulse-width-modulation inverters, A second-order transfer function for DC/DC converters, A first-order transfer function for AC/AC (AC/DC/AC) converters.

Unit II: DIGITALLY CONTROLLED AC/DC RECTIFIERS

Mathematical modeling for AC/DC rectifiers, Single-phase full-wave AC/DC rectifier, Three-phase half-wave controlled AC/DC rectifier, Three-phase full-wave controlled AC/DC rectifier.

Digitally Controlled DC/AC Inverters: Mathematical modeling for DC/AC PWM inverters, Single-phase full-bridge PWM VSI, Three-phase full-bridge PWM VSI, Three-phase full-bridge PWM CSI, Multistage PWM inverter, Multilevel PWM inverter.

Unit III: DIGITALLY CONTROLLED DC/DC CONVERTERS

Mathematical Modeling for power DC/DC converters, Fundamental DC/DC converter, Developed DC/DC converters, Soft-switching converters, Multi-element resonant power converters.

Digitally Controlled AC/AC Converters: Traditional modeling for AC/AC (AC/DC/AC) converters, Single-phase AC/AC converter, Three-phase AC/AC voltage controllers, AC/DC/AC PWM converters.

Unit IV: OPEN-LOOP CONTROL FOR DIGITAL POWER ELECTRONICS

Introduction, Stability analysis, Unit-step function responses, Impulse responses.

Closed-Loop Control for Digital Power Electronics: Introduction, PI control for AC/DC rectifiers, PI control for DC/AC inverters and AC/AC (AC/DC/AC) converters, PID control for DC/DC converters.

Unit V: ENERGY FACTOR APPLICATION IN AC AND DC MOTOR DRIVES

Introduction, Energy storage in motors, A DC/AC voltage source, An AC/DC current source, AC motor drives, DC motor drives.

Text Books

1. Digital Power Electronics and Applications- *Fang Lin LuoHong YeMuhammad Rashid.*

Reference Books

1. Wu T. F. and Chen Y. K., A systematic and unified approach to modeling PWM dc/dc converters based on the graft scheme, *IEEE Trans Ind Electron*, Vol. 45, No. 1, 1998, pp. 88–99

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED POWER ELECTRONIC CONVERTERS
(Professional Elective III)

Course Code: GR20D5037 **L/T/P/C: 3/0/0/3**

I YEAR II SEMESTER

Course objectives

1. Explain the operation of advanced power electronic circuit topologies.
2. Summarize the control strategies involved in power electronic circuits.
3. How to analyze different DC-DC power supplies.
4. Analyze and design switched mode regulators for various industrial applications.
5. Propose few practical circuits, used in practice

Course outcomes

1. Valuate the design of APFC.
2. Analyze and design of Switched Mode power conversion topologies,
3. Analyze and design of DC-DC converters.
4. Analyze and design of resonant converters.
5. Design DC-DC convertors for different renewable energy sourses

UNIT I

BOOST TYPE APFC AND CONTROL

Introduction, Circuit Model Analysis, Design - Three phase utility interphases and control

UNIT II

SMPS TOPOLOGIES

Buck regulators-condition for continuous inductor current and capacitor voltage, Boost regulators-condition for continuous inductor current and capacitor voltage, Buck-Boost regulators-condition for continuous inductor current and capacitor voltage. Cuk regulators-condition for continuous inductor current and capacitor voltage, Comparison of regulators.

UNIT III

DC POWER SUPPLIES

DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter, Applications.

UNIT IV

RESONANT CONVERTERS

Introduction, Class E resonant inverter, Zero Current Switching resonant converters-L type ZCS resonant converter-M type ZCS resonant converter-Zero Voltage Switching resonant converters-Two quadrant ZVS resonant converters, Resonant DC Link Inverters with Zero Voltage Switching.

UNIT V

Modelling and design of DC-DC Converters for various renewable energy – Small Signal Modelling, Conversion. Few power electronic circuits used in practice for controlling electric drives- Analysis and comparison of different PWM Techniques for Induction Motor drives.

Text Books

1. Rashid “Power Electronics” Prentice Hall India 2007.
2. G.K.Dubey et.al “Thyristorised Power Controllers” Wiley Eastern Ltd., 2005, 06.
3. Cyril W Lander “Power Electronics” McGraw Hill., 2005.
4. B. K Bose “Modern Power Electronics and AC Drives” Pearson Education (Asia)., 2007
5. Abraham Pressman “Switching Power Supply Design” McGraw Hill Publishing Company. 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DYNAMICS OF ELECTRICAL MACHINES
(Professional Elective III)

Course Code: GR20D5038 **L/T/P/C: 3/0/0/3**

I YEAR II SEMESTER

Course objectives

1. Explain Performance characteristics of machine.
2. Interpret the dynamics of the machine.
3. How to determine stability of machine.
4. Analyze the synchronous machine.
5. Analyze different electrical machines with dynamic modelling.

Course outcomes

1. Analyze the performance characteristics of all electric machines.
2. Apply Knowledge of transformations for the dynamic analysis of machines
3. Determine stability of the machines under small signal conditions
4. Determine stability of the machines under transient conditions
5. Analyze synchronous machine.

Unit I

Stability, Primitive 4 Winding Commutator Machine. Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine.

Unit II

Torque Equation. Analysis of Simple DC Machines using the Primitive Machine Equations, the Three Phase Induction Motor.Transformed Equations. Different Reference Frames for Induction Motor Analysis Transfer Function Formulation.

Unit III

Three Phase Salient Pole Synchronous Machine, Parks Transformation- Steady State Analysis, Large Signal Transient. Small Oscillation Equations in State Variable Form, Dynamical Analysis of Interconnected Machines.

Unit IV

Large Signal Transient Analysis using Transformed Equations,DC Generator /DC Motor System

Unit V

Alternator / Synchronous Motor System.

Text Books

1. D.P. Sengupta & J.B. Lynn," Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. I. Boldia & S.A. Nasar, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
5. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London
. 1967

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED DIGITAL SIGNAL PROCESSING
(Professional Elective III)

Course Code: GR20D5039 **L/T/P/C: 3/0/0/3**
I YEAR II SEMESTER

Course objectives

1. Explain Characteristics of discrete time signals and systems
2. Compare the difference between discrete-time and continuous-time signals.
3. Apply and Understand Discrete Fourier Transforms (DFT).
4. Illustrate various factors involved in design of digital filters.
5. Summarize estimation of Power spectrum and the need for Power Spectrum estimation.

Course outcomes

1. Analyze the time domain and frequency domain representations of discrete time signals and systems.
2. Design techniques for IIR filters and its realization structures.
3. Design techniques for FIR filters and its realization structures.
4. Develop knowledge about the finite word length effects in implementation of digital filters.
5. Estimate power spectrum of stationary random signals.

Unit I

Discrete time signals, linear shift invariant systems, Stability and causality, Sampling of continuous time signals, Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier transform, Z Transform-Properties of different transforms.

Unit II

Linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, bilinear transformation method.

Unit III

FIR filter design using window functions, Comparison of IIR and FIR digital filters, Basic IIR and FIR filter realization structures, Signal flow graph representations Quantization process and errors, Coefficient quantisation effects in IIR and FIR filters

Unit IV

A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling, Overflow oscillations and zero Input limit cycles in IIR filters, Linear Signal Models,all pole, all zero and Pole-zero models.

Unit V

Power Spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals, Optimum linear filters, Optimum signal estimation, Mean square error estimation, Optimum FIR and IIR Filters.

Text Books

1. Sanjit K Mitra, “Digital Signal Processing: A computer-based approach “, TataMc Graw-Hill Edition 1998
2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, “Statistical and Adaptive Signal Processing”, Mc Graw Hill international editions.-2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

AI AND MACHINE LEARNING TECHNIQUES FOR POWER ELECTRONIC APPLICATIONS
(Professional Elective IV)

Course Code: GR20D5040 **L/T/P/C: 3/0/0/3**
I YEAR II SEMESTER

Course objectives

1. Understand basis in designing with Intelligent Systems
2. Concept of learning Support Vector Machines
3. Understand Neural Networks & their learning rules
4. Comprehend Fuzzy Inference Systems.
5. Analyse power electronic systems which are designed using Fuzzy and Neural Networks.

Course outcome

1. Describe the importance of designing the System with AI and Machine Learning.
2. Learn Support Vector Machines and its Regression.
3. Distinguish the various Neural Networks Architectures.
4. Categorize Fuzzy rule base and neuro-fuzzy systems.
5. Analyze various power electronic systems using neural & fuzzy systems.

UNIT-1 INTRODUCTION

Towards Intelligent Machines, Well-Posed Machine Learning Problems, Examples of Applications-Machine Vision, Biometric Recognition & Handwriting recognition, load forecasting and Control & Automation. Time Series Forecasting, Datasets for Unreastically Simple and Realistic Problems, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured/Unstructured. Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

UNIT-II SUPPORT VECTOR MACHINES

Learning with Support Vector Machines, Perceptron Algorithm, Linear Soft Margin Classifier for Overlapping Classes, Nonlinear Classifier, Regression by Support Vector Machines, Variants of Basic SVM Techniques.

Unit-III NEURAL NETWORKS

Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear Neuron and the Widrow-Hoff Learning Rule, Error-Correction Delta Rule, Multi-Layer Perceptron Networks, Radial Basis Functions Networks.

UNIT-IV FUZZY INFERENCE SYSTEMS

Cognitive Uncertainty and Fuzzy Rule-Base, Fuzzy Quantification of Knowledge, Fuzzy Rule-Base and Approximate Reasoning, Takagi-Sugeno Fuzzy Mode, Neuro-Fuzzy Inference Systems.

UNIT-V APPLICATIONS

Neural Network Topologies for space vector pulse width modulation of three level inverter, Neural Network based feedback signal estimator performance – Torque & Rotor Flux, Neural Network topology for stator flux estimator, Neuro-fuzzy based efficiency optimization control, Neuro-Fuzzy Controller based Direct Torque Control

Text Books

1. Applied Machine Learning – M. Gopal, Mc Graw Hill
2. Power Electronics & Motor Drives – Advances & Trends, Bimal K Bose, 2nd Edition, Academic Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DISTRIBUTED GENERATION
(Professional Elective IV)

Course Code: GR20D5041 **L/T/P/C: 3/0/0/3**
I YEAR II SEMESTER

Course objectives

1. Knowledge of renewable energy sources.
2. Understanding of the working of off-grid and grid-connected renewable energy generation schemes.
3. Micro-Grids modelling and Analysis
4. Protection methods for Micro grids
5. Issues, Challenges and Limitations of Distributed Generation

Course outcomes

1. Understand the planning and operational issues related to Distributed Generation.
2. Acquire Knowledge about Distributed Generation
3. Learn Micro-Grids modelling and Analysis
4. Simulate case studies with Micro grids
5. Illustrate Protection methods for Micro grids

Unit I: PLANNING OF DGS

Sitting and sizing of DGs optimal placement of DG sources in distribution systems, Grid integration of DGs Different types of interfaces, Inverter based DGs and rotating machine-based interfaces, Aggregation of multiple DG units.

Unit II: TECHNICAL IMPACTS OF DGS
Transmission systems Distribution systems De-regulation Impact of DGs upon protective relaying, Impact of DGs upon transient and dynamic stability of existing. Distribution systems, Steady-state and Dynamic analysis.

Unit III
Economic and control aspects: Market facts, Issues and challenges Limitations of DGs, Voltage control techniques, Reactive power control, Harmonics Power quality issues, Reliability of DG based systems.

Unit IV: INTRODUCTION TO MICRO-GRIDS
Types of micro-grids: autonomous and non-autonomous grids Sizing of micro-grids, Modelling & analysis of Micro-grids with multiple DGs, Micro-grids with power electronic interfacing units.

Unit V: TRANSIENTS IN MICRO-GRIDS
Protection of micro-grids, Case studies, advanced topics.

Text Books

1. H. Lee Willis, Walter G. Scott,"Distributed Power Generation – Planning and Evaluation", Marcel Decker Press.

Reference Books

1. M.GodoySimoes, Felix A.Farret, "Renewable Energy Systems – Design and Analysis with Induction Generators", CRC press.
2. Stuart Borlase." Smart Grid: Infrastructure Technology Solutions" CRC Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SMART GRIDS
(Professional Elective IV)

Course Code: GR20D5042 **L/T/P/C: 3/0/0/3**
I YEAR II SEMESTER

Course objectives

1. Understand concept of smart grid and its advantages over conventional grid
2. Acquire knowledge of different Smart Sensors
3. Learn wide area measurement techniques
4. Illustrate Distributed Automation integrated with Smart techniques
5. List and compare different Wireless Sensor Networks in Smart Grid

Course outcomes

1. Appreciate the difference between smart grid & conventional grid
2. Apply knowledge of different Smart Sensors in real time applications
3. Formulate solutions in the areas of smart substations, and wide area measurements
4. Illustrate Distributed Automation integrated with Smart techniques
5. List and compare different Wireless Sensor Networks in Smart Grid

Unit I : INTRODUCTION TO SMART GRID

What is Smart Grid, Concept of Smart grid, Definitions & International policies, Need of Smart Grid; Smart Appliances: LED Lighting, Sensors for Green Building, Electric Vehicles in Smart Grid Environment: Load shifting using Electric Vehicles, Control Equipment, Outage Management during Battery Degradation, Smart Sensors: WSN enabled Consumer Applications in Smart Grid, WSN enabled Demand Management for Residential Customers, Coordination of PHEV Charging/Discharging cycles.

Unit II: DISTRIBUTION AUTOMATION

Architecture and Communication, Information Technology and Communication, Wind Energy in the context of Smart Grid, Intelligent Wind Converters, Grid Interconnection Solutions, Grid Connected Solar Power Plants, V-I characteristics of PV Module, PV plants connected to Grid.

Unit III : MICRO-GRID

Advantages, Architecture, DC links in Radial Distribution networks, Back to Back Voltage Source converter topology, DC Link Model, Network Constraints, DG units in Smart Grids, Control Strategies for DG units and Active loads.

Unit IV : LOW VOLTAGE DC MICROGRID

Solid State Lighting System, Intelligent Wireless Sensor Network and Its Sensors, Energy Conservation in Green Building.

Unit V: WIRELESS SENSOR NETWORKS IN SMART GRID:

ZigBee, Wi-Fi, Z-wave, Wireless HART, Security and Privacy of WSN based Consumer Applications, ZigBee based Energy Management.

Text Books

1. Krzysztof Iniewski, “Smart Grid Infrastructure& Networking” , McGrawHill ,2014.

2. Clark W.Gellings, P.E. , “The Smart Grid Enabling Energy Efficiency and Demand Response” , The Fairmont Press, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTRICAL DRIVES LAB

Course Code: GR20D5043 **L/T/P/C: 0/0/2/2**
I YEAR II SEMESTER

Course objectives

1. Strong background in different types of Drives used in industry
2. Knowledge on various lab experiments related different electrical braking methods.
3. Strong foundation for simulation software's like MATLAB/ PSIM
4. Knowledge of different types of special machines and their control
5. Design of hardware circuit for any given DC or AC drive

Course outcomes

1. Explain the performance of TRIAC as AC voltage controller
2. Design Simulation model for DC or AC drives.
3. Develop speed control methods to three phase IM and Explain the concept of scalar control in three phase IM
4. Explain the concept of electrical braking in different applications
5. Mathematically model PMSM and PMBLDC motor and Control of PMBLDC, SRM and PMSM in MATLAB/ SIMULINK

Task1
Study of Thyristor controlled D.C Drive
Task2
Study of Chopper Fed DC Motor.
Task3
Study of A.C single phase motor speed control using TRIAC.
Task4
PWM inverter fed three phase induction motor control using PSPICE/MATLAB/PSIM software.
Task5
VSI/CSI fed induction motor drive analysis using MATLAB/PSPICE/PSIM software.
Task6
Study of V/f control operation of three phase induction motor.
Task7
Study of permanent magnet synchronous motor drive fed by PWM inverter using software.
Task8
Regenerative/ Dynamic breaking operation for DC motor study using software.
Task9
Dynamic breaking / Plugging of three phase IM
Task10
Study of different speed and current control algorithms of PMBLDC motor and SRM using MATLAB/SIMULINK/ PSIM software.

Hardware Experiment

Task11

Realization of PMBLDC motor drive

a) Design of Inverter and interfacing circuit to DSP
b) Design of Voltage and current sensors
c) Design of Speed/ Position sensors interfacing circuit

Text Books

1. GRIET reference Manual

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DSP AND MICROCONTROLLER LAB

Course Code: GR20D5044 **L/T/P/C: 0/0/2/2**
I YEAR II SEMESTER

Course objectives

1. Understand Code Composer Studio Software.
2. Discuss the configuration of the digital signal processors.
3. Generating the PWM signals with different examples
4. Program the PWM signals Examples by interfacing Matlab with Code Composer Studio.
5. Execute the applications for various speed control modes.

Course outcomes

1. Run the programs using Code Composer Studio.
2. Execute the programs using different PWM generation.
3. Execute the speed control operation on BLDC/ PMSM motor.
4. Execute the data exchange between the two sources using Code Composer Studio.
5. Describe the importance of programming using CC Studio for motor applications.

Task1
Introduction to Code Composer Studio- An example.
Task2
Configuring GPIO pins of TMS320F28027 processor for flashing onboard LEDs.
Task3
Configuring ADC pins for real time data exchange.
Task4
Generation of gate signals for DC-DC boost converter.
Task5
Generation of gate signals for DC-AC 1-phase full bridge inverter.
Task6
Generation of gate signals for 3-phase voltage source inverter.
Task7
Speed control of DC motor by interfacing embedded coder with MATLAB Simulink.
Task8
Speed control of BLDC motor with a velocity control mode.
Task9
Speed control of an induction motor with v/f control mode.
Task10
Speed control of PMSM motor FOC control mode.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR20D5143 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

Course Objectives:

1. To improve the technical presentation skills of the students.
2. To train the students to do literature review.
3. To impart critical thinking abilities for problem solutions.
4. To learn different implementation techniques.
5. To prepare technical reports

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

1. Choose the problem domain in the specialized area under computer science and engineering.
2. Acquire and categorize the solution paradigms with help of case studies
3. Design and code using selected hardware, software and tools.
4. Execute, Implement and demonstrate the problem statement by using the selected hardware, software and tools.
5. Document the thesis and publish the final work in a peer reviewed journal.

Syllabus Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Departmental committee.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECCHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE)

Course Code: GR20D5152 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To understand that how to improve their writing skills and level of readability
2. To learn about what to write in each section
3. To understand the skills needed when writing a Title and ensure the good quality of paper at very first-time submission
4. To understand the process of research
5. To write quality research papers

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

1. Will have given a view of what writing is all about
2. Will be able to understand Research and its process
3. Will be able to comprehend the steps and methods involved in research process
4. Will have learned various skills necessary that are necessary for doing research
5. Will have learned how to write quality research papers along with other research areas

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts and writing an Introduction

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit 4: A. Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

B. Skills that are needed when writing the Methods, the Results, the Discussion, an the Conclusion

Unit 5: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Ian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISASTER MANAGEMENT
(AUDIT COURSE)

Course Code: GR20D5153 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches,
5. Planning and programming in different countries, particularly their home country or the countries they work in.

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

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them

Unit 1: **Introduction:** Disaster: Definition, Factors and Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit 2: Repercussions of Disasters and Hazards: **Economic Damage**, Loss of Human And Animal Life, Destruction Of Ecosystem. **Natural Disasters**: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit 3: Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit 4: Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental AndCommunity Preparedness.

Unit 5: Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in RiskAssessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trendsin Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

References:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal bookCompany
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, NewDelhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., NewDelhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SANSKRIT FOR TECHNICAL KNOWLEDGE

(AUDIT COURSE)

Course Code: GR20D5154 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes*:*

1. Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
2. Enable students to understand roots of Sanskrit language.
3. Students learn engineering fundamentals in Sanskrit.
4. Students can attempt writing sentences in Sanskrit.
5. Ancient Sanskrit literature about science & technology can be understood

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical,Mechanical, Architecture,Mathematics and Applications of OCR for Sanskrit and Indian Languages, Tool and Techniques, Survey

Unit 4: Interactive Sanskrit Teaching Learning Tools: Interactive Sanskrit Learning Tools, Introduction, WhyInteractive Tools for Sanskrit? E-learning, Basics of Multimedia, Web based tools development HTML, Web page etc., Tools and Techniques

Unit 5 : Standard for Indian Languages (Unicode) Unicode Typing in Devanagari Scripts, Typing Tools and Software, Text Processing and Preservation Tools, Text Processing, Preservation,Techniques, Text Processing and Preservation, Tools and Techniques, Survey

Reference Books

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, NewDelhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New DelhiPublication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., NewDelhi.
4. Bharti A., R. Sangal, V. Chaitanya, "NL, Complexity Theory and Logic" in Foundations of Software Technology and Theoretical Computer Science, Springer,1990.
5. Tools developed by Computational Linguistics Group, Department of Sanskrit,University of Delhi, Delhi-110007 available at: http://sanskrit.du.ac.in
6. Basic concept and issues of multimedia:http://www.newagepublishers.com/samplechapter/001697.pdf
7. Content creation and E-learning in Indian languages: a model:

http://eprints.rclis.org/7189/1/vijayakumarjk_01.pdf

8. HTML Tutorial - W3Schools: www.w3schools.com/html
9. The Unicode Consortium: http://unicode.org/.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VALUE EDUCATION
(AUDIT COURSE)

Course Code: GR20D5155 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. To understand the significance of human conduct and self-development
5. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

Course Outcomes: Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human Values
3. Developing the Professionalism Ethics, Risks, Responsibilities and Life Skills.
4. Student will be able to realize the significance of ethical human conduct and self-development
5. Students will be able to inculcate positive thinking, dignity of labor and religious tolerance.

Unit 1: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit 3: Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Unit 5: Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics,

Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Reference Books

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi
2. Jagdish Chand, “Value Education”
3. N. Venkataiah, “ Value Education”, APH Publishing, 1998 - Education

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION
(AUDIT COURSE)

Course Code: GR20D5156 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional
3. Role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
5. To understand the role and functioning of Election Commission of India.

Course Outcomes: Students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.
5. Discuss the significance of Election Commission of India.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights &Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance and composition of judiciary: Parliament- Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, composition of judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration and Election Commission: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PEDAGOGY STUDIES

(AUDIT COURSE)

Course Code: GR20D5157 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Review existing evidence on the review topic to inform Programme design and policy making
2. Undertaken by the DFID, other agencies and researchers.
3. Identify critical evidence gaps to guide the development.
4. Establishing coordination among people in order to execute pedagogy methods.
5. To study pedagogy as a separate discipline.

Course Outcomes: Students will be able to understand

1. What pedagogical practices are being used by teachers in formal classrooms in developing countries?
2. What pedagogical practices are being used by teachers in informal classrooms in developing countries?
3. Synergy from the work force.
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit 3: Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4: Professional development: alignment with classroom practices and follow- up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3):361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London:DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3):272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston:Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRESS MANAGEMENT AND YOGA

(AUDIT COURSE)

Course Code: GR20D5158 **L/T/P/C: 2/0/0/2**

Course Objective:

- To achieve overall health of body and mind.
- To overcome stress.
- To lower blood pressure and improve heart health.
- Relaxation and Sleeping aid and to become non-violent and truthfulness.
- To increase the levels of happiness and to eliminate all types of body pains.

Course Outcomes: Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also improve efficiently.
2. Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
3. Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
4. Manage stress through breathing, awareness, meditation and healthy movement.
5. Build concentration, confidence and positive self-image

Unit 1: Definitions of Eight parts of yoga. (Ashtanga)

Ashtanga, the eight limbs of yoga, is Patanjali's classification of classical yoga, as set out in his Yoga Sutras. He defined the eight limbs as yama (abstinences), niyama (observances), asana (postures), pranayama (breathing), pratyahara (withdrawal), dharana (concentration), dhyana (meditation) and Samadhi (absorption).

Unit-2. **Orientation to Patanjala Yoga sutra**:

Introduction to Yoga sutra - Nature of Yoga science, Definition of yoga, the nature of seer in pure and modified state, Vrittis - Nature, classification, definition, method to control of chittavrittis. Samprajnata Samadhi and its classification, Iswarapranidhana - a means to attain Samadhi, definition and quality of Iswara. Astanga yoga-Vama, Niyama, Asana, Pranayama, Ratyahara-Bahiranga Yoga, Dharana, Dhyana, Samadhi-Antaranga Yoga, Powers Introduction.

Unit-3. **Orientation of Hath yoga pradipika** :

Hath yoga - Introduction, relationship of Hath yoga and Raja yoga, greatness of Hath yoga, Hath yogi parampara, importance of Hath and its secrecy, place of Hath yoga Practice, Destructives and constructive of yoga, Yama and Niyama, Asana, methods of Hath yoga Practice, Mitahara, Pathya and Apathya. Rules in food taking, Hath yoga achievements. Paranayama - Benefits of Pranayama, Nadishuddi and Pranayama. Duration and time for pranayama practice, Gradation of Pranayama, Sweat and Pranayama, Food during pranayama practice, Yukta and Ayukta pranayama, Nadishuddi, Satkriya-Neti, Dhouti, Basti, Nauli, Trataka, Kapalbhati, Gajakarani, Importance of Pranayama practice. Symtoms of Nadishuddhi, Manonnani, Varieties of Kumbhaka-Methods of practice, Classification of their benefits, Hathayogasiddhilakshanam. Kundalini as base for all yoga, Results of Kundalini prabyodha, Synonyms for Susumna, Mudras Bandhas-classification, benefits and methods of practice, Nadanusandhana.

Unit 4: Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 5: Asan and Pranayam - Various yoga poses and their benefits for mind & body. Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami YogabhyasiMandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama(Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. HathayogaPradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - HariharanandaAranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga PradeepaOmananda Tirtha- Geeta Press, Gorakhpur.
8. Gherandasamhita - Bihar School of Yoga, Munger, Bihar.
9. Shivayogadipika - Sadashivabrahmendra, Ananda Ashramagranthavali, Choukhamba Press
10. Yoga Darshan : Swami Niranjanananda-Sri PanchadashanamParamahamsaAlakh Bara, Deoghar.
11. Four chapters on Freedom (commentary on the Yoga sutras of Patanjali), Swami Satyananda (1983), Bihar School of Yoga, Munger.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(AUDIT COURSE)

Course Code: GR20D5159 **L/T/P/C: 2/0/0/2**

Course Objectives

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students
- To differentiate three types of happiness (Sukham)
- To describe the character traits of a spiritual devotee

Course Outcomes

- Study of Shrimad- Bhagwad-Gita wiil help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neethishatakam will help in developing versatile personality of students
- To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
- To develop tranquil attitude in all favorable and unfavorable situations and to develop high spiritual intelligence

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

WIDE BANDGAP POWER DEVICES
(Professional Elective V)

Course Code: GR20D5045 **L/T/P/C: 3/0/0/3**
II YEAR I SEMESTER

Course objectives:

1. Learn the characteristics of Power electronic devices
2. Study the GAN device fundamentals
3. Lean the SIC devices fundamentals
4. To understand the GAN device applications in Power Electronics
5. To understand the SIC device applications in Power Electronics

Course Outcomes:

1. Comparison of SI based devices with wideband gap power devices
2. Demonstration of GAN characteristics
3. Illustrate the SIC Characteristics
4. Design of GAN based power electronics circuits.
5. Design of SIC based power electronics circuits

UNIT I

INTRODUCTION OF DEVICES

MOSFET structure and characteristics, MOSFET drain current, MOSFET transconductance and output conductance, MOSFET on-state resistance. The insulated gate bipolar transistor (IGBT) IGBT structure and characteristics - IGBT at turn-off and turn on, IGBT latch-up. Introduction of Wind band gap devices SiC, GaN, C(Diamond), necessity of wind band Gap, advantage of wide band gap semiconductors.

UNIT II

GAN DEVICES

Fabrication of GaN Devices, Characterization and modelling GaN devices, Switching Characteristics, Advantages of GaN over si power semiconductors.

UNIT III

SIC DEVICES

Fabrication of SiC Devices, Characterization and modelling SiC devices, Switching Characteristics, Advantages of SiC over silicon power semiconductors.

UNIT IV

GAN APPLICATIONS

Consumer applications, Industrial applications, energy converters, e-mobility devices.

UNIT V

SIC APPLICATIONS

High efficiency inverters for solar and wind power, power converters for electric and hybrid vehicles, power inverters for Industrial equipment's, high voltage switches for X-ray generators

TEXTBOOKS:

1.Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design", John's Wiley and Sons.

2. B. W. Williams, Power Electronics: Devices, Drivers, Applications, and Passive Components, TMH

3. B Jayant Balija, Fundamentals Power Electronic Devices, Springer

4. B Jayant Balija, SIC Devices, world Scientific Publishing, 2005.

5. Fei (Fred) Wang, Zheyu Zhang, and Edward A. Jones, Characterization of Wide Bandgap Power Semiconductor Devices, IET ENERGY ENGINEERING

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HIGH VOLTAGE DC TRANSMISSION
(Professional Elective V)

Course Code: GR20D5046 **L/T/P/C: 3/0/0/3**

II YEAR I SEMESTER

Course objectives

1. Covering Voltage source converter-based transmission
2. Focusing on HVDC control
3. Know about VSC HVDC control
4. Analysis of harmonics and their rectification.
5. Impact of AC system performance on DC system

Course Outcomes

1. Compare the differences between HVDC and HVAC transmission.
2. Know about VSC transmission advantages.
3. Cover the different control strategies.
4. Identification of valve firing control schemes.
5. Address the role of AC system faults on HVDC system.

Unit I: HVDC TRANSMISSION

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

Unit II: HVDC CONVERTORS OPERATION AND ANALYSIS

Thyristors and their characteristics, silicon rectifiers IGBT's ,HVDC voltage source converters principle and operation , 6 pulse convertor configuration, ideal communication process without gate control, DC output voltage , gate control of valves, analysis of voltage wave forms with overlap angle, analysis of communication circuits , equivalent circuit of rectifier, Inverter operation with overlap, Equivalent circuit of inverter , complete equivalent circuit of HVDC link, power factor and reactive power of converters, analysis of 12 pulse converter, power flow in HVDC links, Power flow and current control , power loss in DC systems, operation and analysis of VSC converters, VSC inverter operation , power flow in VSC-DC transmission, comparison between CSC(classical HVDC) and NSC-HVDC system.

Unit III: HVDC CONVERTER CONTROL

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

Unit IV: HARMONICS IN HVDC SYSTEM

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

Unit V: FAULTS ON AC SIDE OF CONVERTER STATION

3-phase symmetrical fault and asymmetrical faults,
commutation failure, DC circuit breaker, Multi Terminal HVDC system: series and parallel MTDC systems and their operation and control, AC-DC system interaction short circuit ratesand its effects

Text Books

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

Reference Books

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN AND DEVELOPMENT OF LED LIGHTING

(Professional Elective V)

Course Code: GR20D5047 **L/T/P/C: 3/0/0/3**

II YEAR I SEMESTER

Course Objectives:

1. Understand the LED Fundamentals
2. Learn thermal management in LED Lighting
3. Design of LEDs for different application
4. Learn how to design Drivers for AC and DC lighting
5. Explain the different microcontrollers used in LED applications

Course Outcomes:

At the end of the course student will be able to

1. Demonstrate Need of LEDs over other lamps
2. Design of heat sinks for LED Lighting
3. Identify the Design parameters of LEDs
4. Design of Drivers for AC and DC lighting
5. Can suggest suitable microcontrollers for LED applications

UNIT I

INTRODUCTION

Lighting Fundamentals - A Very Brief History of the Study of Light, Introduction to Lighting Fundamentals, Quantitative Parameters of Lighting.

Lighting Technologies- Fluorescent Lamps, Incandescent Lamps and Light-Emitting Diode Lamps

Understanding Illumination, Understanding Energy Efficiency and Understanding Energy Efficiency

UNIT II

LED LIGHTING DEVICES

Basics in Semiconductor Optoelectronics, Compound Semiconductor Materials and Fabrication Challenges and Determining and Improving LED Lighting Efficacy

LED Module Manufacturing- LED Lighting Components and Subsystems, Thermal Management and Lifetime Studies, Optimizing Module Designs for Manufacturing Platforms

Thermal Performance of LEDs and Thermal Management of LEDs

UNIT III

LED LAMP DESIGN CONSIDERATIONS

Lighting Applications and Lamp Requirements, Designs to Suit Lighting Applications, LED Lamp Design Considerations for Common Lighting Applications and LED Lamp Design Parameters and Trade-offs and Practical characteristics of LEDs.

UNIT IV

DRIVER DESIGN FOR LEDS

DC Drive Circuitry Design for LEDs and AC Drive Circuitry for LEDs

System design with LEDs, Practical Design of a USB Light, Practical Design of an Automotive Tail -Light and Practical Design of an LED Light Bulb

UNIT V

SMART LED LIGHTING

Basics of Smart LED Lighting, Selection of Microcontrollers for LED and basics, Communication basics wired, wireless schemes.

Textbooks:

1. Understanding LED Illumination – M Nisa Khan – CRC Press, 2014
2. Practical Lighting Design with LEDs – Ron Lenk and Carol Lenk, IEEE Press- 2017

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective I)

Course Code: GR20D5146 **L/T/P/C: 3/0/0/3**

II Year I Semester

Prerequisites: Estimation & Costing, Construction Technology and Project management.

Course Objectives:

1. To attain knowledge in Cost Management process and Costing System.
2. Ability to understand the basic concepts of Project planning, execution, and cost control
3. Discuss about Various types of costs and its behaviour along with Quality Management
4. Identify various types of Budgets involved in Cost Management process
5. Broaden the career potential of available techniques and problems available in Cost Management.

Course Outcomes:

1. Discuss various construction costs to manage a construction project.
2. Summarize different construction activities and its application related to cost based on the field requirements.
3. Identify Cost Behaviour of various types of cost and Quality Management
4. Identifying various construction Budgets involved Cost Management process.
5. Discussing various types of Techniques and Problem-solving techniques involved in Construction

UNIT I

Introduction and Overview of the Strategic Cost Management Process, Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost, Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II

Project: Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT III

Cost Behaviour and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision- making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value- Chain Analysis.

UNIT IV

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

REFERENCE BOOKS

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2. Charles T. Horngren and George Foster, Advanced Management Accounting.
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY

(Open Elective I)

Course Code: GR20D5147 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives

1. To understand the importance of maintaining a safe workplace.
2. To maintain safety standards in compliance with regulatory requirements and within engineering limits understand personal safety and industrial safety.
3. To create a job safety analysis (JSA) for a given work project.
4. To follow safety recordkeeping and management, and the role of the safety manager.
5. To utilize personal proactive equipment.

Course Outcomes

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic workplace monitoring Ability to do Hazard analysis.
3. Demonstrate an understanding of workplace injury prevention, risk management, and incident investigations.
4. Understand the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace.
5. Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravitylubrication,v.Wickfeedlubricationvi.Sidefeedlubrication,vii.Ringlubrication,
Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors,
iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference Books

1. Maintenance Engineering Handbook, Higgins & Morrow, Da InformationServices.
2. Maintenance Engineering, H. P. Garg, S. Chand andCompany.
3. Pump-hydraulic Compressors, Audels, Mcgrew HillPublication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & HallLondon.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH

(Open Elective I)

Course Code: GR20D5148 **L/T/P/C:3/0/0/3**

II Year I Semester

Course Objectives

1. To define and formulate linear and Non-linear programming problems and appreciate their limitations arising from a wide range of applications.
2. To perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
3. To distinguish various inventory models and develop proper inventory policies.
4. To solve the scheduling and sequencing models.
5. To understand how to model and solve problems using dynamic programming, Game Theory.

Course Outcomes

1. The student will formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. The student will able to carry out sensitivity analysis.
3. The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. The student will able to distinguish various inventory models and develop proper inventory policies.
5. The student will also propose the best strategy using decision making methods under uncertainty and game theory.

Unit I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex techniques, Sensitivity Analysis, Inventory Control Models

Unit II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem -CPM/PERT

Unit IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Reference Books

1. H.A. Taha, Operations Research, An Introduction, PHI,2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi,1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi,2008
4. Hitler Libermann Operations Research: McGraw Hill Pub.2009
5. Panner selvam, Operations Research: Prentice Hall of India2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS

(Open Elective I)

Course Code: GR20D5149 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objective

1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
2. To know about feedback networks.
3. To learn about the concept of fuzziness involved in various systems
4. To understand the concept of adequate knowledge about fuzzy set theory.
5. To learn about comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm

Course Outcomes

1. To Expose the students to the concepts of feed forward neural networks
2. To provide adequate knowledge about feedback networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

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 Back propagation 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& 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.

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.

Reference Books

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks – Simon Hykins , Pearson Education
4. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
5. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY

(Open Elective I)

Course Code: GR20D5150 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. To understand Cyber security challenges and their threats.
2. To understand Cyber attacks and their vulnerabilities.
3. To understand ethical hacking concepts and social engineering targets.
4. To understand cyber forensic investigation process
5. To recognize cyber laws and ethics

Course Outcomes: after completing this course student able to

1. Understand importance and challenges of Cyber security
2. Investigate cybercrime and collect evidences
3. Identify security risks and take preventive steps
4. Able to use knowledge of forensic tools and software
5. Knowledge about Indian IT act and International law

UNIT I:

Introduction to Cyber Security: Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.

UNIT II:

Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.

UNIT III:

Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies.

UNIT IV:

Cyber Forensics and Auditing: Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, and Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013

UNIT V:

Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace.

TEXT BOOKS:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyberdefense Program Against Advanced Threats, A-press .
2. Nina Godbole, SumitBelapure, Cyber Security, Willey
3. Hacking the Hacker, Roger Grimes, Wiley
4. Cyber Law By Bare Act, Govt Of india, It Act 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTERNET OF THINGS ARCHITECTURE AND DESIGN PRINCIPLES

(Open Elective I)

Course Code: GR20D5151 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. To assess the vision and introduction of IoT.
2. To Understand Networking & Communication aspects of IOT.
3. To Explore the Application areas of IOT and to analyze the current needs
4. To Understand State of the Art - IoT Architecture.
5. To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes: On successful completion of the course, the student will:

1. Understand the concepts of Internet of Things
2. Analyze basic protocols in wireless sensor network
3. Design IoT applications in different domain and be able to analyze their performance
4. Understand the Hardware concepts of Internet of Things
5. Implement basic IoT applications through python.

UNIT-1

Introduction to IoT :

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network.

UNIT-II

Network & Communication aspects

Connectivity terminologies-IOT Node, LAN,WAN, Gateway, IOT Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4,IPV6,HTTP,MQTT,COAP

UNIT-III

IOT Applications

Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits,

Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges,

Industrial IOT- Requirements, Design Considerations, Applications

UNIT-IV

Hardware Platforms

Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry

UNIT-V

Developing IoTs

Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor based application through embedded system platform, Implementing IoT concepts with python.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Internet of Things, Jeeva Jose, Khanna Publishing, 2018
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846).
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",1st st Edition, Apress Publications, 2013. (ISBN-13: 978- 1430257.
3. Internet of Things Challenges, Advances and Applications by Quas F.Hassan, Atta Ur Rehaman Khan, and Sajiad A. Madani