Academic Regulations
Program Structure
and
Detailed Syllabus

Master of Technology
in
Power Electronics

(Two Year Regular Programme)

(Applicable for Batches admitted from 2022)

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for M.Tech. (Regular) under GR22

(Applicable for Batches Admitted from 2022-23)

Post Graduate Degree Programme in Engineering and Technology (PG)

Gokaraju Rangaraju Institute of Engineering & Technology (GRIET) offers a 2-year (4 Semesters) Master of Technology (M.Tech.) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	20	M.Tech. Structural Engineering
2	Electrical and Electronics Engineering	43	M.Tech. Power Electronics
3	Mechanical Engineering	52	M.Tech. Design for Manufacturing
4	Electronics and Communication Engineering	57	M.Tech. VLSI
5	Computer Science and Engineering	58	M.Tech. Computer Science and Engineering
6	Information Technology	B0	M.Tech. Data Science

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

2. **Admission:** 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 GATE, 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.
3. **Programme Pattern:**

   a) Each Academic year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.

c) The total credits for the Programme are 68.

d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

e) A student has a choice of registering for credits from the courses offered in the programme.

f) All the registered credits will be considered for the calculation of final CGPA.

g) Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

h) Course Classification: All courses offered for all undergraduate programmes in M.Tech. degree programmes are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
2	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
3	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
4	Audit	Audit Courses	Mandatory non creditable courses
5	PW	Project Work/Dissertation	Mini Project work, Dissertation Phase-I, II.

4. 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. programme.

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 fulfilled all the requirements for the award of the degree.

5. 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 examination 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.

e) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year I semester for promotion to first Year II Semester.

f) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year II semester for promotion to second Year I Semester.

6. 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.

S. No	Components	Internal Evaluation	External Evaluation	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Mini Project	100	--	100
4	Dissertation	50	50	100

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

Assessment Procedure

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is by conducting Assignments and Quiz exams at the end of each unit **i) Assignment – 5 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 5 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development - 10 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours. **i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks** **ii) task/experiment/program-15 marks** **iii) evaluation of results -15 marks** **iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks** **v) viva-voce on concerned laboratory course - 10 marks**

d) Project Review Committee: 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.

e) Mini Project: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Student shall carryout the mini project in consultation with the mini project supervisor. The Project Review Committee (PRC) along with supervisor will review the progress of the mini project during the internal evaluation for 50 marks. Mini Project Viva Voce will be evaluated by the PRC for another 50 marks before the semester end examinations. The student must secure a minimum of 50% of marks in i) internal evaluation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he/she must reappear for the same as and when scheduled.

Internal Evaluation: Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (50)			
1	First week of the semester	Abstract submission*	10
2	Fourth week of the semester	First Review	10
2	Mid of the semester	Second Review	10
3	Last week of the semester	Last Review	20

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: (50 Marks) The mini project report is presented before PRC along with the supervisor.

Guidelines to award 50 marks:

S. No	Date	Review/ PRC report	Marks
External Evaluation Marks (50)			
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	10
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	20
4	Results and Discussion	Verified by PRC	10

f) Dissertation (Phase I & Phase II): Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee (PRC).

- The candidate must present in **Dissertation Work Review - I**, in consultation with his/her Dissertation Supervisor, the title, objective and plan of action of his/her Dissertation work to the PRC for approval ***within four weeks*** from the commencement of **Second year First Semester**. Only after obtaining the approval of the PRC can the student initiate the Dissertation work.
- If a candidate wishes to change his/her supervisor or topic of the Dissertation, he/she can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his/her initial plans of Dissertation proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- The candidate shall submit his/her Dissertation progress report in two stages at least with a gap of **three** months between them.
- The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of PRC ***not earlier than 40 weeks*** from the date of approval of the Dissertation work. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- **The Dissertation Work Review - II** in II Year I Semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he/she fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.

- **The Dissertation Work Review - III** in II Year II Sem. carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Dissertation Work and decide whether the Dissertation is eligible for final submission. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he/she fails to obtain the required minimum marks, he/she must reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate must secure a minimum of 50% marks in Dissertation Evaluation (Viva- Voce) examination.
- Dissertation Work Reviews - II and III shall be conducted in Phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review- III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review – III in the next academic year only at the time of Dissertation Work Review - II (Phase I).
- A student shall present the progress of the dissertation through Dissertation Reviews II and III with at least a gap of three months between the reviews.
- After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM Check from the approved agency with a similarity index not more than 24% and the plagiarism report and be included in the final thesis. If the similarity index has more than the required percentage, the student is advised to modify accordingly and resubmit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to ***TWO***. The candidate must register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled.
- Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the Institute, after submission of a research paper related to the Dissertation work in a SCOPUS/Web of Science/UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.
- If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained if there is no specific recommendation for resubmission.
- If the report of the examiner is satisfactory, the Head of the Department shall coordinate and decide for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate must secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.
- If he/she fails to fulfill the requirements of minimum 50% of marks, he/she will reappear for the Dissertation Viva-Voce examination ***only after three months***. In the reappeared examination also, if he/she fails to fulfill the requirements, he/she will not be eligible for the award of the degree, unless he/she is asked to revise and resubmit his/her Dissertation Work by the board within a specified time period (within ***four*** years from the date of commencement of his/her first year first semester).

7. 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.

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

9. **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.

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

11. **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 (i.e.,16 marks out of 40 marks) in CIE, 40% of marks (i.e.,24 marks out of 60 marks) in SEE and a minimum aggregate of 50%(i.e.,50 marks out of 100 marks) of the total marks in the Semester-end examination (SEE) and Internal Evaluation (CIE) taken together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

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 Dean Admissions of 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-B. 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) $\mathbf{S_k}$ the SGPA of k^{th} semester (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.,

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

Where $\mathbf{C_i}$ is the number of credits of the i^{th} course and $\mathbf{G_i}$ is the grade point scored by the student in the i^{th} course and **n** is the number of courses registered in that semester.

ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by a student over all the semesters of a programme, i.e., upto and inclusive of $\mathbf{S_k}$, where $k \geq 2$.

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

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

12. **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:

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA ≥ 7.75
2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

Equivalence of grade to marks

Marks % = (CGPA -0.75)*100

13. **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.

14. **Re-Admission/Re-Registration (Re-Admission for Discontinued Student)**

- A student, who has discontinued the M. Tech. degree programme due to any reason whatsoever, may be considered for 'readmission' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned.
- If a student is detained in a subject (s) due to shortage of attendance in any semester, he/she may be permitted to re-register for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he/she seeks re-registration, with prior permission from the authorities concerned
- A candidate shall be given only one-time chance to re-register and attend the classes for a maximum of two subjects in a semester, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work, in the next academic year and secure the required minimum

attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

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) GR22 Course Structure

I YEAR - I SEMESTER

S. No.	Group	Course Code	Subject	Credits			Total Credits	Hours			Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P		L	T	P				
1	PC	GR22D5025	Modelling and Analysis of Electrical Machines	3	0	0	3	3	0	0	3	40	60	100
2	PC	GR22D5026	Modelling and Simulation of Power Electronic Converters	3	0	0	3	3	0	0	3	40	60	100
3	PE I	GR22D5027	Power Quality & FACTS	3	0	0	3	3	0	0	3	40	60	100
		GR22D5028	Switched Mode Power Supplies											
		GR22D5029	Optimal and Adaptive Control											
4	PE II	GR22D5030	High Voltage DC Transmission	3	0	0	3	3	0	0	3	40	60	100
		GR22D5031	PWM Techniques for Power Electronic Converters											
		GR22D5032	Electric and Hybrid Vehicles											
5	PC	GR22D5033	Power Quality Lab	0	0	2	2	0	0	4	4	40	60	100
6	PC	GR22D5034	Power Electronics Lab	0	0	2	2	0	0	4	4	40	60	100
7	PC	GR22D5011	Research Methodology and IPR	2	0	0	2	2	0	0	2	40	60	100
Total				**14**	**0**	**4**	**18**	**14**	**0**	**8**	**22**	**280**	**420**	**700**
8	AC		Audit Course I	0	0	0	0	2	0	0	2	40	60	100

I YEAR - II SEMESTER

S. No	Group	Course Code	Subject	Credits			Total Credit	Hours			Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P		L	T	P				
1	PC	GR22D5035	Electric Drives System	3	0	0	3	3	0	0	3	40	60	100
2	PC	GR22D5036	Modern and Digital Controlof Power Electronic and Drive Systems	3	0	0	3	3	0	0	3	40	60	100
3	PE III	GR22D5037	Advanced Power Electronic Converters	3	0	0	3	3	0	0	3	40	60	100
		GR22D5038	Dynamics of Electrical Machines											
		GR22D5039	DSP based Control of Power Electronic Converters											
4	PE IV	GR22D5040	AI and Machine LearningTechniques for Power Electronic Applications	3	0	0	3	3	0	0	3	40	60	100
		GR22D5041	Wide Bandgap Power Devices											
		GR22D5042	Distributed Generation & Smart Grids											
5	PC	GR22D5043	Electrical Drives Lab	0	0	2	2	0	0	4	4	40	60	100
6	PC	GR22D5044	DSP and MicrocontrollerLab	0	0	2	2	0	0	4	4	40	60	100
7	PW	GR22D5144	Mini Project	2	0	0	2	0	0	2	2	50	50	100
Total				**14**	**0**	**4**	**18**	**12**	**0**	**10**	**22**	**280**	**420**	**700**
8	AC		Audit Course II	0	0	0	0	2	0	0	2	40	60	100

II YEAR - I SEMESTER

S. No	Group	Course Code	Subject	Credits			Total Credits	Hours			Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P		L	T	P				
1	PE V	GR22D5045	Power Electronics for Renewable Energy Systems	3	0	0	3	3	0	0	3	40	60	100
		GR22D5046	Non-Linear Control For Power Electronic Converters											
		GR22D5047	Design and Development of LED Lighting											
2	OE	GR22D5147	Cost Management of Engineering Projects	3	0	0	3	3	0	0	3	40	60	100
		GR22D5148	Industrial Safety											
		GR22D5149	Operations Research											
		GR22D5150	Artificial Neural Networks and Fuzzy Systems											
		GR22D5151	Cyber Security											
		GR22D5152	Internet of Things Architecture and Design Principles											
3	PW	GR22D5145	Dissertation Phase – I	0	0	10	10	0	0	20	20	100		100
Total				**6**	**0**	**10**	**16**	**6**	**0**	**20**	**26**	**180**	**120**	**300**

II YEAR - II SEMESTER

S.No	Group	Course Code	Subject	Credits			Total Credits	Hours			Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P		L	T	P				
1	PW	GR22D5146	Dissertation Phase – II	0	0	16	16	0	0	32	32	100	100	200
			Total	**0**	**0**	**16**	**16**	**0**	**0**	**32**	**32**	**100**	**100**	**200**

Audit Courses I & II

1	GR22D5153	English for Research Paper Writing
2	GR22D5154	Disaster Management
3	GR22D5155	Sanskrit for Technical Knowledge
4	GR22D5156	Value Education
5	GR22D5157	Indian Constitution
6	GR22D5158	Pedagogy Studies
7	GR22D5159	Stress Management by Yoga
8	GR22D5160	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: GR22D5025 **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. Analyze the dynamic behavior of rotating machines.
4. Understand the equivalent circuit of synchronous machines.
5. Design mathematical model of special electrical machines.

UNIT I
ELECTROMAGNETIC ENERGY CONVERSION

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
REFERENCE FRAME THEORY

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
DYNAMIC MODELING OF INDUCTION MACHINES

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

UNIT IV
PERMANENT MAGNET SYNCHRONOUS MACHINE

Permanent magnet synchronous machine, construction, surface permanent magnet (square and sinusoidal back emf type) and interior permanent magnet machine, operating principle of PMSM, dynamic modelling of permanent magnet synchronous machine-computer simulation.

UNIT V
SWITCHED RELUCTANCE MOTORS

Switched Reluctance Motors, construction, principle of working, basics of SRM analysis, torque equation and 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 ofIndia.
3. Miller, T.J.E., “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendo Press.
4. P.C. Krause “Analysis of Electric Machine” Wiley IEEE Press 3rd Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODELLING AND SIMULATION OF POWER ELECTRONIC CONVERTERS

Course Code: GR22D5026 **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 modelling 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

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
MODELLING & 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 PSPICE).

UNIT III
MODELLING & 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
MODELLING & 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 inverters with different PWM techniques**.**

UNIT V
REAL TIME SIMULATION
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. Narayanaswamy P.R. Iyer “Power Electronic Converters- Interactive Modelling UsingSimulink”, 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
POWER QUALITY AND FACTS
(Professional Elective –I)

Course Code: GR22D5027 **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 analyze the PQ problems and their causes.
3. Basic concepts of FACTS device.
4. Knowledge on Voltage source converters and concepts of static shunt compensation.
5. Concepts of series compensation and controlling methods of TCSC, TSSC, GSC.

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 operating principles of various FACTS devices.
4. Know the importance of compensation methods in power system network.
5. Extend the knowledge of active & reactive power and voltage control with FACTS devices.

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.
HARMONICS
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.

UNIT III
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 IV
SHUNT COMPENSATORS
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-V

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.

Text Books

1. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, "Power Quality Problems and Mitigation Techniques" Wiley Publications, 2015.
2. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007.
3. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age
4. International Publishers, 2007.
5. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

Reference Books

1. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000.
2. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000.
3. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.
4. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.
5. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control", Springer Verlag, Berlin, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SWITCHED MODE POWER SUPPLIES
(Professional Elective –I)

Course Code: GR22D5028 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives

1. Summarize the non-isolated DC to DC power converters.
2. Explain the operation of Isolated DC-DC Converters.
3. How to Design Magnetic Component & Switching Regulator Control.
4. Analyze and design Soft-Switched and Resonant DC-DC Power Converters.
5. Explain the basic concepts of Single-Phase Power-Factor Correction.

Course Outcomes

1. Analyze and design non-isolated DC to DC power converters.
2. Understand the design of non-isolated DC-DC Converters topologies.
3. Explain the design magnetic component & switching regulator control.
4. Analyze and design Soft-Switched and Resonant DC-DC Power Converters.
5. Illustrate the basic concepts of Single-Phase Power-Factor Correction.

UNIT I
INTRODUCTION AND BASIC DC TO DC POWER CONVERTERS
Switch Mode Power Conversion; Review of power diodes, Schottky didoes, power MOSFETs &IGBTs. Recent developments in power devices for switch mode power supplies. Drive requirements, switching performance and snubber design. Selection of devices & basic heat sink design.
Basic DC-DC converters - buck, boost, buck-boost & Cuk converters - and their principles of operation; continuous and discontinuous modes of operation; SEPIC converter.

UNIT II
ISOLATED DC-DC CONVERTERS
Single-switch and multi-switch transformer-isolated DC-DC converters. Flyback and forward converters; transformer isolated half-bridge, full-bridge converters. Push-pull converters. Voltage fed and current-fed converters.

UNIT III
MAGNETIC COMPONENT DESIGN &SWITCHING REGULATOR CONTROL
Magnetic core materials and performance; basic inductor and transformer design; practical magnetic design; design aspects to be considered for designing transformers for specific applications – flyback, push-pull, bridge, forward converters.
Small-signal models for switching regulators. Performance analysis and design of closed-loop system under different control methods, and operating modes. Measurement of small signal transfer functions.

UNIT IV
SOFT-SWITCHED AND RESONANT DC-DC POWER CONVERTERS
Motivation. Hard-switching vs soft-switching. Introduction to resonant power converters and their characteristics. Detailed study of a few soft-transition converters.

UNIT V

SINGLE-PHASE POWER-FACTOR CORRECTION

Problems due to harmonics in the current drawn by equipment. Basic concept of active power-factor correction (PFC) techniques. Performance analysis and comparison of different PFC techniques

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Textbooks

1. N Mohan, T M Undeland and W P Robbins, "Power Electronics: Converters, Applications and Design", Wiley.
2. Abraham I Pressman, "Switching Power Supply Design", McGraw-Hill.
3. Selected Conference and Journal Articles.
4. Texas Instruments ‘Power Management’ Application Notes including articles from the well-known Unit rode Seminar Series.
5. Application Notes from International Rectifiers and other Power Devices and ICs manufacturers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMAL AND ADAPTIVE CONTROL
(Professional Elective I)

Course Code: GR22D5029 **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. Solve 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 and adaptive control theories.

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. Quasi linearization. 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.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HIGH VOLTAGE DC TRANSMISSION
(Professional Elective II)

Course Code: GR22D5030 **L/T/P/C: 3/0/0/3**
I 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 in the 12-pulseconverter, harmonics in VSC converter, Harmonic Limits, Harmonic Filters, Non characteristic Harmonic Reduction Using HVDC Controls, 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-HVD schemes.

UNIT V

FAULTS ON AC SIDE OF CONVERTER STATION

3-phase symmetrical fault and asymmetrical faults, commutation failure, DC circuit breaker, DC Faults Two-Level VSC, Multi Terminal HVDC system: series and parallel MTDC systems and their operation and control, AC-DC system interaction short circuit rates and its effects. VSC Converter Modelingunder DC Faults conditions. Advantages and Problems with ground return.

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

PWM TECHNIQUES FOR POWER ELECTRONIC CONVERTERS
(Professional Elective II)

Course Code: GR22D5031 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives

1. Summarize the dc-ac and ac-dc power converters.
2. Explain the operation of pulse width modulation and low switching frequency PWM.
3. Acquire knowledge on Triangle-comparison based PWM and Space vector based PWM.
4. Analyze the performance of dc-ac power converters.
5. Develop deeper insight on advanced features of PWM.

Course Outcomes

1. Analyze and design Power electronic converters for dc-ac and ac-dc power conversion.
2. Understand concepts of pulse width modulation and low switching frequency PWM.
3. Explain Triangle-comparison based PWM and Space vector based PWM.
4. Judge and evaluate performance of dc-ac power converters.
5. Illustrate the concepts of advanced features of PWM.

UNIT I
POWER ELECTRONIC CONVERTERS FOR DC-AC AND AC-DC POWER CONVERSION
Electronic switches, dc-dc buck and boost converters, H-bridge, multilevel converters – diode clamp, flying capacitor and cascaded-cell converters; voltage source and current source converters; evolution of topologies for dc-ac power conversion from dc-dc converters, overview of applications of voltage source converter, motor drives, active front-end converters, reactive compensators, active power filters.

UNIT II
PURPOSE OF PULSE WIDTH MODULATION AND LOW SWITCHING FREQUENCYPWM
Review of Fourier series, fundamental and harmonic voltages; machine model for harmonic voltages; undesirable effects of harmonic voltages – line current distortion, increased losses, pulsating torque in motor drives; control of fundamental voltage; mitigation of harmonics and their adverse effects; Pulse width modulation (PWM) at low switching frequency-Square wave operation of voltage source inverter, PWM with a few switching angles per quarter cycle, equal voltage contours, selective harmonic elimination, THD optimized PWM, off-line PWM.

UNIT III
TRIANGLE-COMPARISON BASED PWM AND SPACE VECTOR BASED PWM
Average pole voltages, sinusoidal modulation, third harmonic injection, continuous PWM, bus-clamping or discontinuous PWM.
Space vector concept and transformation, per-phase methods from a space vector perspective space vector based modulation, conventional space vector PWM, bus-clamping PWM, advancedPWM, triangle-comparison approach versus space vector approach to PWM.

UNIT IV

ANALYSIS OF LINE CURRENT RIPPLE, DC LINK CURRENT & TORQUE RIPPLE

Synchronously revolving reference frame; error between reference voltage and applied voltage, integral of voltage error; evaluation of line current ripple; hybrid PWM for reduced line current ripple. Relation between line-side currents and dc link current; dc link current and inverter state; rms dc current ripple over a carrier cycle; rms current rating of dc capacitors Evaluationof harmonic torques and rms torque ripple, hybrid PWM for reduced torque ripple.

UNIT V

INVERTER LOSS, EFFECT OF INVERTER DEAD-TIME EFFECT, OVER MODULATION & PWM FOR MULTILEVEL INVERTER

Simplifying assumptions in evaluation of inverter loss, dependence of inverter loss on line power factor, influence of PWM techniques on switching loss, design of PWM for low inverter loss.
Requirement of dead-time, effect of dead-time on line voltages, dependence on power factor andmodulation method, compensation of dead-time effect.
Per-phase and space vector approaches to over modulation, average voltages in a synchronously revolving d-q reference frame, low-frequency harmonic distortion.
Extensions of sine-triangle PWM to multilevel inverters, voltage space vectors, space vector based PWM, analysis of line current ripple and torque ripple.

Text Books

1. Eric Monmasson,“Power Electronic Converters: PWM Strategies and Current Control Techniques”, Wiley-IEEE Press.
2. Holmes, D. Grahame, Lipo, Thomas .A, “Pulse Width Modulation for Power Converters: Principles and Practice”: 18 (IEEE Press Series on Power and Energy Systems) .

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC AND HYBRID VEHICLES
(Professional Elective II)

Course Code: GR22D5032 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives

1. 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 CellVehicles: 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, CRCPress, 2011.

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY LAB

Course Code: GR22D5033 **L/T/P/C: 0/0/2/2**
I Year I Semester

Course Objectives

1. Provide the students deep insight of Power Quality problems.
2. Study the causes of PQ problems.
3. Familiarize the effects of voltage and current harmonics.
4. Study the switching transients.
5. 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. Study 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. Discriminate the power quality problems using simulation tools.

Expt-1:
1. Simulation based analysis of nonlinear loads on power quality.
2. Analysis and Simulation of harmonics for various residential loads.

Expt-2: Experimental demonstration of the voltage and current distortions.

Expt-3: Simulation based analysis of voltage flicker.

Expt-4: Simulation based analysis of voltage sag due to starting of large induction motor.

Expt-5: Study the effect of harmonics on energy meter reading.

Expt-6: Investigate the current harmonics in BLDC motor

Expt-7: Investigate the current harmonics in PMSM motor

Expt-8: To reduce the current harmonics with passive and active power filters.

Expt-9: To study the neutral current of unbalanced nonlinear load of a 3-Ph System

Expt-10: Simulation based analysis of STATCOM.

Expt-11: Reducing the Voltage Sag and Swell Problem in Distribution System Using DVR with PI Controller

Expt-12: To obtain the current harmonics drawn by power electronics interface using Simulation

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER ELECTRONICS LAB

Course Code: GR22D5034 **L/T/P/C: 0/0/2/2**
I Year I Semester

Course Objectives

1. Outline the switching devices and their applications in power control.
2. Categorize the different power converters in various systems for power control.
3. Analyze different choppers & control techniques for converters.
4. Experiment with converters and compare the results with theoretical concepts and simulation.
5. Develop hands-on experience in analyzing, designing and carrying out experiments on various power converters.

Course Outcomes

1. Illustrate the operation of different power switching converters.
2. Analyze and evaluate the operation of Converters for different loads.
3. Interpret the performance of Choppers.
4. Analyze and evaluate the operation of AC Voltage controller & Cyclo converters.
5. Judge power electronic inverter performance & practical control circuits for real time applications.

LIST OF EXPERIMENTS

1. Characteristics of SCR, IGBT, MOSFET.
2. Single-Phase Half Controlled Converter with R-load.
3. Single-Phase Fully Controlled Converter with R-load.
4. Performance analysis of Single-phase Full Bridge Inverter with R & RL load.
5. Practical validation of Three-Phase Fully Controlled Converter.
6. Open loop analysis of Buck Converter.
7. Open loop analysis of Boost Converter.
8. Operation of Single-Phase AC Voltage Controller using simulation.
9. Performance analysis of Single-phase Cyclo-converter with R & RL load.
10. Operation of Three Phase Half Controlled Converter using simulation.
11. Operation of Buck-Boost Converter using simulation.
12. Performance and analysis of speed control of single-phase Induction Motor using simulation.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code: GR22D5011 **L/T/P/C: 2/0/0/2**
I Year I Semester

Course Objectives

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

Course Outcomes

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 emphasize 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. Licensingand 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. Ranjit Kumar, 2nd Edition, "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.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S.Chand, 2008.

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC DRIVES SYSTEM

Course Code: GR22D5035 **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

Introduction to electric drives – Block diagram – advantages of electric drives – Dynamics of motor load system, fundamental equations, and types of load. 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. Four quadrant operation of drives. 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. Analysis of single quadrant chopper drives. Regenerative braking control. Two quadrant chopper drives. Four quadrant chopper 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
SYNCHRONOUS MOTOR DRIVES (PM BRUSHLESS DC MOTOR)

Operation of PM BLDC motor in motoring and braking modes. Modeling of PM Brushless dc Motor, The PMBDCM Drive Scheme, Design Considerations for the PMBDC Motor, Design of Current and

Speed Controllers, Applications of PMBLDC drive.

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.

Reference Books

1. P.C. Krause –, “Analysis of Electric Machine”, Wiley-IEEE press 3rd edition.
2. B.K. Bose, “Modern Power Electronics and AC Drives”, Prentice Hall publication, 1st edition, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN AND DIGITAL CONTROL OF POWER ELECTRONIC AND SYSTEMS

Course Code: GR22D5036 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Objectives

1. Knowledge on Basic Mathematics of Digital Control Systems.
2. Focus on Digitally Controlled AC/DC and DC/AC converters.
3. Development of Digitally Controlled DC/DC and AC/AC Converters.
4. Information on Open-loop and Closed-Loop Control for Digital Power Electronics.
5. Analysis application in AC and DC Motor Drives.

Course Outcomes

1. Evaluate Mathematical Modelling 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, Modelling of diode in simulation. Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation. Digital PWM: the Uniformly Sampled Implementation, Synchronization between Sampling and PWM. 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 PWMCSI, Multistage PWM inverter, Multilevel PWM inverter.

UNIT III
DIGITALLY CONTROLLED DC/DC CONVERTERS

Mathematical Modeling for power DC/DC converters, Fundamental DC/DC converter, Converter transfer functions for buck, boost and buck-boost topologies. Developed DC/DC converters, Soft-switching converters, and 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 LuoHongYeMuhammad 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: GR22D5037 **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 sources.

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- pushpull converter-halfbridge 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 OF POWER CONVERTERS
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 India2007.
2. G.K.Dubeyet.al “Thyristorised Power Controllers” Wiley Eastern Ltd.,2005,06.
3. Cyril WLander “Power Electronics”McGrawHill.,2005.
4. B.KBose “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: GR22D5038 **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
PRIMITIVE MACHINE
Stability, Primitive 4 Winding Commutator Machine. Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine.

UNIT II
ANALYSIS - PRIMITIVE MACHINE
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
SYNCHRONOUS MACHINE
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
TRANSIENT ANALYSIS
Large Signal Transient Analysis using Transformed Equations, DC Generator /DC Motor System

UNIT V
SYNCHRONOUS MACHINES OSCILLATIONS
Introduction, Absolute and Apparent Changes in Current and Voltage Vectors, Transformation to Kron's Freely Rotating Reference Axes, Equivalent Networks, Hunting network in Park's axes, hunting network in Kron's axes- Numerical examples, the effect of a voltage regulator.

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. 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

DSP BASED CONTROL OF POWER ELECTRONIC CONVERTERS
(Professional Elective III)

Course Code: GR22D5039 **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
INTRODUCTION
Digital Control Circuits for Power Electronics Systems- Analog Versus Digital Control Circuit, Causal and Non-causal Digital Circuits,LTI Discrete-Time Circuits, Hard Real-Time Control Systems, Sampling Rate, Simultaneous Sampling, Number of Bits; Control Circuits, Power Filters.

UNIT II
ANALOG SIGNALS CONDITIONING AND DISCRETIZATION
Introduction, Analog Input, Galvanic Isolation, Common Mode Voltage, Isolation Amplifiers, Current Measurements-A Resistive Shunt, Current Transformers, Transformer with Hall Sensor, Current Transformer with Magnetic Modulation,Current Transducer with Air Coil, Comparison of Current Sensing Techniques; Selected Parameters of Digital Control Circuit; Total Harmonic Distortion; Sampling of Analog Signal, Signal Quantization, A/D Converters Suitable for Power Electronics Control Circuits.

UNIT III
SELECTED METHODS OF SIGNAL FILTRATION AND SEPARATION AND THEIR IMPLEMENTATION
Introduction, Digital Filters, Lattice Wave Digital Filters, Modified Lattice Wave Digital Filters, Linear-Phase IIR Filters, Multi rate Circuits, Digital Filter Banks, Implementation of Digital Signal Processing Algorithms- Basic Features of the DSP.

UNIT IV
SELECTED MICROCONTROLLERS SUITABLE FOR POWER ELECTRONICS CONTROL CIRCUITS
TMS320F28335, TMS320F2837xD, Digital Signal Processor—TMS320C6xxx, Digital Signal Processors—SHARC Family, Selected Simulation Methods and Programs for Power Electronics Circuits, Simulation of Power Electronics System Together with Digital Control Circuit.

UNIT V

SELECTED ACTIVE POWER FILTER CONTROL ALGORITHMS

Control Circuit of Shunt APFs, Simulation of APF, APF Control with First Harmonic , Shunt APF Classical Control Circuit, Dynamics of Shunt, Predictive Control Algorithm for APF, Selected Harmonics Separation Methods Suitable for APF- Control Circuit with MDFT, Control Circuit with p _ q Algorithm, Multirate Shunt APF - Analog Input Circuit, The Output Inductors, APF Simulation Results,Multirate Shunt APF with Prediction.

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: GR22D5040 **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. Analyze power electronic systems which are designed using Fuzzy and Neural Networks.

Course Outcomes

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 I
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

WIDE BANDGAP POWER DEVICES
(Professional Elective IV)

Course Code: GR22D5041 **L/T/P/C: 3/0/0/3**
I Year II 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. Introduction to LT Spice/MATLAB Software.

UNIT II
GAN DEVICES

Fabrication of GaN Devices, Characterization and modelling GaN devices, Switching Characteristics, Advantages of GaN over si power semiconductors. Characterisation of GaN Devices using LTSpice/MATLAB Software.

UNIT III
SIC DEVICES

Fabrication of SiC Devices, Characterization and modelling SiC devices, Switching Characteristics, Advantages of SiC over silicon power semiconductors. Characterisation of SiC Devices using LTSpice/MATLAB Software.

UNIT IV
GAN APPLICATIONS

Consumer applications, Industrial applications, energy converters, e-mobility devices. LED Driver simulation using LTSpice /MATLAB Software.

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, Power converter simulations for electric and hybrid vehicles using LTSpice/MATLAB Software.

Text Books

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.

Reference Books

1. B Jayant Balija, SIC Devices, world Scientific Publishing, 2005.
2. 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

DISTRIBUTED GENERATION & SMART GRIDS
(Professional Elective IV)

Course Code: GR22D5042 **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. A case study of a microgrid with a peak shaving/islanding EMS is used to explore workflows on design, testing, and validation.

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. Krzyszt ofIniewski, “Smart Grid Infrastructure& Networking” , McGraw Hill ,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 GR22D5043 **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.

List of Experiments:

Expt-1. Study of Thyristor controlled D.C Drive
Expt-2. Study of Chopper Fed DC Motor.
Expt-3. Study of A.C single phase motor speed control using TRIAC.
Expt-4. PWM inverter fed three phase induction motor control using MATLAB software.
Expt-5. VSI/CSI fed induction motor drive analysis using MATLAB software.
Expt-6. Study of V/f control operation of three phase induction motor.
Expt-7. Study of permanent magnet synchronous motor drive fed by PWM inverter using software.
Expt-8. Regenerative/ Dynamic breaking operation for DC motor study using MATLAB software.
Expt-9. Dynamic breaking / Plugging of three phase IM
Expt-10. Study of different speed and current control algorithms of PMBLDC motor and SRM using MATLAB software.
Expt-11. Speed Control of SRM (Switched Reluctance Motor) in Forward Motoring and Reverse Motoring Mode.
Expt-12. Speed Control of PMBLDC Motor in Forward Motoring, Reverse Motoring and Forward Breaking Mode.
Expt-13. Speed Control of PMSM in Forward Motoring Mode.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DSP AND MICROCONTROLLER LAB

Course Code: GR22D5044 **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.

Expt-1. Introduction to Code Composer Studio- An example.
Expt-2. Configuring GPIO pins of TMS320F28027 processor for flashing onboard LEDs.
Expt-3. Configuring ADC pins for real time data exchange.
Expt-4. Generation of gate signals for DC-DC boost converter.
Expt-5. Generation of gate signals for DC-AC 1-phase full bridge inverter.
Expt-6. Generation of gate signals for 3-phase voltage source inverter.
Expt-7. Speed control of DC motor by interfacing embedded coder with MATLAB Simulink.
Expt-8. Speed control of BLDC motor with a velocity control mode.
Expt-9. Speed control of an induction motor with v/f control mode.
Expt-10. Speed control of PMSM motor FOC control mode.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE)

Course Code:GR22D5153 **L/T/P/C: 2/0/0/0**

Course Objectives:

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

Course Outcomes:

1. Give a view of what writing is all about
2. Understand Research and its process
3. Comprehend the steps and methods involved in research process
4. Have learned various skills necessary that are necessary for doing research
5. Have learned how to write quality research papers along with other research areas

UNIT I

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

UNIT II

Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper

UNIT III

A. Abstracts and writing an Introduction, Review of the Literature, Methods and Results
B. Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

UNIT IV

A. Methods, the Results, Discussion, Conclusions, the Final Check, Clarifying Who Did What, Highlighting Your Findings
B. Key Skills that are needed when writing the Methods, the Results, the Discussion, and the Conclusion

UNIT V

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 : GR22D5154 **L/T/P/C: 2/0/0/0**

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

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 I

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

UNIT II

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 III

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 IV

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 And Community Preparedness.

UNIT V

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 Risk Assessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

SUGGESTED READINGS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE)

Course Code: GR22D5155 **L/T/P/C: 2/0/0/0**

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 I
Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT II
Order, Introduction of roots, technical information about Sanskrit Literature

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

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

UNIT V
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

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.
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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE EDUCATION
(AUDIT COURSE)

Course Code: GR22D5156 **L/T/P/C: 2/0/0/0**

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

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 I

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 II

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 III

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 IV

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 V

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.

Suggested reading

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: GR22D5157 **L/T/P/C: 2/0/0/0**

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

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

UNIT II: Philosophy of the Indian Constitution
Preamble Salient Features

UNIT III: 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 IV: 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 V: 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: GR22D5158 **L/T/P/C:2/0/0/0**

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

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 oflearners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT I: 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 II: Thematic overview

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT III : 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 IV : 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 V: 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 BY YOGA
(AUDIT COURSE)

Course Code: GR22D5159 **L/T/P/C: 2/0/0/0**

Course Objectives

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

Course Outcomes

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 I: 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 II: 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 chitta vrittis. 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 III: 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 IV: Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigrahaShaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT V

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 Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama (Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. Hathayoga Pradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - Harihara nanda Aranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga Pradeepa Omananda 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 Panchadashanam Paramahamsa Alakh 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: GR22D5160 **L/T/P/C: 2/0/0/0**

Course Objectives

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

Course Outcomes

1. Study of Shrimad- Bhagwad-Gita wiil help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neethishatakam will help in developing versatile personality of students
4. To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
5. 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 Swarupananda Advaita 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

POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS
(Professional Elective V)

Course Code: GR22D5045 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Define the basic concepts of Distributed Generation.
2. Explain the concepts in photovoltaic energy conversion.
3. Illustrate the information about high power electronics for wind energy.
4. Strong foundation for ac–dc–ac converters for distributed power generation systems.
5. Elaborate the principle of modulation and control of single-phase grid-side converters.

Course Outcomes

1. Recall the concepts of Distributed Generation.
2. Develop the photovoltaic energy conversion.
3. Illustrate the high power electronic concepts for wind energy.
4. Analyze the ac–dc–ac conversion for distributed power generation systems.
5. Discuss modulation and control of single-phase grid-side converters.

UNIT I
AN OVERVIEW ON DISTRIBUTED GENERATION AND SMART GRID CONCEPTS AND TECHNOLOGIES

Introduction, Requirements of Distributed Generation Systems and Smart Grids, Photovoltaic Generators, Wind and Mini-hydro Generators, Energy Storage Systems, Electric Vehicles, Microgrids, Smart Grid Issues, Active Management of Distribution Networks, Communication Systems in Smart Grids, Advanced Metering Infrastructure and Real-Time Pricing Standards for Smart Grids.

UNIT II
PHOTOVOLTAIC ENERGY CONVERSION SYSTEMS

Introduction, Power Curves and Maximum Power Point of PV Systems- Electrical Model of a PV Cell, Photovoltaic Module I–V and P–V Curves, MPP under Partial Shading, Grid-Connected PV System Configurations- Centralized Configuration, String Configuration, Multi-string Configuration, AC-Module Configuration, Control of Grid-Connected PV Systems- Maximum Power Point Tracking Control Methods, DC–DC Stage Converter Control, Grid-Tied Converter Control, Anti-islanding Detection, Recent Developments in Multilevel Inverter-Based PV Systems

UNIT III
HIGH POWER ELECTRONICS: KEY TECHNOLOGY FOR WIND TURBINES

Introduction, Development of Wind Power Generation, Wind Power Conversion - Basic Control Variables for Wind Turbines, Wind Turbine Concepts; Power Converters for Wind Turbines - Two-Level Power Converter, Multilevel Power Converter, Multicell Converter; Power Semiconductors for Wind Power Converter Controls and Grid Requirements for Modern Wind Turbines – Active Power Control, Reactive Power Control, Total Harmonic Distortion, Fault Ride-Through Capability, Emerging Reliability Issues for Wind Power System

UNIT IV

AC–DC–AC CONVERTERS FOR DISTRIBUTED POWER GENERATION SYSTEMS

Introduction - Bidirectional AC–DC–AC Topologies, Passive Components Design for an AC–DC–AC Converter, DC-Link Capacitor Rating, Flying Capacitor Rating, L and LCL Filter Rating, Comparison; Pulse-Width Modulation for AC–DC–AC Topologies - Space Vector Modulation for Classical Three-Phase Two-Level and Three-Level Converter; DC-Link Capacitors Voltage Balancing in Diode-Clamped Converter - Pulse-Width Modulation for Simplified AC–DC–AC Topologies, Voltage-Oriented Control of an AC–DC Grid-Side Converter, Line Current Controllers of an AC–DC Grid-Side Converter, Direct Power Control with Space Vector Modulation of an AC–DC Grid-Side Converter, Line Power Controllers of an AC–DC Grid-Side Converter, DC-Link Voltage Controller for an AC–DC Converter.

UNIT V

MODULATION AND CONTROL OF SINGLE-PHASE GRID-SIDE CONVERTERS

Introduction, Modulation Techniques in Single-Phase Voltage Source Converters- Parallel-Connected H-Bridge Converter (H-BC), H-Diode Clamped Converter (H-DCC), H-Flying Capacitor Converter (H-FCC), Comparison; Control of AC–DC Single-Phase Voltage Source Converters, Single-Phase Control Algorithm Classification, DQ Synchronous Reference Frame Current Control – PI-CC, ABC Natural Reference Frame Current Control – PR-CC, Controller Design, Active Power Feed-Forward Algorithm

Text Books

1. Haitham Abu-Rub; Mariusz Malinowski; Kamal Al-Haddad, “Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications”, Wiley-IEEE Press, 2014.
2. John Twidell & Wier, “Renewable Energy Resources”, CRC Press, 2009.
3. D.P. Kothari, Singal, Rakesh, Ranjan, “Renewable Energy sources and Emerging Technologies”, PHI, 2009.

Reference Books

1. G.D. Rai, “Non-Conventional Energy Sources”, Khanna publishers.
2. B.H.Khan, “Non-Conventional Energy Sources”, PHI.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NON-LINEAR CONTROL FOR POWER ELECTRONIC CONVERTERS
(Professional Elective V)

Course Code: GR22D5045 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. To provide the students a deep insight in to dynamic models of power converters.
2. Learn basic concepts of bifurcation and chaos theory.
3. Analyze nonlinear phenomena in dc/dc converters.
4. Knowledge on nonlinear phenomena in other power electronic systems.
5. Explain the concepts of nonlinear control and control of chaos.

Course Outcomes

1. Understand the dynamic models of power converters.
2. Develop the basic concepts of bifurcation and chaos theory.
3. Analyze nonlinear phenomena in dc/dc converters.
4. Acquire knowledge on nonlinear phenomena in other power electronic systems.
5. Extend the knowledge of nonlinear control and control of chaos.

UNIT I
INTRODUCTION & DYNAMIC MODELS OF POWER CONVERTERS

Introduction to Power Electronics, An Example: The Buck DC/DC Converter, Study of Nonlinear Dynamics and Chaos in Power Electronics, Introduction to Power Electronic Converters and Models,A Closer Look at Sampled-Data Models for Power Converters.

UNIT II
BASICS OF BIFURCATION AND CHAOS THEORY

Introduction to Nonlinear Dynamics and Chaos, Bifurcations of Smooth Maps, Bifurcations in Piecewise-Smooth Maps, Nonstandard Bifurcations in Discontinuous Maps, The Method of Schwarzian Derivatives, Coexisting Attractors, Basins of Attraction, and Crises.

UNIT III
NONLINEAR PHENOMENA IN DC/DC CONVERTERS

Border Collision Bifurcations in the Current-Mode-Controlled Boost Converter, Bifurcation and Chaos in the Voltage-Controlled Buck Converter with Latch, Routes to Chaos in the Voltage-Controlled Buck Converter without Latch, Saddle-Node and Neimark Bifurcations in PWM DC/DC Converters, Nonlinear Analysis of Operation in Discontinuous-Conduction Mode, Nonlinear Phenomena in the Cuk Converter.

UNIT IV
NONLINEAR PHENOMENA IN OTHER POWER ELECTRONIC SYSTEMS

Modeling a Nonlinear Inductor Circuit, Inverters under Tolerance Band Control, Nonlinear Noise Effects in Power Converters, Nonlinear Phenomena in the Current Control of Induction Motors, Analysis of Stability and Bifurcation in Power Electronic Induction Motor Drive Systems.

UNIT V

NONLINEAR CONTROL AND CONTROL OF CHAOS

Conventional Nonlinear Controls in Power Electronics, Sliding Mode and Switching Surface Control, Energy-Based Control in Power Electronics , Ripple Correlation Control , Control of Chaos, Closed-Loop Regulation of Chaotic Operation, Control of Bifurcation, Synchronization of Chaos.

Text Books

1. Soumitro Banerjee; George C. Verghese "Nonlinear Phenomena in Power Electronics: Bifurcations, Chaos, Control, and Applications", Wiley-IEEE Press
2. Yaser Mohammadian Roshan, Nonlinear Control and Application of Power Electronics Boost Converters.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN AND DEVELOPMENT OF LED LIGHTING
(Professional Elective V)

Course Code: GR22D5047 **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

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: GR22D5147 **L/T/P/C: 3/0/0/3**
II Year I Semester

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
COST MANAGEMENT PROCESS

Introduction and Overview of the Strategic Cost Management Process, Cost concepts indecision-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 MANAGEMENT

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
PROJECT PLANNING

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

UNIT V
QUANTITATIVE TECHNIQUES
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. 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: GR22D5148 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Understand the importance of maintaining a safe work place.
2. Maintain safety standards incompliance with regulatory requirements and with in engineering limits understand personal safety and industrial safety.
3. Create a job safety analysis (JSA) for a given work project.
4. Follow safety record keeping and management, and the role of the safety manager.
5. Utilize personal proactive equipment.

Course Outcomes

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic work place monitoring. Ability to do Hazard analysis.
3. Demonstrate and understanding of work place 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 work place.
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, washrooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, 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, **i.** Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, 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, over hauling of mechanical components, over hauling 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 Information Services.
2. Maintenance Engineering, H.P. Garg, S.Chandand Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans,Chapman & HallLondon.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH
(Open Elective I)

Course Code: GR22D5149 **L/T/P/C:3/0/0/3**
II Year I Semester

Course Objectives

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

Course Outcomes

1. Formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. Carry out sensitivity analysis.
3. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. Distinguish various inventory models and develop proper inventory policies.
5. Propose the best strategy using decision making methods under uncertainty and game theory and design the simulation models.

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.

Simulation: Implementation of simulation modelling, Design of simulation models. Generation of random deviates, the uniform distribution and its importance to simulation, Generation of random numbers (Properties of uniformly distributed numbers, Mid-square technique, Mid-product, technique, Fibonacci method).

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 India 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS
(Open Elective I)

Course Code: GR22D5150 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Cater the knowledge of Neural Networks.
2. Know about concepts of feed forward neural networks.
3. Learn about the Paradigms of Associative Memory and Architecture of Hopfield Network.
4. Recall of adequate knowledge about fuzzy set theory.
5. Learn about applications of Fuzzy and Neural networks.

Course Outcomes

1. Summarize about Neural Networks.
2. Gain knowledge on feed forward neural networks.
3. Illustrate about Paradigms of Associative Memory and Architecture of Hopfield Network.
4. Comprehend about Classical and Fuzzy sets.
5. Simulate and Design Real time applications using Fuzzy and Neural networks.

UNIT I
INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, 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.

UNIT II
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. Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning difficulties and Improvements.

UNIT III
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

CLASSICAL& FUZZY SETS

Basic concepts of crisp sets and fuzzy sets, Types of fuzzy sets, Properties Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzification, Membership value assignment, development of rule base and decision-making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT V

APPLICATION OF FUZZY AND NEURAL NETWORKS:

Application in pattern recognition, Image processing and computer vision, Application in control: Fuzzy controllers, neuro controllers and fuzzy neuro controllers, applications in expert systems and decision-making systems, application in real world computing, Simulation Tools.

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY
(Open Elective I)

Course Code: GR22D5151 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Illustrate Cyber security challenges and their threats.
2. Summarize Cyber-attacks and their vulnerabilities.
3. Analyze about ethical hacking concepts and social engineering targets.
4. Examine cyber forensic investigation process.
5. Recognize cyber laws and ethics.

Course Outcomes

1. Recall the 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 Cyber security -How to Build a Successful Cyber defense Program Against Advanced Threats, A-press .
2. Nina Godbole, Sumit Belapure, Cyber Security, Willey.
3. Roger Grimes, Hacking the Hacker ,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: GR22D5152 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Assess the vision and introduction of IoT.
2. Know aboutNetworking & Communication aspects of IoT.
3. Explore the System hardware and prototyping.
4. List various hardware platforms of IoT and to analyze the current needs.
5. Classify Real World IoT Design Constraints, Industrial Automation in IoT, Case studies.

Course Outcomes

1. Summarize the concepts of Internet of Things.
2. Analyze basic protocols in Network & Communication aspects.
3. Illustrate about System hardware and prototyping in IoT.
4. Understand the Hardware Platform concepts of Internet of Things.
5. Design IoT applications in different domain studies and be able to analyze their performance.

UNIT I
INTRODUCTION TO IOT

The Internet of Things: An Overview, Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. Design Principles for Connected Devices. Design Principles for the Web Connectivity for connected-Devices.

UNIT II
NETWORK & COMMUNICATION ASPECTS

Internet Connectivity Principles, Connectivity terminologies-IOT Node, LAN, WAN, Gateway, IOT Stack vs. Web Stack, IoTIdentification and Data Protocols-IPV4, IPV6, HTTP, MQTT, COAP.
IoT & M2M Data Acquiring, Organizing and Analytics in IoT/M2M Applications/ Services/Business Processes, Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services.

UNIT III
SYSTEM HARDWARE AND PROTOTYPING

Sensors, Actuators, Radio Frequency Identification, Wireless Sensor Networks and Participatory Sensing Technology. Prototyping the Embedded Devices for IoTs. Prototyping Devices, Gateways, Internet and Web/Cloud Services Software Components.

UNIT IV
HARDWARE PLATFORMS: INTRODUCTION

Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Raspberry Pi Board introduction and Booting of OS introduction. Introduction to Python, Introduction to different IoT tools.

UNIT V

DEVELOPING IOTS ANDAPPLICATIONS AND CASE STUDIES

Developing sensor-based application through embedded system platform, Implementing IoT concepts with python. IoT Project Case Studies.

Text Books

1. Raj Kamal, “Internet Of Things Architecture & Design Principles”,Mcgraw Hill Education.
2. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”.
3. Jeeva Jose, “Internet of Things”, Khanna Publishing, 2018.
4. 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. Quas F.Hassan, Atta Ur Rehaman Khan, and Sajiad A. Madani, “Internet of Things Challenges, Advances and Applications”.