ACADEMIC REGULATIONS
PROGRAM STRUCTURE
and
DETAILED SYLLABUS

Master of Technology

(Power Electronics)

(Two Year Regular Programme)

(Applicable for Batches admitted from 2017)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

ACADEMIC REGULATIONS

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

For all Postgraduate Programmes (M.Tech)
GR17 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology-2017 Regulations (GR 17 Regulations) are given hereunder. These regulations govern all the Post Graduate programmes offered by various departments of Engineering with effect from the students admitted to the programmes from 2017-18 academic year.

1. **Programme Offered:** The Post Graduate programme offered by the department is M.Tech, a two-year regular programme in that discipline.

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

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

4. **Programme Pattern:**
   a) A student is introduced to "Choice Based Credit System (CBCS)" for which he/she has to register for the courses at the beginning of each semesters as per the procedure.
   b) Each Academic year of study is divided into two semesters.
   c) Minimum number of instruction days in each semester is 90.
   d) The total credits for the Programme is 88.
   e) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   f) A student has a choice of registering for credits from the courses offered in the programme.
   g) All the registered credits will be considered for the calculation of final CGPA.

5. **Award of M.Tech Degree:** A student will be declared eligible for the award of the M. Tech Degree if he/she fulfills the following academic requirements:
   a) A student shall be declared eligible for the award of M.Tech degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.

B) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech courses.

c) The Degree of M.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. Attendance Requirements

a) A student shall be eligible to appear for the semester end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.

d) A candidate shall get minimum required attendance at least in three theory subjects in the semester to get promoted to the next semester. In order to qualify for the award of M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

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

a) Paper setting and Evaluation of the Answer Scripts shall be done as per the procedures laid down by the Academic Council of the College from time to time.

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

S.no	Particulars	Internal	External	Total
1	Theory	30	70	100
2	Practical	30	70	100
3	Comprehensive Viva	-	100	100
4	Seminar	30	70	100
5	Project work	30	70	100

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

i. **Mid written examinations: 20 Marks**
ii. **Assignment: 5 Marks**
iii. **Continuous Assessment: 5 Marks**
iv. **Total: 30Marks**

d) Mid-Term Written Examination: There shall be two mid-term written examinations during a semester. The first mid-term written examination shall be conducted from the first

50 per cent of the syllabus and the second mid-term written examination shall be conducted from the remaining 50 per cent of the syllabus. The mid-term written examinations shall be evaluated for **20 marks** and average of the marks scored in the two mid-term written examinations shall be taken as the marks scored by each student in the mid-term written examination for that semester.

e) **Assignment:** Assignments are to be given to the students and marks not exceeding 5 (5%) per semester per paper are to be awarded by the teacher concerned.

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

i.	**Writing the program/Procedure:**	**10 Marks**
ii.	**Executing the program/Procedure:**	**10 Marks**
iii.	**Viva:**	**05 Marks**
iv.	**Continuous Assessment:**	**05 Marks**
v.	**Total:**	**30Marks**

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

i.	**Writing the program/Procedure:**	**20 Marks**
ii.	**Executing the program/Procedure:**	**20 Marks**
iii.	**Viva:**	**15 Marks**
iv.	**Lab Record:**	**15 Marks**
v.	**Total:**	**70 arks**

h) **Comprehensive Viva:** There shall be a Comprehensive Viva-Voce in II year I semester. The Comprehensive Viva-Voce will be conducted by the committee consisting of Head of the Department and two senior faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the student's understanding in various subjects he/she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued for 100 marks by the committee. There are no internal marks for the Comprehensive Viva-voce.

i) **Seminar:** There shall be two Seminar Presentations by the student, one each in I and II semesters. For the seminar, the student shall collect the information on a specialized topic other than his/her project and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by a Departmental committee consisting of the Head of the department, seminar Supervisor and a senior faculty member. **The seminar shall be evaluated for 100 marks. Internal evaluation is for 30 marks and external for 70 marks.**

j) Evaluation of Main Project Work: A Project Review Committee (PRC) is to be constituted by the Principal/Director with Head of the Department as the Chairman and two other senior faculty members of the department.

i. **Registration for Project work:** A candidate is permitted to register for the project work after satisfying the attendance requirements of all the courses (theory and practical courses) up to III Semester.

ii. After satisfying the registration requirements, a candidate is permitted to register for the project work after satisfying, the title, objectives and plan of action of his project work to the Project Review Committee for its approval. Only after obtaining the approval of Project Review Committee of the Department, the student can initiate the project work. Any changes thereafter in the project are to be approved by PRC. The student has to work under the guidance of both internal guide (one faculty member of the department) and external guide (from Industry not below the rank of an officer). Internal guide is allotted by the Head of the Department or Coordinator of the Project Work whereas external guide is allotted by the industrial organization in which the project is undertaken.

iii. The candidate shall submit status of the report in two stages at least with a gap of 20 days between them.

iv. The work on the project shall be initiated in the beginning of the fourth semester and the duration is one semester. A candidate is permitted to submit project report only after successful completion of theory and practical courses with the approval of PRC and not earlier than 40 days from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of the thesis to the Head/Coordinator (through internal research guide) and shall make an oral presentation before the PRC.

v. After approval from the PRC, the final thesis is to be submitted along with ANTI-PLAGIARISM report from the approved agency with a similarity index not more than 30%.

vi. Two hardcopies and one soft copy of the project work (dissertation) certified by the research supervisors shall be submitted to the College/Institute.

vii. The thesis shall be adjudicated by one external examiner selected by the Institute out of 5-member panel, submitted by the department.

viii. The marks allotted for project work review are 100, out of which30 are for internal and 70 for external. Internal evaluation marks are awarded by the PRC on the basis of the student's performance in the three pre-submission reviews and the external evaluation is done by the external examiner.

ix. The marks allotted for project work and dissertation are 100, out of which 30 are for internal and 70 for external. Internal evaluation marks are awarded by the PRC on the basis of the student's performance in the three pre-submission reviews and the external evaluation is done by the external examiner. In both internal and external evaluations the student shall score at least 40% marks and an aggregate of 50% marks to pass in the project work.

If the report of the examiner is favourable, Viva-voce examination shall be conducted by a Board consisting of the Supervisor, Head and the External Examiner who adjudicated the project work. The Board shall jointly evaluate the student's performance in the project work.

x. In case the student doesn't pass through the project work, he has to reappear for the viva-voce examination, as per the recommendations of the Board. If he fails succeed at the second Viva-voce examination also, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit the Project by the Board. Head of the Department and Project coordinator shall coordinate and make arrangements for the conduct of viva-¬voce examination. When one does get the required minimum marks both in internal and external evaluations the candidate has to revise and resubmit the dissertation in the time frame prescribed by the PRC. If the report of the examiner is unfavourable again, the project shall be summarily rejected.

xi. If the report of the viva-voce is not satisfactory, the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination, he will not be eligible for the award of the degree, unless the candidate is asked to revise and resubmit.

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

In the event of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In case of re-registration, the student has to pay the re-registration fee for each course, as specified by the college.

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

Letter Grade	Grade Point	Percentage of Marks
O (Outstanding)	10	Marks>=90
A+ (Excellent)	9	Marks>=80 and Marks < 90
A (Very Good)	8	Marks>=70 and Marks < 80
B+ (Good)	7	Marks>=60 and Marks < 70
B (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) S_k the SGPA of kth semester(1 to 4) is the ratio of sum of the product of the number of credits and grade points to the total creditsof all courses registered by a student,

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

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course and n is the number of courses registered in that semester.

ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by a student over all the semesters of a programme, i.e., upto and inclusive of Sk, where k ≥ 2.

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

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

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

Class Awarded		CGPA Secured
3.1	First class with distinction	CGPA ≥ 7.75
3.2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
3.3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

14. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against him, the result of the student (for that Semester) may be withheld and he will not be allowed to go into the next Semester. The award or issue of the Degree may also be withheld in such cases.

15. **Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

16. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the 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.

M.Tech (PE) **M.Tech (PE) PROGRAMME STRUCTURE** **I Year-I Semester**

Sub-Code	Group	Subject	L	T	P	C	Int	Ext	Total
GR17D5040	PC	Machine Modeling& Analysis	3	1	0	4	30	70	100
GR17D5037	PC	Analysis Of Power Electronic Converters	3	1	0	4	30	70	100
GR17D5039	PC	Power Electronic Control Of DC Drives	3	1	0	4	30	70	100
	OE-I	**Open Elective – I**	3	1	0	4	30	70	100
	Elective I		3	1	0	4	30	70	100
GR17D5041	PE	HVDC Transmission							
GR17D5042	PE	Energy Conservation Systems							
GR17D5054	PE	Advanced Digital Signal Processing							
	Elective II		3	1	0	4	30	70	100
GR17D5044	PE	Solar and Wind Energy							
GR17D5043	PE	Digital Control of Power Electronic Systems							
GR17D5045	PE	Special Machines							
GR17D5046	Lab	Electrical Systems Simulation Lab	0	0	2	2	30	70	100
GR17D5173	SPW	Seminar – I	0	0	2	2	30	70	100
		Total	**18**	**6**	**4**	**28**	**240**	**560**	**800**

M.Tech (PE) **M.Tech (PE) PROGRAMME STRUCTURE** **I Year-II Semester**

Sub-Code	Group	Subject	L	T	P	C	Int	Ext	Total
GR17D5036	PC	Modern Power Electronics	3	1	0	4	30	70	100
GR17D5047	PC	Power Electronic Control of AC Drives	3	1	0	4	30	70	100
GR17D5049	PC	Flexible AC Transmission Systems	3	1	0	4	30	70	100
	OE-I	**Open Elective – I**	3	1	0	4	30	70	100
	Elective III		3	1	0	4	30	70	100
GR17D5051	PE	Power Quality							
GR17D5052	PE	Digital Control Systems							
GR17D5067	PE	Electric Smart Grid							
	Elective IV		3	1	0	4	30	70	100
GR17D5048	PE	Microcontrollers							
GR17D5055	PE	Programmable Logic Controllers							
GR17D5056	PE	Reactive Power Compensation and Management							
GR17D5057	Lab	Power Converters Lab	0	0	2	2	30	70	100
GR17D5174	SPW	Seminar – II	0	0	2	2	30	70	100
Total			18	6	4	28	240	560	800

II Year-I Semester

Sub-code	Group	Subject	L	T	P	C	Int	Ext	Total
GR17D5175	SPW	Comprehensive Viva-voce	-	-	-	4	0	100	100
GR17D5176	SPW	Project work Review	-	-	-	12	30	70	100
Total			-	-	-	16	30	170	200

II Year-II Semester

Sub-Code	Group	Subject	L	T	P	C	Int	Ext	Total
GR17D5177	SPW	Project work and Dissertation	-	-	-	16	30	70	100
Total			-	-	-	16	30	70	100

A student has a choice to select one Open Elective Pool I in I Semester and one Open Elective Pool II in II Semester.

Open Elective Pool-I

	Group	Subject	L	T	P	C	Int.	Ext.	Total
GR17D5178	OE-I	E- Commerce and Applications (CSE)	3	1	0	4	30	70	100
GR17D5179		Enterprise Resource Planning (IT)	3	1	0	4	30	70	100
GR17D5180		Modern Control Theory (EEE)	3	1	0	4	30	70	100
GR17D5181		Computer Oriented Numerical Methods in Engineering (CE)	3	1	0	4	30	70	100
GR17D5182		Advanced Computer Architecture (ECE)	3	1	0	4	30	70	100
GR17D5183		Operations Research (ME)	3	1	0	4	30	70	100

Open Elective Pool-II

Sub-Code	Group	Subject	L	T	P	C	Int	Ext	Total
GR17D5184	OE-II	Human Computer Interaction (CSE)	3	1	0	4	30	70	100
GR17D5185		Big Data and Analytics (IT)	3	1	0	4	30	70	100
GR17D5186		Neural and Fuzzy Systems (EEE)	3	1	0	4	30	70	100
GR17D5187		Project Management (CE)	3	1	0	4	30	70	100
GR17D5188		Hardware Software Co-Design(ECE)	3	1	0	4	30	70	100
GR17D5189		Non-Conventional Energy Resources(ME)	3	1	0	4	30	70	100

I- SEMESTER

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

MACHINE MODELING AND ANALYSIS

M.Tech (Power Electronics) I Year - I Semester
Course Code: GR17D5040 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Electrical machines, Mathematical Formulae.

COURSE OBJECTIVES: The objective of this course is to provide

- Strong back ground of mathematical equations of electrical machines
- Knowledge how to control ac machines like dc machines.
- Knowledge on decoupling of active and reactive components.]
- Design and simulate all ac machines in a frame of reference.
- Knowledge on transformation techniques

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

- Define the advances in machine modelling.
- Evaluate the design and Working of DC machines.
- Articulate mathematical model of separately excited DC motor.
- Evaluate all Transformation Techniques.
- Techniques for analyzing voltage, current and torque equations of synchronous machines.
- Techniques for analyzing voltage, current and torque equations of synchronous machines in state variable form
- Techniques to stimulate synchronous in two axis frame.

UNIT-I

Basic concepts of Modeling –Conventions- transformations- Speed, voltages in armature- Basic Two-pole Machine representation of generalized machine, Kron's primitive Machine-voltage, current and Torque equations.

UNIT-II

DC Machine Modeling - Mathematical model of separately excited D.C motor – Steady State analysis-Transient State analysis-Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor-Linearization Techniques for small perturbations.

UNIT-III

Reference Frame Theory Linear Transformation-Phase transformation - three phase to two phase transformation (abc to αβ0) and two phase to three phase transformation αβ0 to abc - -Power

equivalence.

UNIT-IV

Modeling of three phase Induction Machine Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-state space model with flux linkages as variables.

UNIT- V

Modeling of Synchronous Machine Synchronous machine inductances – Mathematical model-transformation to the rotor's dq0 reference frame- Flux linkages in terms of winding currents-referring rotor quantities to the stator- voltage equations in the rotor's dq0 reference frame-electromagnetic torque-currents in terms of flux linkages-steady state operation- modeling of PM Synchronous motor, modeling of BLDC motor.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Thyristor control of Electric Drives - Vedam Subramanian.
2. Analysis of electric machinery and Drive systems - Paul C.Krause, Oleg wasynezuk, Scott D.Sudhoff.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALYSIS OF POWER ELECTRONIC CONVERTERS

M.Tech (Power Electronics) I Year - I Semester
Course Code: GR17D5037 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Control Systems, Mathematical Formulae

COURSE OBJECTIVES: The objective of this course is to provide

- Analysis of single and three phase ac voltage controllers and cycloconverters.
- Knowledge on different circuit evaluation parameters in single and three phase inverter circuits for practical design.
- Design of controllers for dc-dc converters in voltage and peak current mode.
- Knowledge on different pf improvement techniques in single and three phase converters.
- Simulation techniques of inverters

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

- Design power electronic converters for power control applications.
- Analyze ac voltage controllers.
- Analyze cyclo-converters.
- Design dc-dc converters.
- Express the design and control of rectifiers and inverters.
- Simulate svm method in inverters.
- Articulate the basic power electronic circuits

UNIT-I

SINGLE PHASE AC VOLTAGE CONTROLLERS: Single phase AC voltage controllers with Resistive, Resistive-inductive and Resistive-inductive-induced e.m.f. loads - ac voltage controllers with PW Control - Effects of source and load inductances - Synchronous tap changers-Applications - numerical problems.

UNIT-II

THREE PHASE AC VOLTAGE CONTROLLERS: Three phase AC voltage controllers - Analysis of controllers with star and delta Connected Resistive, Resistive-inductive loads - Effects of source and load Inductances - applications - numerical problems.

CYCLOCONVERTERS: Single phase to single phase cycloconverters - analysis of midpoint and bridge Configurations - Three phase to three phase cycloconverters - analysis of Midpoint and bridge configurations - Limitations - Advantages - Applications- numerical problems

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UNIT –III

SINGLE PHASE CONVERTERS: Single phase converters - Half controlled and Fully controlled

converters -Evaluation of input power factor and harmonic factor - continuous and Discontinuous load current - single phase dual converters - power factor Improvements - Extinction angle control - symmetrical angle control - PWM -single phase sinusoidal PWM - single phase series converters - Applications -Numerical problems.

THREE PHASE CONVERTERS: Three phase converters - Half controlled and fully controlled converters -Evaluation of input power factor and harmonic factor - continuous and Discontinuous load current - three phase dual converters - power factor Improvements - three phase PWM - twelve pulse converters - applications -Numerical problems.

UNIT -IV

D.C. TO D.C. CONVERTERS: Analysis of step-down and step-up dc to dc converters with resistive and Resistive-inductive loads - Switched mode regulators - Analysis of Buck Regulators - Boost regulators - buck and boost regulators - Cuk regulators - Condition for continuous inductor current and capacitor voltage - comparison of regulators –Multi ouput boost converters - advantages - applications - Numerical problems.

UNIT-V

PULSE WIDTH MODULATED INVERTERS (SINGLE PHASE): Principle of operation - performance parameters - single phase bridge inverter -evaluation of output voltage and current with resistive, inductive and Capacitive loads - Voltage control of single phase inverters - single PWM - Multiple PWM - sinusoidal PWM - modified PWM - phase displacement Control - Advanced modulation techniques for improved performance - Trapezoidal, staircase, stepped, harmonic injection and delta modulation - Advantage - application - numerical problems.

PULSE WIDTH MODULATED INVERTERS (THREE PHASE): Three phase inverters - analysis of 180 degree condition for output voltage And current with resistive, inductive loads - analysis of 120 degree Conduction - voltage control of three phase inverters - sinusoidal PWM - Third Harmonic PWM – 60 degree PWM - space vector modulation - Comparison of PWM techniques-harmonic reductions - Current Source Inverter - variable d.c. link inverter - boost inverter - buck and boost inverter - inverter circuit design - advantages -applications - numerical problems.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Power Electronics - Mohammed H. Rashid - Pearson Education -Third Edition - First Indian reprint 2004.
2. Power Electronics - Ned Mohan, Tore M. Undeland and William P. Robbins -John Wiley and Sons - Second Edition

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER ELECTRONIC CONTROL OF DC DRIVES

M.Tech (Power Electronics) I Year - I Semester
Course Code: GR17D5039 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Control Systems, Electrical Machines.

COURSE OBJECTIVES: The objective of this course is to provide

- Deep insight of different types of DC drives and their usage.
- Knowledge on different control techniques of DC Motors.
- Analysis of the controlling performances of DC Motor with 1-ph and 3-ph bridge rectifiers.
- Information on simulation of DC motor drives.
- Knowledge on different operations of a chopper for a DC drive.

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

- Perform the analysis of different types of drives and their controllers for DC motors.
- Relate the performance characteristics of different types of drives.
- Analyse the different modes of operation of 1-ph and 3-ph controlled bridge rectifier for DC motor.
- Relate the performances of 1-ph & 3-ph controlled bridge rectifiers with DC motor as a load.
- Understand the different quadrant operations of a chopper for a DC drive.
- Extend the knowledge of current control, speed control and chopper control for closed loop operation of DC motor drives.
- Apply the knowledge of control techniques to do the simulation of DC motor drives.

UNIT-I

CONTROLLED BRIDGE RECTIFIER (1-Φ) WITH DC MOTOR LOAD: Separately exited DC motors with rectified single-phase supply – single phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

UNIT-II

CONTROLLED BRIDGE RECTIFIER (3-Φ) WITH DC MOTOR LOAD: Three-phase semi converter and three phase full converter for continuous and discontinuous modes of operation – power and power factor – Addition of freewheeling diode- Three-phase double converter.
THREE PHASE NATURALLY COMMUTATED BRIDGE CIRCUIT AS A RECTIFIER OR AS AN INVERTER: Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT-III

PHASE CONTROLLED DC MOTOR DRIVES: Three phase controlled converter, control circuit, control modeling of three phase converter – Steady state analysis of three phase converter control DC motor drive – Two quadrant, three phase converter controlled DC motor dive – DC motor and load converter.

CURRENT AND SPEED CONTROLLED DC MOTOR DRIVES: Current and speed controllers – current and speed feedback – Design of controllers – current and speed controllers – Motor equations – filter in the speed feedback loop speed controller – current reference generator – current controller and flow chart for simulation – Harmonics and associated problems – sixth harmonics torque

UNIT-IV

CHOPPER CONTROLLED DC MOTOR DRIVES: Principles of operation of the chopper – four-quadrant chopper circuit – chopper for inversion – Chopper with other power devices – model of the chopper –input to the chopper steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque.

CLOSED LOOP OPERATION OF DC MOTOR DRIVES: Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller.

UNIT-V

SIMULATION OF DC MOTOR DRIVES: Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – command current generator – current controller.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Power Electronic and motor control – Shepherd, Hulley, Liang – II Edition, Cambridge University Press.
2. Electric Motor drives modeling, Analysis and control – R. Krishnan – I Edition, Prentice Hall India.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

HIGH VOLTAGE DC TRANSMISSION
(Elective-I)

M.Tech (Power Electronics) I Year - I Semester

Course Code: GR17D5041 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Power Systems.

COURSE OBJECTIVES: The objective of this course is to provide

- Evaluation of technical and economical aspects of HVDC transmission.
- Information on Voltage source converter based transmission
- Development of HVDC converter analysis
- Focus on HVDC control
- Knowledge on VSC HVDC control
- Analysis of harmonics and their rectification.
- Impact of AC system performance on DC system

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

- compare the differences between HVDC and HVAC transmission.
- Know about VSC transmission advantages.
- Analyze the rectifer and inverter commutating circuits.
- Cover the different control strategies.
- Identification of valve firing control schemes.
- Estimate the requirement of HVDC filters.
- 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 pulse converter , harmonics in VSC converter , harmonic model and equivalent circuit ,design of AC filters , single tuned and double tuned high pass filters , second order filters and C-Type filter, Reactive power considerations of AC filters , Active filters and their applications, filters with VSC-HVDC schemes.

UNIT-V

Faults on AC side of converter station: 3-phase symmetrical fault and asymmetrical faults, commutation failure, DC circuit breaker, Multi Terminal HVDC system: series and parallel MTDC systems and their operation and control, AC-DC system interaction short circuit rates and its effects.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. K.R.Padiyar., HVDC Power Transmission System (English) 2nd edition.
2. Arillaga, High Voltage Direct Transmission,(London) Peter Peregrinus, 1981.

REFERENCE BOOKS

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

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENERGY CONVERSION SYSTEMS
(Elective-I)

M.Tech (power Electronics) I Year - I Semester

Course Code: GR17D5042 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Solar cells, Types of power stations, Energy conversion

COURSE OBJECTIVES: The objective of this course is to provide

- Deep insight in to the spectral distribution of energy in solar radiation
- Analysis of test specifications for PV systems.
- Principles of MHD power generation .
- Knowledge on Wind Energy conversion systems.
- Information on OTEC systems.

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

- Define the advances in spectral distribution
- Evaluate the design and Principles of MHD power generation.
- Articulate MHD technology in power control applications.
- Evaluate the Application of OTEC systems
- Know the techniques for principles of EMF generation
- Evaluate Global energy position and environmental effects.
- Know the techniques for energy storage

UNIT-I

Photo voltaic power generation -spectral distribution of energy in solar radiation- solar cell configurations- voltage developed by solar cell- photo current and load current- practical solar cell performance- commercial photo voltaic systems- test specifications for PV systems- applications of super conducting materials in electrical equipment systems.

UNIT -II

Principles of MHD power generation- ideal MHD generator performance- practical MHD generator-MHD technology. Wind Energy conversion: Power from wind- properties of air and wind- types of wind Turbines- operating characteristics.

UNIT- III

Tides and tidal power stations- Modes of operation- tidal project examples- turbines and generators for Tidal power generation. Wave energy conversion: properties of waves and Power content-vertex motion of Waves- device applications. Types of Ocean thermal energy conversion systems Application of OTEC systems Examples.

UNIT- IV

Miscellaneous energy conversion systems: coal gasification and liquefaction- biomass conversion- geothermal energy- thermo electric energy conversion- principles of EMF generation- description of Fuel cells- Co-generation and energy storage- combined cycle co-generation- energy storage. Global energy position and environmental effects: energy units- global energy position.

UNIT -V

Types of Fuel cells-H_2O_2Fuel cells- Applications of fuel cells-Batteries- Description of Batteries- Battery application for large power. Environmental effects of energy conversion systems-pollution from coal and preventive measures steam stations and pollution- pollution free energy systems.

TEACHING METHODOLOGIES

1. White board
2. PPT's
3. Seminars

TEXT BOOKS

1. "Energy conversion systems" by Rakosh das Begamudre, New age international publishers, New Delhi - 2000.
2. Renewable Energy Resources by John Twidell and Tony Weir, second edition, Espon and Co.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DIGITAL SIGNAL PROCESSING (Elective-I)

M.Tech (Power Electronics) | I Year - I Semester
Course Code: GR17D5054 | L/T/P/C : 3/1/0/4

PRE–REQUISITE: Control Systems, signals and systems.

COURSE OBJECTIVES

- To introduce the basic concepts and techniques for processing signals.
- To familiarize students with the most important methods in DSP, including digital filter design.
- To familiarize students with the transform-domain processing and importance of Signal Processors.
- To provide students with intuitive understanding and practical implementations of the theoretical concepts.

COURSE OUTCOMES

- Define the structure of digital filters.
- Evaluate the design and control of filters
- Articulate DSP control algorithm in digital control applications.
- Evaluate the design and control filters in finite set
- Techniques for analyzing and design filters
- Evaluate the design and control power spectrum
- Techniques to Design filters using the DSP algorithms.

UNIT-I

DIGITAL FILTER STRUCTURES: Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures All pass Filters- tunable IIR Digital Sine-cosine generator-computational complexity of digital filter structures.

UNIT-II

DIGITAL FILTER DESIGN: Preliminary considerations. Bilinear transformation method of IIR filter design-design of Low pass highpass- Bandpass, and Band stop- IIR digital filters-Spectral transformations of hR filters-FIR filter design-based on Windowed Fourier series-design of FIR digital filters with least-mean square-error-constrained Least-square design of FIR digital filters.

UNIT –III

DSP ALGORITHM IMPLEMENTATION: Computation of the discrete Fourier transform-Number representation-Arithmetic operations-handling of overflow-Tunable digital filters-function approximation.

UNIT –IV

ANALYSIS OF FINITE WORD LENGTH EFFECTS: The Quantization process and errors-Quantization of fixed-point and floating-point Numbers-Analysis of coefficient Quantization effects-Analysis of Arithmetic Round-off errors-Dynamic range scaling-signal-to-noise in Low-order IIR filters-Low-Sensitivity Digital filter-Reduction of Product round-off errors feedback-Limit cycles in IIR digital filter-Round-off errors in FFT Algorithms.

UNIT-V

POWER SPECTRUM ESTIMATION: Estimation of spectra from Finite Duration Observations signals-Non-parametric methods for power spectrum estimation-parametric method for power spectrum Estimation-Estimation of spectral form- Finite duration observation of signals-Non-parametric methods for power spectrum estimation-Walsh methods-Blackman and torchy method.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Digital signal processing —sanjit K. Mitra —TMH second edition
2. Discrete Time Signal Processing —Alan V. Oppenheim, Ronald W, Shafer —PHI 1996 Ist Edition reprint
3. Digital Signal Processing principles — algorithms and Applications- john U Proakis — P111 — 3rd edition 2002.
4. Digital Signal Processing — S Salivahanan. A. Vallavaraj C. Gnanapriya — TMH — 2nd reprint 2001.
5. Theory and Applications of Digital Signal Processing —Lourens R RebinarandBernold.
6. Digital Filter Analysis and Design Auntoniam — TMH.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOLAR AND WIND ENERGY
(Elective-II)

M.Tech (power Electronics) I Year - I Semester

Course Code: GR17D5044 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Solar energy, Wind energy

COURSE OBJECTIVES: The objective of this course is to provide

- Introduction of the basic concepts of solar and wind energies.
- Knowledge on the solar power extraction and collection.
- Informationand installation of wind and photo voltaic systems.
- Knowledge of PV solar panels and wind generators.
- Applications of wind and solar power technologies for hybrid power generation

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

- Explain the principles that underlie the ability of various natural phenomena to deliver solar energy.
- Outline the technologies that are used to harness the power of solar energy.
- Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment.
- Explain the principles that underlie the ability of various natural phenomena to deliver wind energy.

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

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

REFERENCE BOOKS

1. B.H.Khan, “Non- Conventional Energy Resources”, 2nd edition, Tata McGraw-Hill, New Delhi

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL CONTROL OF POWER ELECTRONICS SYSTEMS (Elective-II)

M.Tech (Power Electronics) I Year - I Semester
Course Code: GR17D5043 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Control Systems.

COURSE OBJECTIVES: The objective of this course is to provide

- The concepts and applications of Digital Power Electronics
- Methods used for implementing digital conversion to real time applications of Power Electronics
- Knowledge on the importance of Digital Controlling of converters.
- Design concepts of digital power electronic circuits.
- Implementation of PWM techniques using digital control

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

- Understand digital controlling methods and ability to design it.
- Deal with the different types of converters
- Test the difference between closed loop and open loop
- Design mathematical models of the different types of converters
- Implement pwm techniques using digital control.
- Understand system responses with fast acting digital controllers.
- Impart knowledge for research studies in digital power electronics.

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, Introduction to reconstruction of sampled signals, Data conversion: the zero-order hold, The first-order hold, The second-order hold, The Laplace transform (the s-domain), The z-transform (the z-domain)

UNIT-II

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

UNIT-III

Digitally Controlled AC/DC Rectifiers – Introduction, Mathematical modelling for AC/DC Rectifiers, Single-phase half-wave controlled AC/DC rectifier, Single-phase full-wave AC/DC rectifier, Three-

phase half-wave controlled AC/DC rectifier, Three-phase full-wave controlled AC/DC rectifier, Three-phase double-anti-star with interphase-transformer controlled AC/DC rectifier, Six-phase half-wave controlled AC/DC rectifier, Six-phase full-wave controlled AC/DC rectifier.

UNIT-IV

Digitally Controlled DC/AC Inverters – Introduction, Mathematical modelling for DC/AC PWM inverters, Single-phase half-wave VSI, Single-phase full-bridge PWM VSI, Three-phase full-bridge PWM VSI, Three-phase full-bridge PWM CSI, Multistage PWM inverter, Multilevel PWM inverter.

Digitally Controlled DC/DC Converters – Introduction, Mathematical Modelling for power DC/DC converters, Fundamental DC/DC converter, Developed DC/DC converters, Soft-switching converters, Multi-element resonant power converters.

UNIT-V

Open- loop Control for Digital Power Electronics – Introduction, Stability analysis, Unit-Step function responses, Impulse responses, Summary.
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.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS:

1. Digital Power Electronics and Applications – Fang Lin Luo Hong Ye Muhammad Rashid, ELSEVIER Academic Press

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

SPECIAL MACHINES

(Elective —II)

M.Tech (power Electronics) I Year - I Semester
Course Code: GR17D5045

PRE–REQUISITE: Power Electronics, Control Systems, Power Systems

COURSE OBJECTIVES: The objective of this course is to provide

- A deep insight in to the working of special dc machines with respect to their characteristics.
- Analysis of stepper motors.
- Recent technologies on advancedpermanent magnet materials and motors
- Knowledge ofconventional dc motor operaion and analysis.
- Design techniques of linear induction motors.

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

- Define the advances in dc machines.
- Evaluate the design and control of stepper motors.
- Articulate reluctance motors in control applications.
- Evaluate the design and control of variable stepper motors.
- Analyze and design of permanent magnet materials.
- Evaluate the design and control of dc machines
- Design linear induction motors

UNIT-I

SPECIAL TYPES OF D.C MACHINES-I: Series booster-Shunt booster-Non-reversible boost-Reversible booster

SPECIAL TYPES OF DC MACHINES –II: Armature excited machines—Rosenberg generator-The Amplidyne and Metadyne— Rototrol and Regulex-third brush generator-three-wire generator-dynamometer.

UNIT–II

STEPPER MOTORS: Introduction-synchronous inductor (or hybrid stepper motor)-Hybrid stepping motor-Construction-principles of operation- Energization with two phase at a time-essential conditions for the satisfactory operation of a 2-phase hybrid step motor - very slow - speed synchronous motor for servo control-different configurations for switching the phase windings-control circuits for stepping motors-an open-loop controller for a 2-phase stepping motor.

UNIT-III

VARIABLE RELUCTANCE STEPPING MOTORS: Variable reluctance (VR) Stepping motors, single-stack VR step motors, Multiple stack VRmotors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor-discriminator (or rotor position sensor) transilator- major loop-characteristics of step motor in open-loop drive – comparison between open-loop position control with step motor and a positioncontrol servo using a conventional (dc or ac) servo motor-Suitability and areas of application of stepping motors-5- phase hybrid stepping motor - single phase - stepping motor, the construction, operating principle torque developed in the motor.

UNIT-IV

SWITCHED RELUCTANCE MOTOR: Introduction – improvements in the design of conventional reluctance motors- Some distinctive differences between SR and conventional reluctance motors-principle of operation of SRM- Some design aspects of stator and rotor pole arcs, design of stator and rotor and pole arcs in SR motor-determination of L(θ)-θ profile - power converter for SR motor-A numerical example –Rotor sensing mechanism and logic control, drive and power circuits, position sensing of rotor with Hall problems-derivation of torque expression, general linear case.

PERMANENT MAGNET MATERIALS AND MOTORS: Introduction- Hysteresis loops and recoil line- stator frames (pole and yoke - part) of conventional PM dc Motors- Equivalent circuit of a PM-Development of Electronically commutated dc motor from conventional dc motor.

UNIT-V

BRUSHLESS DC MOTOR: Types of construction – principle of operation of BLDM- sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit-Theoretical analysis and performance prediction, modeling and magnet circuit d-q analysis of BLDM -transient analysis formulation in terms of flux linkages as state variables-Approximate solution for current and torque under steady state – Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution)-Methods or reducing Torque Pulsations, 180 degrees pole arc and 120 degree current sheet.

LINEAR INDUCTION MOTOR: Development of a double sided LIM from rotary type IM- A schematic of LIM drive for electrictraction development of one sided LIM with back iron-field analysis of a DSLIM fundamentalassumptions.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. K.venkataratnam, “Special electrical machines” - University press.
2. R.k. Rajput ,“Electrical machines”-5th edition.
3. V.V. Athani,“ Stepper motor : Fundamentals , Applications and Design”- New age International publication.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL SYSTEMS SIMULATION LAB

M.Tech (power Electronics) I Year - I Semester
Course Code: GR17D5046 L/T/P/C : 0/0/4/2

PRE–REQUISITE: Power Electronics, Control Systems, Power Systems

COURSE OBJECTIVES: The objective of this course is to provide

- various modules in software for simulating experiments.
- Simulations of various power electronic converters in software.
- Knowledge on various converter experiments.
- Information on solving transfer functions.
- Simulations of different SMPS circuits

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

- Simulateelectrical system circuits.
- Do various engineering projects
- Simulate controlled rectifiers
- Conduct simulations in inverter circuits.
- Conduct simulations in stability analysis.
- Simulate differentsmps circuits.
- Conduct simulations for multi level inverters.

SYLLABUS

List Of Experiments

1 STEP, Ramp, Impulse, Sinusoidal Response Of Series RLC Circuit.
2 Single Phase Half & Full Wave Rectifier With R & RL Load.
3 Three Phase Bridge Rectifier With Source Inductance.
4 Single Phase Full Wave Rectifier With Load Filter.
5 Single Phase Half & Fully Controlled Rectifier with RL-Load.
6 Single Phase & Full Wave Ac Voltage Controller.
7 State Space To Transfer Function.
8 Transfer Function To State Space.
9 Simulate LPF, HPF Filters.
10 Simulate Digital Filters.
11 Simulate Buck & Boost Converter with Open and Close Loops Operation.
12 Simulate Cuk&FlyBack Converter with Open and Close Loops Operation.
13 Simulate Z Source Inverters.
14 Simulate 3level and 5level Multi level Inverters.
15 Simulate Static Voltage Compensator (SVC).

OPEN ELECTIVE - I

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

E - COMMERCE AND APPLICATIONS
(Open Elective I)

M.Tech (CSE) I Year - I Semester

Course Code: GR17D5178 L/T/P/C : 3/1/0/4

Course Objectives

- To understand the interest and opportunity of e-commerce
- To know and understand the critical success factors in implementing an ecommerce
- System
- To know how to plan and how to manage e-commerce solutions
- To have hands on, real-life experience with electronic commerce applications
- To analyze and understand the human, technological and business environment
- Associated with e-commerce

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

- Understand the trends in e-Commerce and the use of the Internet.(Level 2)
- Analyze, Understand and Comparethe principles of E-commerce and basics of World Wide Web.(Level 2&4)
- Analyze, Understandthe concept of electronic data interchange and its legal, social and technical aspects.(Level 2&4)
- Understandand Evaluate the security issues ssssover the web, the available solutions and future aspects of e-commerce security .(Level 2&5)
- Understanding and Validating the concept of E-banking, electronic payment system.(Level 2&5)
- Understand, Analyze and Comparethe capabilities and limitation of agents, Web based marketing and various security Issues. (Level 2&4)
- Understandingand Evaluation of online advertisements, website design issues and Creating a business transaction using an e commerce site.(Level 2,5 &6)

UNIT-I

INTRODUCTION Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce, advantages of E commerce, anatomy of e commerce applications.

UNIT-II

INFRASTRUCTURE FOR E COMMERCE Packet switched networks – TCP/IP protocol script – Internet utility programmes – SGML, HTML and XML – web client and servers – Web client/server architecture – intranet and extranets.

UNIT-III

WEB BASED TOOLS FOR E COMMERCE Web server – performance evaluation - web server software feature sets – web server software and tools – web protocol – search engines – intelligent agents –EC software – web hosting – cost analysis

UNIT- IV

SECURITY Computer security classification – copy right and Intellectual property – electronic commerce threats – protecting client computers – electronic payment systems and risks involved in it –electronic cash __ micro payment system– strategies for marketing – sales and promotion – cryptography –authentication.

UNIT-V

INTELLIGENT AGENTS Definition and capabilities – limitation of agents – security – web based marketing – search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.

TEXT BOOKS

1. Ravi Kalakota, " Electronic Commerce", Pearson Education,
2. Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.

REFERENCES BOOK

1. EfraimTurvanJ.Lee, David kug and chung, "Electronic commerce" Pearson Education Asia 2001.
2. Brenda Kienew E commerce Business Prentice Hall, 2001.
3. Manlyn Greenstein and Miklos "Electronic commerce" McGraw-Hill, 2002.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENTERPRISE RESOURCE PLANNING
(Open Elective-I)

M.Tech (IT) I Year - I Semester

Course Code: GR17D5179 L/T/P/C : 3/1/0/4

PREREQUISITES

- Fundamentals of enterprise resource planning (ERP) systems concepts
- Importance of integrated information systems in an organization.

COURSE OBJECTIVES: The objective of the course is to provide the student

- Understanding of the basic concepts of ERP systems for manufacturing or service companies, and the differences among MRP, MRP II, and ERP systems
- Thinking in ERP systems: the principles of ERP systems, their major components, and the relationships among these components
- Capability to adapt in-depth knowledge of major ERP components, including material requirements planning, master production scheduling, and capacity requirements planning
- Understanding knowledge of typical ERP systems, and the advantages and limitations of implementing such systems
- Understanding the business process of an enterprise
- Grasp the activities of ERP project management cycle
- Understanding the emerging trends in ERP developments

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

- Examine systematically the planning mechanisms in an enterprise, and identify all components in an ERP system and the relationships among the components
- Understand production planning in an ERP system, and systematicallydevelop plans for an enterprise
- Use methods to determine the correct purchasing quantity and right time to buy an item, and apply these methods to material management
- Understand the difficulties of a manufacturing execution system, select a suitable performance measure for different objectives, and apply priority rules to shop floor control
- Knowledge of ERP implementation cycle
- Awareness of core and extended modules of ERP
- Apply emerging trends in ERP

UNIT-I

Introduction: Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

UNIT-II

IMPLEMENTATION: Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

UNIT- III

BUSINESS MODULES: Business Modules in an ERP Package – Finance – Manufacturing – Human Resource –Plant Maintenance – Materials Management – Quality Management – Sales and Distribution.

UNIT- IV

ERP MARKET: ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

UNIT- V

ERP-Present and future : Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP.

TEXT BOOKS

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning” , Thomson Learning, 2001.
3. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning – concepts and Planning”, Prentice Hall, 1998.
4. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN CONTROL THEORY
(Open Elective-I)

M.Tech (EEE) I Year - I Semester

Course Code: GR17D5180 L/T/P/C : 3/1/0/4

PREREQUISITE: Control Systems, Mathematics.

COURSE OBJECTIVES

- To familiarize students with the modelling of systems
- To familiarize the students with the state space analysis of dynamic systems and observe their controllability and Observability.
- To make students understand the concepts of describing function analysis of nonlinear systems and analyze the stability of the systems.
- To analyze the stability of the nonlinear systems.

COURSE OUTCOMES

- Ability to obtain the mathematical model of any system.
- Ability to obtain the state model for dynamic systems.
- Ability to analyze the controllability and Observability for various types of control systems.
- Ability to understand the various types of nonlinearity.
- Ability to analyze the stability of the nonlinear systems.
- Ability to synthesize the nonlinear systems.

UNIT-I

MATHEMATICAL PRELIMINARIES: Fields, Vectors, Vector Spaces — Linear combinations and Bases — Linear Transformations and Matrices — Scalar Product and Norms ,Eigenvalues, Eigen Vectors and a Canonical form representation of linear operators, The concept of state — State Equations for Dynamic systems, Time invariance and Linearity Non uniqueness of state model — State diagrams for Continuous-Time State models.

UNIT-II

STATE VARIABLE ANALYSIS: linear Continuous time models for Physical systems-- Existence and Uniqueness of Solutions to Continuous- time State Equations — Solutions of Linear Time Invariant Continuous-Time State Equations—State transition matrix and it's properties.

CONTROLLABILITY AND OBSERVABILITY-General concept of controllability— General concept of Observability—Controllability tests for Continuous-Time Invariant Systems ---
Observability tests for Continuous-Time Invariant Systems— Controllability and Observability of State Model in Jordan Canonical form— Controllability and Observability Canonical forms of State model.

UNIT- III

NON LINEAR SYSTEMS -I

Introduction to Non Linear Systems - Types of Non-Linearities-Saturation-Dead-Zone - Backlash Jump Phenomenon etc;— Singular Points-Introduction to Linearization of nonlinear systems, Properties of Non Linear systems-Describing function-describing function analysis of nonlinear systems-Stability analysis of Non-Linear systems through describing functions.

UNIT-IV

NON LINEAR SYSTEMS-II

Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase- plane analysis of nonlinear control systems.

UNIT-V

STABILITY ANALYSIS

Stability in the sense of Lyapunov, Lyapunovs stability and Lyapunov's instability theorems - StabilityAnalysis of the Linear continuous time invariant systems by Lyapunov second method — Generation of Lyapunov functions Variable gradient method — Krasooviski's method.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Modern Control System Theory by M.Gopal — New Age International -1999
2. Modern Control Fngineering by Ogata:K — Prentice Hall – 1997

REFERENCE BOOK

1. Control Systems Engineering, N. S. Nise: 4th Ed., Wiley, 2004.Engineering, 4th Ed., Wiley, 2004.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER–ORIENTED NUMERICAL METHODS IN ENGINEERING
(Open Elective-I)

M.Tech (Civil) I Year - I Semester

Course Code: GR17D5181 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES

- To develop the skill of solving linear algebraic systems by direct and iteration methods.
- To illustrate advanced matrix techniques in the determination of Eigen values and Eigen vectors of square matrix.
- To analyze the performance of various interpolation technique and perform error analysis.
- To compare various numerical differentiation and integration techniques. •
- To explain the various techniques to study Initial and Boundary value problems in ODE.
- To solve a range of problems on applicable software.

COURSE OUT COMES: At the end of the course the student will be able to

- Solve linear algebraic system by direct and iteration methods.
- Apply the knowledge of Eigen values and Eigen vectors to some contents in engineering.
- Develop the skill of working with symmetric matrices in the study of Engineering problems.
- Apply the knowledge of interpolation and extrapolation of uniform and non uniform data to certain contents of Civil Engineering.
- Apply the knowledge of numerical differentiation and integration to some contents of Civil Engineering
- Learn grid based methods to solve Initial and Boundary value problems that arise in engineering problems.
- Develop the skill of solving computational problems using software.

UNIT-I

Solutions of linear equations: Direct method – Cramer's rule, Guass – Elimination method-Gauss Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Successive over –relaxation method.

Eigen values and eigen vectors: Jacobi method for symmetric matrices- Given's method for symmetric matrices-Householder's method for symmetric matrices-Rutishauser method of arbitrary matrices –Power method.*Demonstration of solutions using open source software in Numerical Methods.

UNIT-II

Interpolation: Linear Interpolation - Higher order Interpolation - Lagrange Interpolation – Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation.*Demonstration of solutions using open source software in Numerical methods.

UNIT - III

Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulae using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson's extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations. *Demonstration of solutions using open source software in Numerical Methods.

UNIT-IV

Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation. Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson's method.*Demonstration of solutions using open source software in Numerical Methods.

UNIT-V

Ordinary Differential Equation: Euler's method – Backward Euler method – Mid point method – single step method, Taylor's series method- Boundary value problems-case studies. *Demonstration of solutions using open source software in Numerical Methods.

***NOTE:** Demonstration of solutions using open source software in Numerical Methods only for the knowledge of students to apply in their Project Works. Not for examination.

TEXT BOOKS

1. M.K.Jain-S.R.K.Iyengar, R.K.Jain Numerical methods for scientific and engineering computations, Willey Eastern Limited, 1987
2. S.S.Shastry, Numerical methods.
3. Curtis I.Gerala, Applied numerical analysis, Addisson Wasley published campus.

REFERENCES BOOKS

1. C.Chopra, Raymond P.Canal, Numerical methods for Engineers Stevan, Mc. Graw Hill book Company, 4th edition, 2002.
2. C.Xavier, C Language and Numerical methods, New age international publisher, 2003.
3. Dr. M.Shanta Kumar, Computer based numerical analysis, Khanna Book publishers, New Delhi.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED COMPUTER ARCHITECTURE
(Open Elective-I)

M.Tech (ECE) I Year - I Semester

Course Code: GR17D5182 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES

- To learn how to build the best processor/computing system understanding the underlying tradeoffs and ramifications.
- To identify and analyze the attributes of computer architecture design with recent trend technology.
- To identify the techniques to improve the speed and performance of computers – Parallelism in Instruction level – Hardware approaches - pipelining,dynamic scheduling, superscalar processors, and multiple issue of instructions.
- To implement the design aspects and categorize various issues , causes and hazards due to parallelisms.
- To examine and compare the performance with benchmark standards.
- To understand the framework for evaluating design decisions in terms of application requirements and performance measurements.
- To learn the design and analysis of complex and high performance multiprocessors and supporting subsystems from the quantitative aspect.

COURSE OUTCOMES: After going through this course the student will be able to

- An ability to discuss the organisation of computer-based systems and how a range of design choices are influenced by applications.
- An ability to understand the components and operation of a memory hierarchy and the range of performance issues influencing its design.
- An ability to interpret the organisation and operation of current generation parallel computer systems, including multiprocessor and multicore systems.
- An ability to understand the various techniques to enhance a processors ability to exploit instruction-level parallelism (ILP), and its challenges.
- An ability to know the classes of computers, and new trends and developments in computer architecture.
- An ability to develop the applications for high performance computing systems.
- An ability to undertake performance comparisions of modern and high performance computers.

UNIT -I

Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, Quantitative principles of computer design, Amdahl's law.

Instruction set principles and examples- Introduction, classifying instruction set- memory addressing type and size of operands, Operations in the instruction set.

UNIT-II

Pipelines: Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT-III

Instruction Level Parallelism (ILP) - The Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, High performance instruction delivery- Hardware based speculation.

ILP Software Approach:

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.

UNIT-IV

Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism-Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – Memory architecture, Synchronization.

UNIT-V

Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.
Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, an Imprint of Elsevier.

REFERENCE BOOKS

1. John P. Shen and Miikko H. Lipasti -, Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

IOPERATIONS RESEARCH
(Open Elective-I)

Mtech(ME) I Year - I Semester

Course Code: GR17D5183 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES: The Objective of this course is to provide

- Analysis of quantitative methods and techniques for effective Decision–making.
- Constructing models that are used in solving business decision problems.
- Introduce the students to the use of basic methodology for the solution of linear programs and integer programs.
- Introduce the students to methods for solving large-scale transportation and assignment problems.
- Illustrate how sequencing is carried out in assigning jobs to machines
- Understand the concept of Inventory and apply different models in optimizing the same.
- Apply PERT/CPM: [Project scheduling and allocation of resources] to schedule and control construction of dams, bridges, roads etc. in an optimal way.

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

- Apply various linear programming techniques for optimal allocation of limited resources such as machine, materials and money
- Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment polices.
- Solve game theory problems.
- Solve problems of inventory and develop proper inventory policies.
- Apply PERT/CPM: [Project scheduling and allocation of resources] to schedule and control construction of dams, bridges, roads etc in a optimal way.
- Solve sequencing problems.
- Develop optimum replacement policy

UNIT-I

Introduction: Definition and scope of operations research(OR),ORmodel, solving the O**R** model, art of modeling, phases of OR study.

Linear Programming:

Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II

Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms

Assignment: Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games: Rectangular games, Min-max theorem, graphical solution of 2xnormx2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems: Elements of Queuing model, generalized Poisson queuing model.

UNIT-V

Inventory Control: Models of inventory, operation of inventory system, quantity discount.
Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text/ Reference Books:

1. Wayne L. Winston,"OperationsResearch", Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research - An Introduction", Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research", PHI Learning, 2008.
4. V. K. Khanna, "Total Quality Management", New Age International, 2008.

Teaching Methodology:

- Lecture is delivered on blackboard, preparing OHP sheets and by preparing Power point presentations.
- Seminars are conducted on new technologies related to subject.
- Assignments are given.
- Group discussions are conducted on familiar topics related to subject.
- Industrial visits for practical exposure to understand and explore things.

II- SEMESTER

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN POWER ELECTRONICS

M.Tech (Power Electronics) I Year - II Semester
Course Code: GR17D5036

PRE–REQUISITE: Power Electronics, Control Systems, Power Systems

COURSE OBJECTIVES: The objective of this course is to provide

- A deep insight in to the working of different switching devices with respect to their characteristics.
- Analysis ofdifferent resonant converters and control with their applications.
- Knowledge on advanced converters and switching techniques implemented in recent technology.
- Analysis and operation of power supplies.
- Design techniques of resonant inverters.

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

- Define the advances in power electronic devices.
- Evaluate the design and control of multi level inverters.
- Articulate power electronic resonant converters in power control applications.
- Evaluate the design and control of inverters.
- Know the techniques for analyzing and design of resonant inverters.
- Evaluate the design and control of power supplies.
- Know the techniques to design and control UPS.

UNIT-I

MODERN POWER SEMICONDUCTOR DEVICES: Modern power semiconductor devices-MOS turn Off Thyristor (MTO)-Emitter Turn Off Thyristor (ETO) Intergrated Gate Commutated thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

UNIT-II

RESONANT PULSE INVERTERS: Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches-analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches Frequency response of series resonant inverters-for series loaded inverter-for parallel loaded inverter-For series and parallel loaded inverters-parallel resonant inverters Voltage control of resonant inverters-class E inverter, Class E rectifier-numerical problems.

UNIT-III

RESONANT CONVERTERS: Resonant converters-Zero current switching resonant converters-L type ZCS resonant converter-M type ZCS resonant converter-zero voltage Switching resonant converters-comparison between ZCS and ZVS Resonant converters-Two quadrant ZVS resonant converters-resonant de-link Inverters evaluation of L and C for a zero current switching inverter Numerical problems.

UNIT-IV

MULTILEVEL INVERTERS: Multilevel concept-Classification of multilevel inverters-Diode clamped multilevel inverter-principle of operation-main features improved diode Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

MULTILEVEL INVERTERS (CONTINUED): Cascaded multilevel inverter principle of operation-main features-Multilevel inverter applications-reactive power compensation-back to back intertie system adjustable drives -Switching device currents-delink capacitor voltage balancing-features of Multilevel inverters-comparisons of multilevel converters.

UNIT-V

DC POWER SUPPLIES: DC power supplies-classification-switched mode dc power supplies-fly back Converter forward converter- push-pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional power supplies-Applications.

POWER CONDITIONERS AND UNINTERRUPTIBLE POWER SUPPLIES: Introduction-power line disturbances-power conditioners-uninterruptible Power supplies -applications.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

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

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER ELECTRONIC CONTROL OF A.C. DRIVES

M.Tech (Power Electronics) I Year - II Semester
Course Code: GR17D5047 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Control Systems, Power Systems, Networks.

COURSE OBJECTIVES: The objective of this course is to provide

- In depth knowledge to students with different types of AC drives and their usage.
- Different control techniques of Induction Motors.
- Controlling performances of Induction Motor (IM) on stator and rotor sides.
- Techniques to control the Synchronous machine..
- Techniques to control the BLDC motor drives.

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

- Perform the analysis of different types of drives and their controllers for IM.
- Relate the performance characteristics of different drives.
- Extend the knowledge of current control for IM.
- Analyze the performance of vector control for IM drives.
- Extend the knowledge of current control for Synchronous motor drive.
- Relate the performance characteristics of control techniques for IM & Synchronous motor drives.
- Understand the control techniques of 3-ph BLDC motors and variable reluctance motor drives.

UNIT-I

INTRODUCTION TO AC DRIVES: Introduction to motor drives-Torque production Equivalent circuit analysis-Speed-Torque Characteristics with variable voltage operation Variable frequency constant v/t operation — Variable stator current operation-Induction motor characteristics in constant torque and field weakening regions.

UNIT-II

CONTROL OF INDUCTION MOTOR DRIVES AT STATOR SIDE: Scalar control — Voltage fed inverter control — Open loop volts/HZ control-speed control with slip regulation-speed control with torque and flux control-current controlled voltage fed inverter drive-current — fed inverter control-Independent current and frequency control-Speed and flux control in Current-Fed inverter drive Volts/Hz control of Current —fed inverter drive-Efficiency optimization control by flux program.

UNIT-III

CONTROL OF INDUCTION MOTOR DRIVE AT ROTOR SIDE: Slip power recovery drives-Static Kramer Drive-Phasor diagram-Torque expression- speed control of a Kramer Drive — Static Schreiber's Drive — modes of operation.

VECTOR CONTROL OF INDUCTION MOTOR DRIVES: Principles of Vector control — Vector control methods — Direct methods of vector control —Indirect methods of vector control-Adaptive control principles — Self tuning regulator Model referencing control.

UNIT-IV

CONTROL OF SYNCHRONOUS MOTOR DRIVES: Synchronous motor and its characteristics-Control strategies-Constant torque angle control-Unity power factor control-Constant mutual flux linkage control.

CONTROLLERS: Flux weakening operation-Maximum speed-Direct flux weakening algorithm-Constant Torque mode controller-Flux Weakening controller-indirect flux weakening-Maximum permissible torque-speed control scheme-Implementation strategy speed controller design.

UNIT - V

VARIABLE RELUCTANCE MOTOR DRIVE: Variable Reluctance motor drive-Torque production in the variable reluctance motor Drive characteristics and control principles-Current control variable reluctance motor service drive.

BRUSLILESS DC MOTOR DRIVES: Three phase full wave Brushless dc motor — Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Electric Motor Drives Pearson Modeling. Analysis and control — R. Krishnan — Publications- Ist edition—2002.
2. Modern Power Electronics and AC Drives B K Bose — Pearson Publications 1edition

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLEXIBLE AC TRANSMISSION SYSTEMS

M.Tech (Power Electronics) I Year - II Semester
Course Code: GR17D5049 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Power Systems.

COURSE OBJECTIVES: The objective of this course is to provide

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

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

- Express different types of FACTS controllers and their role in improving power system performance.
- Understand the operating principles of various FACTS devices.
- Know the importance of compensation methods in power system network.
- Relate the performance and applications of VSI & CSI.
- Extend the knowledge of active & reactive power and voltage control with FACTS devices.
- Analyse role of SVC&STATCOM in improving the power system dynamics.
- Analyze the use of control schemes of TCSC,TSSC,GSC in improving the power quality.

UNIT-I

FACTS CONCEPTS: Transmission interconnections Power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT-II

VOLTAGE SOURCE CONVERTERS: Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, comparison of current source converters with voltage Source converters.

UNIT-III

STATIC SHUNT COMPENSATION: Objectives of shunt compensation, midpoint voltage regulation voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators switching converter type var generators hybrid var generators.

UNIT-IV

SVC and STATCOM: The regulation and Slope transfer function and dynamic performance, transient Stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT-V

STATIC SERIES COMPENSATORS: Concept of series capacitive Compensation improvement of transient stability, power oscillation damping Functional requirements GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC) and thyristor controlled series capacitor (TCSC)control schemes for GSC, TSSC and TCSC.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. "Understanding FACTS Devices' N.G. Hingorani and L.Guygi IEEE Press Publications 2000.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY
(Elective — III)

M.Tech (Power Electronics) I Year - II Semester

Course Code: GR17D5051 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Power Systems

COURSE OBJECTIVES: The objective of this course is to provide

- A deep insight in to the various power quality issues arise in power systems.
- Information on effect of pq issues on various electrical devices
- Analysis and the operation of mitigation equipment for power quality issues.
- Monitoring techniques for pq problems
- Measurement techniques for pq problems

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

- Understand various power quality issues and their remedial measures.
- Express what an interruption is, where it originates, what the causes, limits, their costs are and how to predict the number of interruptions.
- Gain knowledge on Voltage sag and its characterization in single-phase and three phase networks
- Know the behaviour of various equipment to voltage sags.
- Apply the knowledge to design mitigation equipment
- Discuss about the standards of Power Quality and EMC Standards
- Measure sags in radial and non-radial networks

UNIT-I

INTRODUCTION: Introduction of the Power Quality (PQ) problem, terms used in PQ: Voltage Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT-II

LONG INTERRUPTIONS: Interruptions-Definition-Difference between failure, outage, Interruptions-causes of Long Interruptions-Origin of Interruptions-Limits for the Interruption frequency-Limits for the interruption duration-costs of Interruption-Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.

SHORT INTERRUPTIONS: Short interruptions-definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple

events, single phase tripping-voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT-III

VOLTAGE SAG CHARACTERIZATION-SINGLE PHASE: Voltage sag-definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration.

VOLTAGE SAG-CHARACTERIZATION-THREE PHASE: Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT-IV

PQ CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS: Voltage sag-equipment behavior of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT-V

MITIGATION OF INTERRUPTIONS AND VOLTAGE SAGS: Over view of mitigation methods-from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

POWER QUALITY AND EMC STANDARDS: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. “Understanding Power Quality Problems” by Math HJ Bollen. IEEE Press
2. “Electrical power systems quality,3rd edition,Roger C.Dugan,Marle F.F Mcgranaghan,Surya Santoso,H.Waybe Beaty,Mc CrawHill professional.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL CONTROL SYSTEMS
(Elective-III)

M.Tech (Power Electronics) I Year - II Semester

Course Code: GR17D5052 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Control Systems, Digital electronics

COURSE OBJECTIVES: The objective of this course is to provide

- Basic concepts of sampling and reconstruction of the continuous time signals.
- State space analysis of discrete control systems.
- Information about the transform analysis of discrete time control systems.
- Concepts of digital control system design and their stability analysis.
- Design techniques of state feedback controllers and observers

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

- Define the advances in digital control systems.
- Evaluate z-transforms of linear control systems.
- Articulate the need of state space analysis.
- Evaluate the design and control discrete time control system
- Analize the techniques and design of resonant inverters.
- Evaluate the design and control of stability analysis of discrete systems.
- Design state feedback controllers and observers.

UNIT-I

SAMPLING AND RECONSTRUCTION: Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous - time signal.

THE Z - TRANSFORMS: Introduction, Linear difference equations, pulse response, Z-transforms, Theorems of Z Transforms, the inverse Z-transforms, and Modified Z- Transforms.

Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEM: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled-data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT-II

STATE SPACE ANALYSIS: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state-space equations.

CONTROLLABILITY AND OBSERVABILITY: Concepts of Controllability and Observability, Tests

for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT-III

STABILITY ANALYSIS: Stability Analysis of closed loop systems in the Z- Plane.Jury's stability test- Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion. Stability analysis using Liapunov theorems.

UNIT -IV

DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS: Design of digital control based on the frequency response method-Bilinear Transformation and Design procedure in the w-plane. Lead, Lag and Lead-Lag compensators and digital PIP controllers. Design digital control through deadbeat response method.

UNIT-V

STATE FEEDBACK CONTROLLERS AND OBSERVERS: Design of state feedback controller through pole placement - Necessary and sufficient conditions, Ackerman's formula. State Observers-Full order and Reduced order observers.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI. 2nd Edition

REFERENCE BOOKS

1. Digital Control and State Variable Methods by M.Gopal, TMH
2. Computerized control systems, K.J Astrom

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC SMART GRID
(Elective-III)

M.Tech (Power Electronics) I Year - II Semester

Course Code: GR17D5067 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Systems, Computer Origination

COURSE OBJECTIVES: The objective of this course is to provide

- Knowledge on smartgrid concepts and information on necessity of SCADA in power systems.
- The concepts of SCADA communication systems .
- Integration of smart devices for substation automation .
- Description of Energy management systems and framework.
- Exposure on Distribution automation and management systems.

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

- Apply the concepts of smart grid architecture , dynamic energy systems , energy port in real time applications
- Apply smart grid policies and programs to encourage end – use energy efficiency.
- Explore the SCADA communication systems.
- Get acquainted with the SCADA and smart grid protocols.
- Extend knowledge of substation automation functions and benefits of data warehousing .
- Interpret the load forecasting and transmission operations and management in real time applications.
- Integrate DMS framework and real time DMS applications.

UNIT-I

SCADA fundamentals: Introduction, Open system: Need and advantages, Building blocks of SCADA systems, Remote terminal unit (RTU),Intelligent electronic devices (IEDs),Data concentrators and merging units, SCADA communications systems, Master station, Human-machine interface(HMI),Building the SCADA systems, legacy, hybrid and new systems, Classification of SCADA systems.

UNIT-II

SCADA communication: Introduction, SCADA communication requirements, Smart grid communication infrastructure, SCADA communication topologies, SCADA data communication techniques, Data communication, SCADA communication protocol architecture, Evolution of SCADA communication protocols, SCADA and smart grid protocols, Media for SCADA and smart grid communication, Guided media, Unguided (wireless) media, Communication media, Security for SCADA and smart grid communication, Challenges for SCADA and smart grid communication.

UNIT -III

Substation automation (SA): Conventional substations: Island of automation, New smart devices for substation automation, The new integrated digital substation, Substation automation: Technical issues, The new digital substation, Substation automation architectures, New versus existing substations, Substation automation(SA) application functions, Data analysis benefits of data warehousing.

UNIT -IV

Energy management systems(EMS) for control centers: Introduction, operating states of the power systems and sources of grid vulnerability, Energy control centers, EMS frame work, Data acquisition and communication(SCADA systems), Generation operation and management, Transmission operations and management: Real time, Study-mode simulations, Post-event analysis and energy scheduling and accounting, Dispatcher training simulator, Smart transmission, EMS with WAMS, Future trends in EMS and DMS with WAMS, Case studies in EMS and WAMS.

UNIT -V

Smart Grid Concepts: Introduction, Smart grid definition and development, old grid versus new grid, Stakeholders in smart grid development, Smart grid solutions, Smart distributions, Smart transmission.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Mini S.Thomas, John D. Mc Donald, " Power System SCADA and Smart Grids", CRC Press, Taylor & Francis Group.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

MICROCONTROLLERS
(Elective-IV)

M.Tech (Power Electronics) I Year - II Semester

Course Code: GR17D5048 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Computer Organization, Microcontroller.

COURSE OBJECTIVES: The objective of this course is to provide

- Fundamental concepts of Micro Controllers and their architecture.
- Efficient programs in assembly Level language of the 8051family of Microcontrollers.
- Techniques of interfacing between processors and peripheral devices so that they them selves can design and develop a complete Microcontroller based system.
- Solid foundation on interfacing the external devices to the microcontroller according to the user requirements to create novel products and solutions for the real time problems.
- Applications involving Microcontrollers.

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

- Express architecture of Micro Controllers
- Program a microcontroller system in assembly code and C.
- Understand Serial Data Transfer Technique
- Build and test a microcontroller based system.
- Interface the system to A/D and D/A converters.
- Interface the system to switches,keypads,and displays.
- Use 8051 timers and interrupts.

UNIT-I

INTRODUCTION AND 8051 ARCHITECTURE: Introduction to micro controllers, comparing microprocessors and micro controllers, 4,8,16 and 32 bit micro controllers, Development systems for Micro controllers, Architecture; Architecture of 8051, pin configuration of 8051 micro controller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts.,

UNIT-II

MOVING DATA AND LOGICAL OPERATIONS: Introduction, Addressing modes, External Data moves, Code Memory Read-only Data Moves, PUSH and POP Op codes, Data Exchanges, Logical Operations; Byte-Level Logical Operations, Bit Level Logical Operations, Rotate and Swap Operations.

UNIT-III

ARITHMETIC OPERATIONS, JUMP AND CALL OP CODES: Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Jump and Call op codes; The jump and call program range, Jumps, Calls and Subroutines, call and returns, Interrupts and Returns.

UNIT-IV

8051 MICROCONTROLLER DESIGN: Introduction, micro controller specification, micro controller Design, Testing the Design, Timing sub routines, Lookup Tables for the 8051, Serial Data Transmission.

UNIT-V

APPLICATIONS AND SERIAL DATA COMMUNICATION: Introduction, Key boards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts, Serial data Communication; Network Configurations, 8051 Data Communication Modes.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. "The Intel Microprocessors", Architecture Programming & Interfacing by Barry b Brey.
2. Advanced Microprocessors by Kenneth J Ayala, Thomson publishers.
3. Microcontrollers by Kenneth J Ayala, Thomson publishers
4. Microprocessors & Interfacing Programming & Hardware by DOUGLAS V. Hall

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMABLE LOGIC CONTROLLERS
(Elective-IV)

M.Tech (Power Electronics) | I Year - II Semester
Course Code: GR17D5055 | L/T/P/C : 3/1/0/4

PRE–REQUISITE: Microprocessor, logic gates and programming, Digital Electronics.

COURSE OBJECTIVES: The objective of this course is to provide

- Knowledge on different PLCs and their usage in control of drives.
- Knowledge onPLC architecture
- Implementation of ladder diagrams for practical applications.
- Analysis of analogdevices used in PLC operations.
- Knowledge on interfacing PLC with HMI

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

- Perform different types of PLC programming schemes.
- Implement ladder diagrams for process control.
- Control the robots using PLC.
- Tune the PLC for different applications.
- Analyse the PLC internal architecture.
- Extend knowledge of PLC in analog operations.
- Interface PLC with other technologies like HMI, SCADA.

UNIT- I

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

UNIT-II

PLC PROGRAMMING: PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.
Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT-III

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

number conversion functions.

UNIT-IV

DATA HANDLING FUNCTIONS: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications.

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

UNIT-V

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

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS

1. Programmable Logic Controllers — Principle and Applications by John W Webb and Ronald A Reiss Filth edition, PHI
2. Programmable Logic Controllers — Programming Method and Applications by JR Hackworth and ED Hackworth — Jr- Pearson, 2004.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

REACTIVE POWER COMPENSATION AND MANAGEMENT (Elective-IV)

M.Tech (Power Electronics) I Year - II Semester
Course Code: GR17D5056 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Power Electronics, Control Systems, Power Systems

COURSE OBJECTIVES: The objective of this course is to provide

- A deep insight in load compensation with respect to their characteristics.
- Analysis of steady state and transient state reactive power compensation in transmission system.
- Knowledge on reactive power coordination.
- Knowledge on demand side and distribution side reactive power management.
- Information on typical layout of traction systems.

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

- Define the advances in power compensation.
- Evaluate the design and control of different types of compensation
- Articulate User side reactive power management
- Articulate steady state and transient state reactive power compensation.
- Techniques for analyzing of reactive power management
- Evaluate reactive power control requirements
- Evaluate the design and Typical layout of traction systems\

UNIT-I

LOAD COMPENSATION: Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

UNIT-II

STEADY – STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM: Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation –examples

TRANSIENT STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEMS: Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples.

UNIT-III

REACTIVE POWER COORDINATION: Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady – state variations – effects of under voltages – frequency –Harmonics, radio frequency and

electromagnetic interferences.

UNIT-IV

DEMAND SIDE MANAGEMENT: Load patterns – basic methods load shaping – power tariffs-KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels

DISTRIBUTION SIDE REACTIVE POWER MANAGEMENT: System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks

UNIT-V

USER SIDE REACTIVE POWER MANAGEMENT: KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

REACTIVE POWER MANAGEMENT IN ELECTRIC TRACTION SYSTEMS AND ARE FURNACES: Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures –power factor of an arc furnace

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOKS:

1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982
2. Reactive power Management by D.M.Tagare,Tata McGraw Hill,2004.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER CONVERTERS LAB

M.Tech (Power Electronics) | I Year - II Semester
Course Code: GR17D5057 | L/T/P/C : 0/0/4/2

PRE–REQUISITE: Power Electronics, Control Systems.

COURSE OBJECTIVES: The objective of this course is to provide

- Hands on experience on power electronics and drives.
- Different switching patterns in power electronics systems.
- Knowledge on advanced power electronic converters.
- Knowledge on the operation of chopper controlled dc drive.
- Information on control techniques for cycloconverters.

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

- Define the basics of power electronics and drives.
- Evaluate the design and control of power electronics and drives.
- Relate the operating characteristics of Thyristor controlled & IGBT controlled drives.
- Analyse the operation of 3-ph Induction Motor (IM) drives.
- Apply the knowledge of control techniques for the speed control of IM.
- Extend the knowledge of control technique for Cycloconverter.
- Relate the operating characteristics of half-wave and fully controlled converters.

List of Experiments

1. Thyristorised drive for PMDC Motor with speed measurement and closed loop Control.
2. IGBT based single 4 quadrant chopper drive for PMDC motor with speed Measurement and closed loop control.
3. Thyristorised drive for 1hp DC motor with closed loop control.
4. Three Phase input, Thyristorised drive, 3 hp DC motor with closed loop control
5. Cyclo converter fed 3-Ø induction motor
6. Speed control of a 3-Ø induction motor using variable voltage
7. Single Phase fully controlled converter with inductive load
8. Single Phase half wave controlled converter with inductive load
9. V/F drive for AC 3-Ø Squirrel-cage induction motor
10. Speed control of a dc motor using chopper drive

NOTE: Conduct a minimum of 8 experiments.

OPEN ELECTIVE - II

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

HUMAN COMPUTER INTERACTION
(Open Elective-II)

M.Tech (CSE) I Year - II Semester

Course Code: GR17D5184 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES: Students undergoing the course are expected to:

- Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
- Recognize how a computer system may be modified to include human diversity.
- Select an effective style for a specific application.
- Design mock ups and carry out user and expert evaluation of interfaces.
- Carry out the steps of experimental design, usability and experimental testing, and
- Evaluation of human computer interaction systems.
- Use the information sources available, and be aware of the methodologies and technologies supporting advances in HCI.

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

- Describe what interaction design is and how it relates to human computer interaction and other fields.
- Describe the social mechanisms that are used by people to communicate and collaborate.
- Describe how technologies can be designed to change people's attitudes and behavior.
- Discuss how to plan and run a successful data gathering program.
- Discuss the difference between qualitative and quantitative data and analysis.
- Discuss the conceptual, practical, and ethical issues involved in evaluation.
- Describe how to perform two types of predictive techniques, GOMS and Fitts Law, and when to use them.

UNIT-I

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

UNIT-II

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

UNIT-III

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

–amount of information –focus and emphasis –presentation information simply and meaningfully –information retrieval on web –statistical graphics –Technological consideration in interface design.

UNIT-IV

Develop System Menus and Navigation Schemes-Select the proper kinds of Windows, -Select the proper Device based Controls, Choose the proper screen based controls.

UNIT-V

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Interaction Devices – Keyboard and Function Keys – Pointing Devices – Speech Recognition Digitization and Generation – Image and Video Display – Drivers.

TEXT BOOKS

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dreamtech.
2. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia
3. Brian Fling, “Mobile Design and Development”, First Edition, Reilly Media Inc., 2009

REFERENCE BOOKS

1. Human – Computer Interaction. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen, Pearson Education.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

BIG DATA ANALYTICS
(Open Elective-II)

M.Tech (IT) I Year - II Semester

Course Code: GR17D5185 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES: The objective of the course is to provide the student:

- Understanding about big data for business intelligence
- Learning business case studies for big data analytics
- Learning about the cloud and big data
- Knowledge about risk management involved in big data
- Understandingnosql big data management
- Understanding about map reduce work flows.
- Capability to Perform map-reduce analytics using Hadoop and related tools

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

- Understand the importance of big data
- Understand challenges with big data
- Knowledge about the technological developments in big data environment
- Understanding about map reduce work flows
- Knowledge about nosql data environment.
- Analysis with Hadoop and related tools
- Capability of understanding the usage of big data in context to cloud and other technologies.

UNIT-I

INTRODUCTION TO BIG DATA What is big data, why big data, convergence of key trends , unstructured data ,industry examples of big data ,web analytics, big data and marketing, fraud and big data ,risk and big data ,credit risk management, big data in medicine, introduction to Hadoop open source technologies , cloud and big data

UNIT-II

UNDERSTANDING BIG DATA Types of digital data, characteristics of data, challenges with big data, definition of big data, big data analytics,data science, technologies in big data environments, CAP theorem.

UNIT-III

NOSQL DATA MANAGEMENT Introduction to NoSQL, aggregate data models, aggregates, key-value and document data Models, relationships, graph databases , schemaless databases ,materialized views, distribution models, sharding ,master-slave replication, peer-peer replication, sharing and replication

UNIT-IV

BASICS OF HADOOP Data format ,features of Hadoop, analyzing data with Hadoop , design of Hadoop distributed file system (HDFS) ,HDFS concepts, scaling out ,Hadoop streaming , Hadoop pipes, Hadoop related tools

UNIT- V

MAPREDUCE APPLICATIONS MapReduce workflows, unit tests with MRUnit , test data and local tests, anatomy of MapReduce job run ,classic Map-reduce, YARN ,failures in classic Map-reduce and YARN , job scheduling , shuffle and sort ,task execution, MapReduce types ,input formats, output formats

TEXT BOOKS

1. Seema Acharya,S.Chellappan,"Big Data and Analytics",Wiley,2014

REFERENCE BOOK

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

NEURAL AND FUZZY SYSTEMS
(Open Elective-II)

M.Tech (EEE) I Year - II Semester

Course Code: GR17D5186 L/T/P/C : 3/1/0/4

PRE–REQUISITE: Control Systems, Power Systems, Mathematics, Physics.

COURSE OBJECTIVES: The objective of this course is to provide

- The concepts of learning methods.
- Knowledge on the artificial neural networks and their architecture.
- Applications of artificial neural networks.
- The concepts of the fuzzy logic control and their real time applications.
- Design concepts of associative memories.

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

- Define the advances in neural networks
- Evaluate the design and control of fuzzy systems.
- Articulate the applications of fuzzy control block sets.
- Evaluate the design of various models in neural networks
- Analyze the techniques of various types of neural networks
- Evaluate the design and control of associative memories
- Design fuzzy logic system.

UNIT-I

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

UNIT-II

Essentials of Artificial Neural Networks: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

Feed Forward Neural Networks

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

UNIT-III

Multilayer Feed forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT-IV

Self-Organizing Maps (SOM) and Adaptive Resonance Theory (ART)

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability-Plasticity Dilemma, Feed forward competition, Feedback Competition.

UNIT-V

Classical and Fuzzy Sets and Fuzzy Logic System Components

Introduction to classical 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.

Applications Neural network applications: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEACHING METHODOLOGIES

1. White board
2. PPTs
3. Seminars

TEXT BOOK

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and G.A.VijayalakshmiPai – PHI Publication.

REFERENCE BOOKS

1. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.
2. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
3. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROJECT MANAGEMENT

M.Tech (Civil) I Year - II Semester
Course Code: GR17D5187 L/T/P/C : 3/1/0/4

COURSE OBJECTIVES: On completion of this Subject/Course, following objectives shall get accomplished

- To provide students about the basics of Management in general and Project Management in particular.
- To train the students about the Monitoring of Projects.
- To make understand the students about the Planning of projects.
- To make understand the students about the Scheduling of projects.
- To train the students about the drawing of CPM & PERT Networks.
- To train the students about teaching of Project Management to UG & PG students
- To motivate the students about the Research Development activities of Project Management which results in timely completion of projects without time and cost over runs.

Course outcomes: On completion of this Subject/Course the student shall be able to

- Perform the Project Management functions effectively.
- Plan the projects.
- Schedule the various activities of Projects.
- Monitor the actual progress with planned progress.
- Draw the CPM & PERT Networks/
- Handle Resources planning including levelling & smoothing.
- Interpret the Indian Contract Act and understand the litigations involved for better Contract Management.

UNIT- I

PROJECT PLANNING: Prime Objectives of Project Management, Main Functions of Project Management, Planning, Principles of Planning, Objectives of Planning, Steps involved in Planning, Stages of Planning, Advantages & limitations of Planning, Failures of Projects & Construction Projects.

UNIT-II

PROJECT SCHEDULING: Scheduling, Project/Construction Schedules, Steps involved in Scheduling, Methods of Scheduling, Bar Charts, Steps involved in Bar Charts, Limitations of Bar Charts, Milestone Charts and Limitations of Milestone Charts.

UNIT-III

PROJECT MONITORING: Network Techniques, Prime Objectives of Networks, Network Terminology, Types of Networks, CPM & PERT, Differences between CPM & PERT, Rules to draw the Network, Drawing of Networks, Advantages of Network , Critical Path, Float and its Types, Slack and Types of Slack.

UNIT-IV

PROJECT COST CONTROL: Direct Costs, Indirect Costs, Total Project Cost, Optimisation of Cost and Steps involved, Resources, Resources Smoothing and Resources Levelling, Crashing of Activities, Time and Cost Over runs of Project.

UNIT-V

PROJECT QUALITY & CONTRACTS:

Quality, Quality Control, Quality Assurance, Project Quality Plans in Construction Projects, Inspection & Test Plans, Method Statements, ISO Certification; Project Contracts, Contract Law, Types of Contracts and Indian Contract Act.

TEXT BOOKS

1. Project Planning and Control with PERT & CPM – BC Punmia, KK Khandielwala.
2. Project Scheduling & Monitoring in Practice – S Chowdhury

REFERENCE BOOKS

1. Project Management Handbook – Lock, Gower
2. Project Management – NJ Smith- Blackwell Publication.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

HARDWARE - SOFTWARE CO-DESIGN
(Open Elective-II)

M.Tech (ECE) I Year - II Semester

Course Code: GR17D5188 L/T/P/C : 3/1/0/4

Course Objectives

- Describe an embedded system design flow from specification to physical realization
- Describe structural behavior of systems.
- Master complex systems.
- Devise new theories, techniques, and tools in design, implementation and testing.
- Master contemporary development techniques.

Course Outcomes: After going through this course the student will be able to

- Gain knowledge of contemporary issues and algorithms used.
- Know the interfacing components, different verification techniques and tools.
- Demonstrate practical skills in the construction of prototypes.
- Understand the use of modern hardware and software tools for building prototypes of embedded systems.
- Apply embedded software techniques to satisfy functional and response time requirements.
- Apply verification tools.
- Understand design representation for system level synthesis.

UNIT-I:

Co- Design Issues: Co- Design Models, Architectures, Languages, A Generic Co-design Methodology.

Co- Synthesis Algorithms:

Hardware software synthesis algorithms: hardware – software partitioning distributed system cosynthesis.

UNIT –II:

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target Architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV

Design Specification and Verification: Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification

UNIT-V

Languages for System – Level Specification and Design-I: System – level specification, design representation for system level synthesis, system level specification languages,

Languages for System – Level Specification and Design-II:

Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf –2009, Springer.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, 2002, Kluwer Academic Publishers

REFERENCE BOOKS

1. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont - 2010 –Springer

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

NON CONVENTIONALENERGYRESOURCES

(Open Elective-II)

M.Tech (ME) I Year - II Semester

Course Code: GR17D5189

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

- Interduce the need of the non-convectional energy sources.
- Impart the role of non-convectional energy for the environment.
- Identify the energy resources utilization systems.
- Recognise the source and potential of wind energy and understand the classifications of wind mills.
- Summarize the principles of bio-conversion, ocean energy and geo thermal energy.

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

- Choose the appropriate renewable energy as an alternate for conventional power in any application.
- Analyze the environmental and cost economics of using renewable energy sources compared to fossil fuels.
- Apply the principles of various energy systems in day to day life.
- Analyze the industrial needs and convert theoretical model to practical circuits with wide range of specifications.
- Evaluate the importance of the renewable resources of energy as the fossil fuels are depleting in the world very fast express about clean and green energy for next generation.
- Analyse large scale demand of heat energy for meeting day to day domestic, institutional and industrial requirements can be met by utilizing solar thermal systems, biogas, PV cells, wind energy, Geothermal, MHD etc.
- Design the various techniques and models fabricated in utilizing the above said sources of energy.

UNIT-I

Introduction: Various non-conven tionalenergy resources-Introduction, availability, classification, relative merits and demerits.

Solar Cells: Theory of solarcells. solarcell materials, solarcellarray, solar callower plant, limitations.

UNIT-II

Solar Thermal Energy: Solar radiation, floatplane collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electricalconversion, non-electricalconversion,environmentalconsiderations.
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations

FuelCells:

Principle of working of various type souffle cell sand their working, performance and limitations.

UNIT-IV

Thermos and the rmionic Conversions:
Principle of working, performance and limitations.
Wind Energy: Wind power and it surcease, sites election, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitation sofenergy conversion systems.

UNIT-V

Bio-mass: Availability of bio-massand its conversion theory.
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, per formance and limitations.
Wave and Tida lWave:
Principle of working, performance and limitations.Waste RecyclingPlants.

TEXT/REFERENCESBOOKS

1. John Twideu and TonyWeir, “Renewal Energy Resources” BSP Publications, 2006.
2. M.V.R.KoteswaraRao, “Energy Resources: Conventional&Non-Conventional “ BSPPublications,2006.
3. D.S.Chauhan, ”Non-conventional Energy Resources” New Age International.
4. C.S. Solanki, “Renewal Energy Technologies: A Practical Guidefor Beginners” PHILearning.