ACADEMIC REGULATIONS

PROGRAM STRUCTURE

and

DETAILED SYLLABUS

Master of Technology

(**Power Electronics**)

(Two Year Regular Programme)

(Applicable for Batches admitted from 2018)

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Bachupally, Kukatpally, Hyderabad- 500 090

Academic Regulations

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
For all Post Graduate Programmes (M.Tech)
GR18 REGULATIONS

Gokaraju Rangaraju Institute of Engineering & Technology - 2018 Regulations (GR 18 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 in 2018-19 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 semester as per the procedure.**
    - **b)** Each Academic year of study is divided into two semesters.
    - **c)** Minimum number of instruction days in each semester is 90.
    - **d)** The total credits for the Programme is 68.
    - **e) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).**
    - **f) A student has a choice of registering for credits from the courses offered in the programme.**
    - **g) All the registered credits will be considered for the calculation of final CGPA.**
5. **Award of M.Tech Degree:** A student will be declared eligible for the award of the M. Tech Degree if he/she fulfills the following academic requirements:
    - a) A student shall be declared eligible for the award of M.Tech degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.
    - b) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech course.
    - c) The Degree of M.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. **Attendance Requirements**

a) A student shall be eligible to appear for the semester end examinations if he/she puts in a minimum of 75% of attendance in 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) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek re-registration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

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

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

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

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

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

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

d) **Mid Examination:** There shall be two mid examinations during a semester. The first mid examination shall be conducted from the first 50 per cent of the syllabus and the second mid examination shall be conducted from the remaining 50 per cent of the syllabus. The mid examinations shall be evaluated for **20 marks** and average of the marks scored in the two mid examinations shall be taken as the marks scored by each student in the mid examination for that semester.

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

f) **For Internal Evaluation in Practical/Lab Subjects:** The marks for internal evaluation are 30. Internal Evaluation is done by the teacher concerned with the help of the other staff 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**
	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**
	Total:	**15 Marks**

h) **Mini Project:** The Mini Project is to taken up with relevance to Industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. The supervisor continuously assesses the students for 20 marks (Continuous Assessment-15 marks, Report-5 marks).At the end of the semester. At the end of the semester the mini project report is evaluated by Project Review Committee. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 70 marksman Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

i) **Dissertation-I and Dissertation-II:** A Project Review Committee (PRC) is to be constituted by 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 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.

ix. **The marks allotted for 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/she 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 unfavorable 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 Points	Percentage of marks
O (Outstanding)	**10**	**Marks >= 90**
A+ (Excellent)	**9**	**Marks >= 80 and Marks < 90**
A (Very Good)	**8**	**Marks >= 70 and Marks < 80**
B+ (Good)	**7**	**Marks >= 60 and Marks < 70**
B (Above Average)	**6**	**Marks >= 50 and Marks < 60**
F (Fail)	**0**	**Marks < 50**
Ab (Absent)	**0**	

Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-C. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned. Computation of SGPA and CGPA:

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i) **S_k the SGPA of k^{th} semester(1 to 4) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,**

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

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

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

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

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

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

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

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

15. **Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other

Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

16. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Programme, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.

17. **General Rules**

a) The academic regulations should be read as a whole for the purpose of any interpretation.

b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.

d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Department of Electrical and Electronics Engineering

Power Electronics

I YEAR - I SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Core I	Electric Drives System	3	-	-	3	30	70	100
2	Core II	Power Electronic Converters	3	-	-	3	30	70	100
3	**PE I**	Advanced Power Electronic Converters/Power Quality / Renewable Energy Systems	3	-	-	3	30	70	100
4	**PE II**	Optimal and Adaptive Control /PWM for power electronic converter / Electric and Hybrid Vehicles	3	-	-	3	30	70	100
5	Core	Electrical Drives Laboratory	-	-	4	2	30	70	100
6	Core	Power Electronics Lab	-	-	4	2	30	70	100
7	Core	Research Methodology and IPR	2	-	-	2	30	70	100
Total			**16**	**-**	**8**	**18**	**240**	**560**	**800**
8	Audit	Audit course -1	2	-	-	0	30	70	100

I YEAR - II SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Core III	Modeling and Analysis of Electrical Machines	3	-	-	3	30	70	100
2	Core IV	Digital Control of Power Electronic and Drive Systems	3	-	-	3	30	70	100
3	**PE III**	FACTS and Custom Power Devices / Dynamics of Electrical Machines / Advanced Digital Signal Processing	3	-	-	3	30	70	100
4	**PE IV**	AI Techniques/ Distributed Generation/ Smart Grids	3	-	-	3	30	70	100
5	Core	Power Quality lab	-	-	4	2	30	70	100
6	Core	Digital Signal Processing Lab	-	-	4	2	30	70	100

7	Audit	Audit course – 2	2	-	-	2	30	70	100
8	Core	Mini-Projects	2	-	-	0	30	70	100
Total			**16**	**-**	**8**	**18**	**240**	**560**	**800**

II YEAR - I SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	**PE V**	1. HVDC 2. Industrial Load Modeling and Control 3. SCADA Systems and Applications	3	-	-	3	30	70	100
2	**Open Elective**	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	3	-	-	3	30	70	100
3	Dissertation	Dissertation Phase – I	-	-	20	10	30	70	100
Total			**6**	**-**	**20**	**16**	**90**	**210**	**400**

II YEAR - II SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Dissertation	Dissertation Phase – II	-	-	32	16	30	70	100
Total					**32**	**16**	**30**	**70**	**100**

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Indian Constitution
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC DRIVE SYSTEM

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

Course objectives

The Objective of this course is to provide the student

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

Course outcomes

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

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

Unit I

Dynamics of Electric Drives: Fundamentals of torque equation. Speed torque convention and multi-quadrant operation, components of load torque.

Unit II

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

Unit III

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

Unit IV

Three Phase Induction and synchronous motor drives: Dynamic modelling of induction machines. Small signal equations, control characteristics of induction machines. Phase-controlled induction

machines. Stator voltage control. Slip energy recovery scheme, frequency control and vector control of induction motor drives.

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

Unit V

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

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

Text Books

1. G.K, Dubey, "Power semiconductor-controlled Drives", Prentice Hall international, New Jersey, 1989.

2. R.Krishanam, “Electric motor drives modeling, analysis and control”, PHI-India-2009.

3. G. K. Dubey,“Fundamentals of electric Drives, Narosa Publishing House”, 2nd edition, 2011.

4. W. Leonhard, “Control of Electrical drives”, Springer, 3rd edition, 2001.

References Books

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONIC CONVERTERS

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

Course objectives

- The objective of this course is to provide the student:
- Understand the concepts and basic operation of power semiconductor switched circuits.
- Understand the operation of single phase and three phase Rectifier Circuits.
- Understand the concept of DC-DC Converters.
- Understand the concepts of Inverters and its operation.
- Apply the knowledge of Converters for real time examples.

Course outcomes

- Understand the concept semiconductor switched circuits with different types of loads
- Analyse the operation of single phase and three phase Rectifier Circuits.
- Evaluate the operation of different DC-DC Converters.
- Understand the knowledge of VSI and CSI.
- Understand the concepts of Cyclo converters & Matrix Converters

Unit I

Analysis of power semiconductor switched (Thyristor) circuits with R, L, RL, RC, D.C. motor load - Input Voltage –Input Current-Output Voltages-Output Currents-Voltages across Switches for different Firing Angles. Calculation of Output Voltage's & Current's. - Battery charging circuit (Elementary treatment).

Unit II

Single-Phase and Three-Phase AC to DC converters: Half controlled configurations-operating domains of three phase full converters and semi-converters - Reactive power considerations.

Unit III

Analysis and design of DC to DC converters - Control of DC-DC converters: Buck converters, Boost converters, Buck-Boost converters - Cuk converters in open loop Configuration- Chopper: Four quadrant operation of dc motor drive.

Unit IV

Inverter-Types of Inverter's-Single phase with R & RL Load and Three phase inverters with R Load -Voltage source and Current source inverters-Voltage control, harmonic minimization by PWM and Transformer Connections.

Unit V

AC to AC power conversion using voltage regulators & Cyclo-converters: Operation-Introduction to Matrix converters- Design aspects of converters, few practical applications-single phase Induction Motor Drive.

Text Books

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

Reference Books

1. Erickson RW, "Fundamentals of Power Electronics", Chapman and Hall.
2. Vithyathil. J, "Power Electronics: Principles and Applications", McGraw Hill

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED POWER ELECTRONIC CONVERTERS

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

Course objectives

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

Course outcomes

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

Unit I

Boost type APFC and control – Introduction, Circuit Model Analysis, Design - Three phase utility interphases and control

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY

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

Course objectives

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

Course outcomes

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

Unit I

Introduction and Power Quality Standards

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

Unit II

Causes of Power Quality Problems

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

Unit III

Passive shunt and series compensation Introduction – Classification and Principle of operation of Passive Shunt and Series Compensators - Analysis and Design of Passive Shunt

Compensators for Single-Phase System, Three-Phase Three Wire System and Three-Phase Four Wire System.

Unit IV

Active Shunt and Series Compensation

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

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

Unit V

Unified Power Quality Compensators

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

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RENEWABLE ENERGY SYSTEMS

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

Course objectives

- Learn various renewable energy sources
- Gain understanding of integrated operation of renewable energy sources
- Study the concepts of distributed generation
- learn the basics of transmission system operation
- Study the economic aspects of distributed generation

Course outcomes

- Gain Knowledge about different renewable energy sourses
- Describe the challenges and problems associated with the use of various energy sources
- Understand the working of distributed generation system in autonomous / grid connected modes
- Differentiate the concept of transmission and protection of distribution generators
- Know the Impact of Distributed Generation on Power System

Unit I

Introduction - **Energy and sustainable development, Scientific principles of renewable energy**, Social implications, distributed energy systems and dispersed generation, Impact of renewable energy generation on environment, sources of energy as Micro turbines, Internal combustion engines.

Unit II

Solar Power – Status, properties and requirements, Photo voltaics, Fast variations with time, Wind Power - Status, properties, requirements, Power Distribution as a Function of the Wind Speed, Combined heat and power – Status and properties, Hydro Energy – Properties and variation with time, Tidal, Wave and Geothermal energy – social and environmental aspects.

Bio mass - Classification, direct combustion of heat and social and environmental aspects. and Fuel Cells - types

Unit III

Impact of Distributed generation on the Power system – Impact of the changes, Overloading, Power Quality – Voltage, Current and multiple generator tripping and design of distributed generation.

Unit IV

Fundamentals of Transmission System Operation, Frequency Control, Balancing, and Reserves, Restoration after a Blackout, Voltage Stability, Kinetic Energy and Inertia Constant Frequency Stability Angular Stability and Fault Ride-Through

Protection - Over current Protection, Calculating the Fault Currents, Bus bar Protection, Excessive Fault Current and Generator Protection.

Unit V

Distributed generation: Introduction, Reasons, Technical Impacts, Economic Impact, Barriers and Renewable Sources of Energy and Interconnection and Case Studies.

Text Books

1. John Twidell and Wier, Renewable Energy Resources, CRC Press, 2009.
2. Math H.Bollen, FainanHassan,"Integration of Distributed Generation in the Power System", July2011,Wiley –IEEE Press
3. Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.

Reference Books

1. Ranjan Rakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies",2nd Ed. Prentice Hall of India ,2011
2. Roger A.Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010
3. James F.Manwell, Jon G.McGowan, Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMAL AND ADAPTIVE CONTROL

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

Course objectives

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

Course outcomes

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

Unit I

Optimal control problem – fundamental concepts and theorems of calculus of variations– Euler - Language equation and external of functional.

Unit II

Variational approach to solving optimal control problems. Hamiltonian and different boundary conditions for optimal control problem. Linear regulator problem - Pontryagin's minimum principle.

Unit III

Dynamic Programming- Principle of optimality and its application to optimal control problem.

Unit IV

Hamilton-Jacobi-Bellman equation- model reference adaptive systems (MRAS)- Design hypothesis.

Unit V

Introduction to design method based on the use of Liapunov function. Design and simulation of variable structure adaptive model following control.

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PWM FOR POWER ELECTRONIC CONVERTER

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

Course objectives

- Discuss various PE converters
- Interpret Zero space vector placement modulation strategies
- Determine programmed modulation strategies
- Adapt pulse width modulation for multilevel inverters
- Interpret the necessity and Importance of PWM techniques

Course outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC AND HYBRID VEHICLES

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

Course objectives

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

Course outcomes

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

Unit I

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

Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

Unit II

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

Unit III

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives, configuration and control of Permanent Magnet Motor Drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit IV

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology, Communications, supporting subsystems

Unit V

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

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL DRIVES LABORATORY

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

Course objectives

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

Course outcomes

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

Task1

Study of Thyristor controlled D.C Drive

Task2

Study of Chopper Fed DC Motor.

Task3

Study of A.C single phase motor speed control using TRIAC.

Task4

PWM inverter fed three phase induction motor control using PSPICE/MATLAB/PSIM software.

Task5

VSI/CSI fed induction motor drive analysis using MATLAB/PSPICE/PSIM software.

Task6

Study of V/f control operation of three phase induction motor.

Task7

Study of permanent magnet synchronous motor drive fed by PWM inverter using software.

Task8

Regenerative/ Dynamic breaking operation for DC motor study using software.

Task9

Dynamic breaking / Plugging of three phase IM

Task10

Study of different speed and current control algorithms of PMBLDC motor and SRM using MATLAB/SIMULINK/ PSIM software.

Hardware Experiment

Task11

Realization of PMBLDC motor drive

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

Text Books

1. GRIET reference Manual

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER ELECTRONICS LAB

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

Course objectives

- To provide the students hands on experience on power electronics switches.
- To program different switching patterns in power electronics systems.
- To study advanced power electronic converters.
- To familiarize the operation of rectifier circuits.
- To study the power electronics based resonant inverters.

Course outcomes

- Define the basics of power electronics switches and Evaluate the V-I characteristics of SCR
- Relate the operating characteristics of Thyristor controlled & IGBT controlled rectifiers
- Analyze the operation of 3-ph bridge rectifiers
- Apply the knowledge of triggering of IGBT & MOSFET for Chopper circuit
- Extend the knowledge of control technique for Cyclo-converter and Relate the operating characteristics of converters for different loads.

Task1

To study V-I characteristics of SCR and measure latching and holding currents.

Task2

To study UJT trigger circuit for half wave and full wave control.

Task3

To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.

Task4

To study single phase (i) fully controlled (ii) half-controlled bridge rectifiers with resistive and inductive loads.

Task5

To study three-phase fully/half-controlled bridge rectifier with resistive and inductive

loads.

Task6

To study single-phase ac voltage regulator with resistive and inductive loads.

Task7

To study single phase cyclo-converter.

Task8

To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.

Task9

To study operation of IGBT/MOSFET chopper circuit.

Task10

To study MOSFET/IGBT based single-phase series-resonant inverter.

Task11

To study MOSFET/IGBT based single-phase bridge inverter

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

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

Course objectives

Course outcomes

Unit I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit II

Effective literature studies approaches, analysis Plagiarism, Research ethics.

Unit III

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

Unit IV

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

Unit V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for

science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. Ranjit Kumar, 2 nd Edition , "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall , "Industrial Design", McGraw Hill,1992.
4. Niebel , "Product Design", McGraw Hill,1974.
5. Asimov , "Introduction to Design", Prentice Hall,1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age",2016.T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,2008

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(CORE III)

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

Course objectives

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

Course outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

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

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL CONTROL OF POWER ELECTRONIC AND DRIVE SYSTEMS

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

Course objectives

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

Course outcomes

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

Unit I

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

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

Unit II

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

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

Unit III

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

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

Unit IV

Open-loop Control for Digital Power Electronics: Introduction, Stability analysis, Unit-step function responses, Impulse responses.

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

Unit V

Energy Factor Application in AC and DC Motor Drives: Introduction, Energy storage in motors, A DC/AC voltage source, An AC/DC current source, AC motor drives, DC motor drives.

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FACTS AND CUSTOM POWER DEVICES

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

Course objectives

- 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

- 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.
- Analyze role of SVC&STATCOM in improving the power system dynamics.

Unit I

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

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DYNAMICS OF ELECTRICAL MACHINES

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

Course objectives

- Explain Performance characteristics of machine.
- Interpret the dynamics of the machine.
- How to determine stability of machine.
- Analyze the synchronous machine.
- Analyze different electrical machines with dynamic modelling.

Course outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

Alternator / Synchronous Motor System.

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DIGITAL SIGNAL PROCESSING

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

Course objectives

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

Course outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

AI TECHNIQUES

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

Course objectives

- Classify the difference between Biological Neuron and Artificial Neuron.
- Understand basic foundation in designing the Intelligent Systems.
- Differentiate between Neural Networks and Fuzzy Neural Networks
- Identify the Systems which are designed using Fuzzy and Neural Networks.
- Describe the importance of the Genetic Algorithm and its applications.

Course outcome

- Describe the importance of designing the System with Artificial Neural Networks.
- Learn different types of fuzzification and defuzzification methods.
- Distinguish the various Neural Networks Architectures.
- Identify a system using Fuzzy logic or Neural network
- Analyze the parameters of Genetic Algorithm.

Unit I

Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multi-Layer Feed Forward Neural Networks, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

Unit II

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods.

Unit III

Fuzzy Neural Networks, few algorithms for learning parameters like Genetic Algorithm

Unit IV

System Identification using Fuzzy and Neural Network

Unit V

Genetic Algorithm, Reproduction cross over, mutation. Introduction to evolutionary program. Applications related to practical problems.

Text Books

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

2. Simon Haykins, “Neural Networks”, Prentice Hall

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

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISTRIBUTED GENERATION

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

Course objectives

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

Course outcomes

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

Unit I

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

Unit II

Technical impacts of DGs: Transmission systems Distribution systems De-regulation Impact of DGs upon protective relaying, Impact of DGs upon transient and dynamic stability of existing. Distribution systems, Steady-state and Dynamic analysis.

Unit III

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

Unit IV

Introduction to micro-grids: Types of micro-grids: autonomous and non-autonomous grids Sizing of micro-grids, Modelling & analysis of Micro-grids with multiple DGs, Micro-grids with power electronic interfacing units.

Unit V

Transients in micro-grids: Protection of micro-grids, Case studies, Advanced topics.

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SMART GRIDS

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

Course objectives

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

Course outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

Low Voltage DC Microgrid: Solid State Lighting System, Intelligent Wireless Sensor Network and Its Sensors, Energy Conservation in Green Building.

Unit IV

Wireless Sensor Networks in Smart Grid: ZigBee, Wi-Fi, Z-wave, Wireless HART, Security and Privacy of WSN based Consumer Applications, ZigBee based Energy Management.

Text Books

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY LAB

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

Course objectives

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

Course outcomes

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

Task1

To study the effect of nonlinear loads on power quality.

Task2

To demonstrate the voltage and current distortions experimentally.

Task3

To reduce the current harmonics with filters.

Task4

To study the voltage sag due to starting of large induction motor.

Task5

To study the capacitor switching transients.

Task6

To study the effect of balanced nonlinear load on neutral current, in a three-phase circuit

Task7

To study the effect of ground loop.

Task8

To study the effect of voltage flicker.

Task9

To calculate the distortion power factor.

Task10

Study the effect of harmonics on energy meter reading.

Task11

To study effect of voltage sag on electrical equipment.

Task12

To obtain the current harmonics drawn by power electronics interface using Simulation

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL SIGNAL PROCESSING LAB

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

Course objectives

- Understand Code Composer Software
- Discuss types of Addressing Modes using Code Composer Software
- Analyze the FFT Operation with different examples
- Program the Filtering Examples by interfacing Matlab with Code Composer Studio.
- Execute the applications of Interrupts

Course outcomes

- Run the programs using Code Composer Studio (I and II)
- Execute the programs using different Addressing Modes.
- Discuss the FFT operation carried on Bit Reversal Operations.
- Execute the data exchange between the two sources using Code Composer Studio.
- Describe the importance of Interrupts and programming using CC Studio

Task1

Introduction to Code Composer Studio-I

Task2

Introduction to Code Composer Studio-II

Task3

Introduction to the Addressing Modes

Task4

FFT and Bit Reversal Operation

Task5

FFT and its Applications

Task6

Audio Codec and its Applications

Task7

Real Time Data Exchange

Task8

IR filtering by interfacing MATLAB with Code Composer Studio

Task9

Introduction to Interrupts

Task10

Digital communication using Binary Phase Shift Keying

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HVDC

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

Course objectives

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

Course Outcomes

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

Unit I

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

Unit II

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

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

Unit III

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

Unit IV

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

Unit V

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

Text Books

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

Reference Books

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL LOAD MODELING AND CONTROL

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

Course objectives

- Understand the energy demand scenario
- Understand the modeling of load and its ease to study load demand industrially.
- Evaluate Electricity pricing models
- Study Reactive power management in Industries.
- Analysis and application of load management tools in Industries.

Course outcomes

- Summarize the load control techniques in industries and its application
- Understand different types of industrial processes and optimize the process using tools like LINDO and LINGO
- Apply load management to reduce demand of electricity during peak time
- Analyze the Integrated Load management for Industries
- Analyze the reactive power management in industries.

Unit I

Electric Energy Scenario-Demand Side Management-Industrial Load Management. Load Curves-Load Shaping Objectives-Methodologies- Barriers; Classification of Industrial Loads-Continuous and Batch processes -Load Modeling.

Unit II

Electricity pricing – Dynamic and spot pricing –Models. Direct load control- Interruptible load control. Bottom up approach- scheduling- Formulation of load models. Optimization and control algorithms Case studies.

Unit III

Reactive power management in industries-controls. Power quality impacts application of filters Energy saving in industries.

Unit IV

Cooling and heating loads. load profiling-Modeling. Cool storage-Types- Control strategies- Optimal operation. Problem formulation Case studies.

Unit V

Captive power units- Operating and control strategies. Power Pooling -Operation models. Energy banking. Industrial Cogeneration. Selection of Schemes Optimal Operating Strategies. Peak load saving-Constraints-Problem formulation- Case study. Integrated Load management for Industries.

Text Books

1. C.O. Bjork “Industrial Load Management - Theory, Practice and Simulations", Elsevier, the Netherlands,1989.
2. C.W. Gellings and S.N. Talukdar, “Load management concepts,” IEEE Press, New York, 1986, pp. 3-28.
3. Y. Manichaikul and F.C. Schweppe ," Physically based Industrial load", IEEE Trans. on PAS, April 1981.
4. H. G. Stoll, "Least cost Electricity Utility Planning”, Wiley Interscience Publication, USA, 1989.
5. I.J.Nagarath and D.P.Kothari, .Modern Power System Engineering., Tata McGraw Hill Publishers, New Delhi, 1995.
6. IEEE Bronze Book- “Recommended Practice for Energy Conservation and cost effective planningin Industrial facilities”, IEEE Inc, USA.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SCADA SYSTEMS AND APPLICATIONS

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

Course objectives

- Knowledge on smart grid 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

- Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications**.**
- Acquire knowledge about SCADA architecture, Remote Terminal Unit (RTU), HMI Systems etc.
- Knowledge about single unified standard architecture IEC 61850.
- Apply Open standard communication protocols.
- Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

Unit I

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies. Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

Unit II

Industries SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

Unit III

SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture –IEC 61850.

Unit IV

SCADA Communication: various industrial communication technologies -wired and wireless methods and fiber optics. open standard communication protocols.

Unit V

SCADA Applications: Utility applications- Transmission and Distribution sector-operations, monitoring, analysis and improvement. Industries - oil, gas and water

Text Books

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of AmericaPublications, USA,2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and RelatedSystems", Newnes Publications, Oxford, UK,2004.
3. William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
5. Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power",PennWell 1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS ANALYTICS

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

Course objectives

Course

UNIT I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series

with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models .Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, persons Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY

(OPEN ELECTIVE)

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for

problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one Machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V

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

Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS ANALYTICS

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Reference Books

1. H.A. Taha, Operations Research, An Introduction, PHI,2008

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets.

Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit V

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPOSITE MATERIALS

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

Unit I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Unit II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Unit III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Unit IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Unit V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition,2007.

Reference Books

1. Hand Book of CompositeMaterials-ed-Lubin.
2. Composite Materials –K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L.Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

WASTE TO ENERGY

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

Unit I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit V

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy

programme in India.

Reference Books

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd.,1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd.,1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd.,1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

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

Course objectives:

- To state how to put research on paper
- To demonstrate how to write an abstract
- To apply the process of research
- To appraise the key skills involved in writing the title, abstract, introduction and review of literature
- To compose a paper which is good and has the qualities of acceptance and publication

Course Outcomes:

- Will be able to understand how to write a research paper
- Will outline the drafting of an abstract
- Will acquire the skills of various elements of research
- Will be in a position to write a good paper
- Will result in increasing the chance of publication

Unit I

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

Unit II

Clarifying Who DidWhat, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

Unit III

Review of the Literature, Methods, Results, Discussion, Conclusions, TheFinal Check.

Unit IV

Key skills are needed when writing a Title, key skills are needed whenwriting an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Unit V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusion.

Unit VI

Useful phrases, how to ensure paper is as good as it could possibly be the first-timesubmission.

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISASTER MANAGEMENT

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

Course objectives

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

Course Outcomes:

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

future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

Unit I

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Typesand Magnitude.

Unit II

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

Unit III

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

Unit IV

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

Unit V

Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Unit VI

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trendsin Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE

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

Course objectives

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

Course Outcomes

- Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
- Enable students to understand roots of Sanskrit language.
- Students learn engineering fundamentals in Sanskrit.
- Students can attempt writing sentences in Sanskrit.
- Ancient Sanskrit literature about science & technology can beunder stood

Unit I

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

Unit II

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE EDUCATION

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

Course objectives

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

Course outcomes

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality
- Student will be able to realize the significance of ethical human conduct and self-development
- Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.

Unit I

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards andprinciples, Value judgement.

Unit II

Importance of cultivation of values, Sense ofduty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, NationalUnity. Patriotism. Love for nature, Discipline

Unit III

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity oflabour, Universal brotherhood and religious tolerance, True friendship, Happiness vs suffering, love fortruth, Aware of self-destructive habits, Association andCooperation, Doing best for savingnature.

Unit IV

Character and Competence –Holy books vs Blindfaith. Self-management and Goodhealth. Science ofreincarnation. Equality, Nonviolence, Humility, Role ofWomen. All religions and same message. Mind your Mind,Self-control. Honesty, Studyingeffectively

Reference Books

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDIAN CONSTITUTION

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

Course objectives

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

Course outcomes

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

Unit I

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

Unit II

Philosophy of the Indian Constitution: Preamble Salient Features.

Unit III

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

Unit IV

Organs of Governance: Parliament-Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Unit V

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

Unit VI

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PEDAGOGY STUDIES

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

Course objectives

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

Course Outcomes

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

Unit I

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

Unit II

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

Unit III

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

Unit IV

Professional development: alignment with classroom practices and follow- up support, Peersupport, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large classsizes

Unit V

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

Reference Book

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRESS MANAGEMENT BY YOGA

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

Course objectives

- To achieve overall Good Health of Body and Mind.
- To lower blood pressure and improve heart health.
- To become non-violent and truthfulness.
- To increase the levels of happiness.
- To eliminate all types of body pains.

Course outcomes

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

Unit I

Definitions of Eight parts of yog. (Ashtanga)

Unit II

Yam and Niyam. Do`s and Don't's inlife. Ahinsa, satya, astheya, bramhacharya andaparigraha Shaucha, santosh, tapa, swadhyay,ishwarpranidhan

Unit III

Asan andPranayam, Various yog poses and their benefits for mind & body. Regulaization of breathing techniques and its effects-Types of pranayam

Reference Books

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, Advaita Ashrama (Publication Department),Kolkata

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

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

Course objectives

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

Course outcomes

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

Unit I: Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride &heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Unit II: Approach to day to day work andduties.

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

Unit III: Statements of basicknowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62,68
- Chapter 12 -Verses 13, 14, 15, 16,17,18
- Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses36,37,42,
- Chapter 4-Verses 18,38,39
- Chapter18 – Verses37,38,63

Reference Books

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