ABOUT ARISTOTLE EDUCATIONAL SOCIETY

Aristotle Educational Society was established in 2000, with an aim of bringing quality Engineering and management education closer to the student's populace at large. The society is founded by experienced and visionary team of academicians, industrialists and NRI Entrepreneurs, whose valuable knowledge and experience are the guiding factors for K G Reddy College of Engineering & Technology (KGRCET). At KGRCET we are always for every driving improvements and innovation in education, is it infrastructure expansion or faculty talent acquisition. Our endeavour is to provide best of the class facilities and services to our students.

Twenty First Century society is considered to be a knowledge society. But many of our educationists and captains of industry are of the opinion that there is a significant mismatch between the kind of education students are equipped with from our institutions and the industry's expectations. It is precisely to bring down this gap that our focus is on continuous enhancement of both the technical skills as well as the soft skill of our students in order to compete and succeed in the global work places of tomorrow.

Vision:

To become new-age engineering institution which is recognized for its innovative teaching and learning culture, research and entrepreneurial ecosystem, and sustainable social impact in the community.

Mission:

- To offer undergraduate and post-graduate programs that is supported through industry relevant curriculum and innovative teaching and learning processes that would help students succeed in their professional careers.
- To provide necessary support structures for students, which will contribute to their personal and professional growth and enable them to become leaders in their respective fields.
- To provide faculty and students with an ecosystem that fosters research and development through strategic partnerships with government organisations and collaboration with industries.
- To contribute to the development of the region by using our technological expertise to work with nearby communities and support them in their social and economic growth.

TEN RULES TO TRANSFORM YOURSELF INTO AN IDEAL STUDENT AND A PERFECT PROFESSIONAL

1. The first thing is punctuality. You are expected to be in your seat in the classroom by 9:00 am. However, 10 minutes of grace time is given to enter the class. If you arrive at the institute after 9:10 am and before 09:50 am you can attend the rest of the classes. From 10:00 am, no student will be allowed to gain entry into the campus. You are not permitted to enter the class after the commencement of the class (except 1st period) and should not leave a class before that class ends.
2. You should not leave the campus during the working hours (between 9:00 am and 3:45 pm) without prior permission from the principal. Students' who wishes to leave the campus for any reason may apply for permission to the concerned Head who in turn forward the case to the Principal. The Principal may issue the Gate pass after getting the consent of the parent.
3. You must wear neat and clean formal dress. Your attire should be befitting to the status of a student doing a professional course. You must wear (display) the Identity Card as long as you are in the campus.
4. Use of mobile phones is strictly prohibited in the class rooms/ labs/ workshops/ library/computer labs/Offices and other prominent places.
5. All the interpersonal communication within the campus must be only in English. If mistakes, fear/tension, mother tongue influence etc. are your reasons for not speaking in English, you must realize that they are all part and parcel of the learning process. Unless you make mistakes and learn from your mistakes you will never be able to acquire good command over English. As you are all aware, good command over English paves the way for a good professional career.
6. In case there is any delay on the part of any teacher in entering your class, and as a result the students are idle, one of the students from your class (preferably CR) may contact the HOD/Academic Counselor for corrective measures/necessary arrangements. You should not be seen in corridors, canteen, and buses or anywhere outside your classroom/lab without carrying a permission letter. If you do not have any teaching hours you are advised to make use of your free time productively, by utilizing various facilities
7. You must actively participate in all academic and extracurricular activities like; Seminars/Workshops, Tech Fests, College Day and all the National Festivals and use them as a platform to present yourself and grow as a better individual.
8. As a student, you are expected to cultivate habits like practicing self-discipline, showing dedication towards your studies and respecting the teachers and elders.
9. If any one of you has any complaints or grievances against the institution, you are always welcome to bring them to the notice of your respective departments and get your problems solved.
10. Never forget that you are always welcome to make your suggestions for the improvement of the institution. Your suggestions will be appreciated and implemented if they found to be good, innovative and helpful to us in offering better services to all

CODE OF CONDUCT OF STUDENTS

It shall be the responsibility of the students of KGRCET to

1. Be familiar with and adhere to this Code and any amendment brought to this Code.
2. Behave in a dignified and courteous manner and show due respect to the authorities, employees, elders and fellow students.
3. Access all educational opportunities and facilities available in the college and make good use of them to benefit academically and develop scientific temper.
4. Respect the laws of the country and human rights and conduct in a responsible and dignified manner at all times.

BEHAVIOUR & CONDUCT OF THE STUDENT IN THE CAMPUS

- Students are expected to be in the classroom by 8.55 am. Only 5 minutes of grace time can be given. No student will be allowed to enter into the campus after 10 am. Students are not permitted to enter a class after the commencement of the class and leave before that class ends.
- Students should not leave the campus during working hours (between 9:00 am and4:15 pm). Students may be permitted to leave the campus only in exceptional circumstances with the prior permission of the Head of the Department concerned and the Principal only. Gate pass will be issued only after the authorization of the Principal.
- Students must wear neat and clean formal dress. Wearing of jeans, T-shirts and sandals is not permitted. Identity Card is to be worn around the neck at all times.
- Use of mobile phones is strictly prohibited in the classrooms, labs, workshops, library, computer labs, offices and seminar halls.
- All the interpersonal communication within the campus must be in English only.
- If any teacher does not report to the class for any reason, the CR is to contact the HOD/Dean Academics for necessary alternative arrangements.
- Students are not to be seen in corridors, canteen, and buses or anywhere outside classrooms/labs without a letter of permission. Free time may be utilized in Library, Digital Library, Language Lab, Sports Lounge, etc.
- Students are encouraged to actively participate in all academic and extracurricular activities like seminars, workshops, clubs, technical fests, sports, College Day and National festivals and use them to develop their technical and soft skills.
- Students are expected to develop manners, self-discipline and integrity and groom themselves to be responsible engineers of the country.
- Students should not indulge in ragging of any form in the campus or off the campus.

RULES FOR STUDENTS

- Students are advised and expected to
- Be punctual for all the activities.
- Be regular for the classes, labs, workshops and examinations.
- Greet their faculty and seniors.
- Express themselves appropriately without the use of profane language or offensive gestures.
- Respect the safety of others by not bringing real or imitation weapons to college or the hostel.
- Avoid indulging in loose talk or spreading rumours on campus.
- Refrain from sitting in places such as parapets, stairs, footpaths, etc.
- Wear their identity cards while on the campus.
- Keep away from possession or consumption of chewing gum, narcotic drugs, tobacco, alcohol and other intoxicating substances which are strictly prohibited by law.
- Do not indulge in anti-institutional, anti-social, anti-national, communal, indecent, immoral or political activities within the campus and hostels
- Do not organize, attend or participate in any activity or agitation sponsored by political or religious organizations.
- Do not respond to any form of strike, procession or agitation including slogan shouting or boycott of activities.
- Take prior approval and permission of the Principal before undertaking any educational/recreational tours or industrial visits.
- Avoid coming to the college in their personal vehicles. Vehicles should be parked in the designated parking space only. Rash or negligent driving of vehicles, blowing of horns and riding with more than one pillion rider is prohibited.
- Report promptly any unauthorized entry of outsiders into the campus as well as hostels.

ACADEMIC REGULATIONS

1. Holidays

KGRCET strictly follows the holidays notified by JNTUH Academic calendar.

2. Attendance

- A student shall be eligible to appear for University Examinations, if he/she possesses an aggregate of at least of 75% of attendance in all the subjects.
- A student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester / 1st year.
- If any student wants to go on leave for three or four days, the parents should meet the academic Counselor of the class, to which the student belongs to, to get the permission.
- Attendance is compulsory on the preceding and the proceeding days of any holiday.

3. Credit System

The credit system is as per the JNTUH Course Structure and syllabus. Students can have the details by going through the syllabus books.

4. Distribution and weight age of marks:

The performance of a student in each semester / I year shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject.

Subject	Internal Exam	Assignments	End semester Exam	Total Marks
Theory	20	5	75	100
Practical	25	-	75	100

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall place in one of the following 4 Classes:

Class Awarded	% of marks to be secured	
First class with Distinction	70 % and above	From the aggregate, marks secure from the best 186 credits
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

For further details on academic regulations, please refer the syllabus books

GENERAL INFORMATION

Communication

In case any student or parent wants to contact the college, authorities and put forward their views should communicate the same to the Head of the department/Principal. Any change of address, the parents have to report it to the academic counselor concerned either personally or by making a phone call.

Ragging

Ragging is strictly prohibited, on the campus and there is an anti-ragging squad working in the college premises and if any senior students are observed troubling the fresher's stringent action will be taken against the culprits and there should be no doubt in any body's mind about the commitment of the college authorities to crush the ragging with an iron hand.

Library (Rules and Regulations)

The college has a spacious and well-stocked library with text books and reference books and several national and international journals and magazines. The stockpile of the books goes on increasing year after year to help students keep abreast of the latest information. All the students are advised to put the library to the optimum utilization and try to widen your knowledge. The Digital library is equipped with 21000+ online E journals.

Titles	:	3012
Volume of books	:	22793
Print Journals	:	60
E-Journals	:	DELNET-1230
Seating Capacity	:	150
Timings	:	8 AM – 6 PM
Digital Library	:	30 systems, High speed Internet, 21000+ online journals

SEMESTER I
ACADEMIC CALENDAR-JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
REVISED ACADEMIC CALENDAR 2020-21
For All Constituent & Affiliated Colleges of JNTUH
B. Tech./B.Pharm. II, III & IV Years I & II Semesters

B. Tech./B.Pharm. II, III & IV Years - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	01.09.2020	
2	1st Spell of Instructions (including Dussehra Recess)	01.09.2020	31.10.2020 (9 Weeks)
3	Dussehra Recess	19.10.2020	24.10.2020
4	End Examinations preparation holidays - Previous Semesters	02.11.2020	04.11.2020 (3 days)
5	2nd Spell of Instructions (including First Mid Term Examinations)	14.12.2020	13.02.2021 (9 Weeks)
6	First Mid Term Examinations	21.12.2020	28.12.2020 (1 Week)
7	Submission of First Mid Term Exam Marks to the University on or before	04.01.2021	
8	Second Mid Term Examinations	15.02.2021	20.02.2021 (1 Week)
9	Practical classes	22.02.2021	27.02.2021 (1 Week)
10	Preparation Holidays and Practical Examinations	01.03.2021	06.03.2021 (1 Week)
11	Submission of Second Mid Term Exam Marks to the University on or before	27.02.2021	
12	End Semester Examinations	08.03.2021	20.03.2021 (2 Weeks)

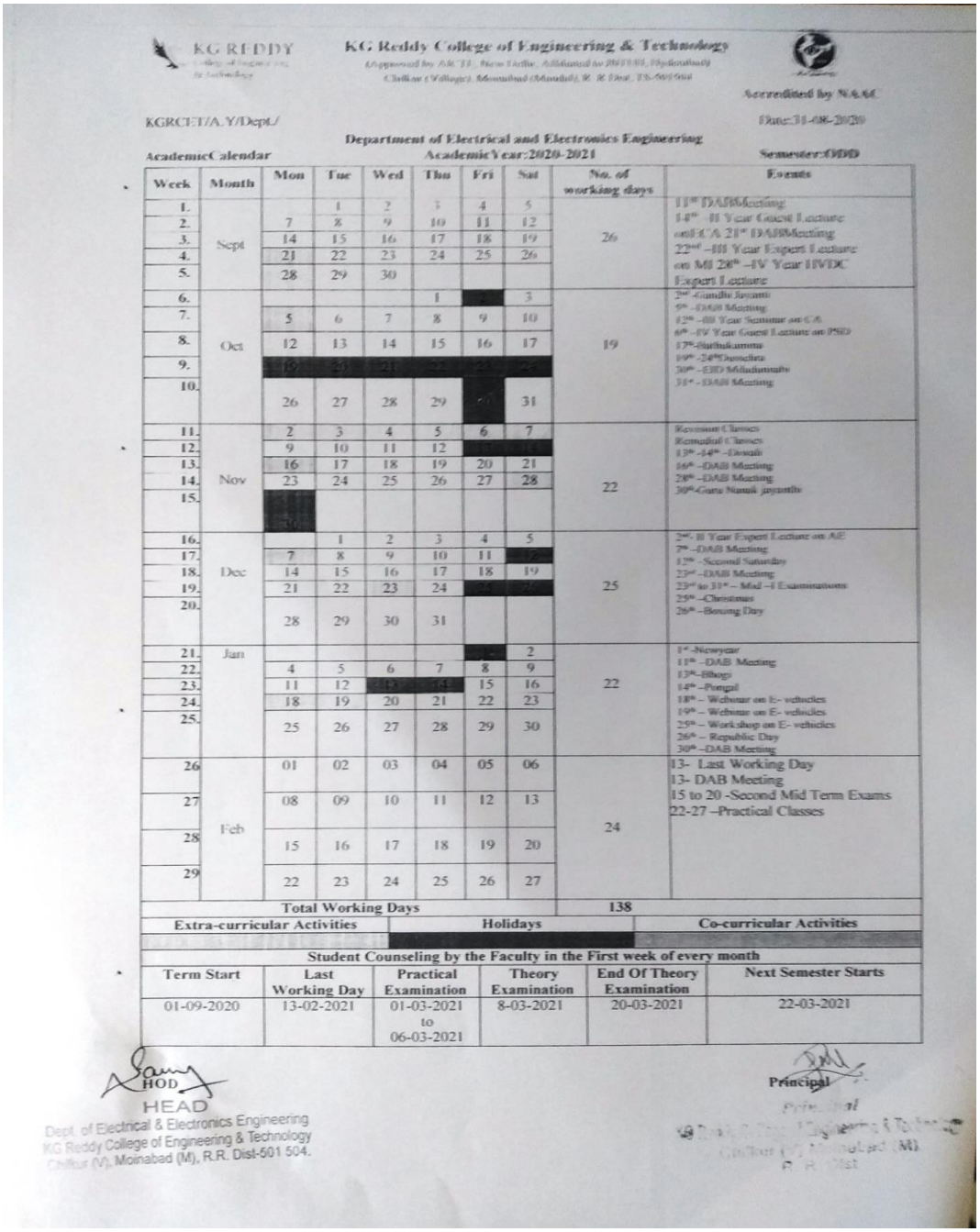
B. Tech./ B.Pharm. II, III & IV Years - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**22.03.2021**	
2	1st Spell of Instructions	22.03.2021	15.05.2021 (8 Weeks)
3	Summer Vacation	17.05.2021	29.05.2021 (2 Weeks)
4	First Mid Term Examinations	31.05.2021	05.06.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	11.06.2021	
6	2nd Spell of Instructions	07.06.2021	31.07.2021 (8 Weeks)
7	Second Mid Term Examinations	02.08.2021	07.08.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	09.08.2021	14.08.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	14.08.2021	
10	End Semester Examinations	16.08.2021	28.08.2021 (2 Weeks)

Note: 1 All the laboratory courses shall be conducted once normalcy is restored.
2 Regular End Semester Examinations of previous Semester (including lab exams) as per the data received from the Examination branch: 05.11.2020 to 11.12.2020.

Sd/- xxxxxx
DIRECTOR, ACADEMIC & PLANNING

SEMESTER I
ACADEMIC CALENDAR – EEE Department



KG REDDY College of Engineering & Technology

(Approved by AICTE, New Delhi, Affiliated to JNTUH, Hyderabad)
Chilkur (Village), Moinabad (Mandal), R. R Dist, TS-501504

Accredited by NAAC

KGRCET/A.Y/Dept./ Date:31-08-2020

Department of Electrical and Electronics Engineering

Academic Calendar — Academic Year:2020-2021 — Semester:ODD

Week	Month	Mon	Tue	Wed	Thu	Fri	Sat	No. of working days	Events
1.	Sept		1	2	3	4	5	26	11th DAB Meeting 14th –II Year Guest Lecture on ECA 21st DAB Meeting 22nd –III Year Expert Lecture on MI 28th –IV Year IIVDC Expert Lecture
2.		7	8	9	10	11	12		
3.		14	15	16	17	18	19		
4.		21	22	23	24	25	26		
5.		28	29	30					
6.	Oct				1	[redacted]	3	19	2nd -Gandhi Jayanti 9th –DAB Meeting 12th –III Year Seminar on CA 16th –IV Year Guest Lecture on PSD 17th-Bathukamma 19th -24thDussehra 30th –EID Miladunnabi 31st –DAB Meeting
7.		5	6	7	8	9	10		
8.		12	13	14	15	16	17		
9.		[redacted]							
10.		26	27	28	29	[redacted]	31		
11.	Nov	2	3	4	5	6	7	22	Revision Classes Remedial Classes 13th -14th –Diwali 16th –DAB Meeting 28th –DAB Meeting 30th-Guru Nanak jayanthi
12.		9	10	11	12	[redacted]			
13.		16	17	18	19	20	21		
14.		23	24	25	26	27	28		
15.		[redacted]							
16.	Dec		1	2	3	4	5	25	2nd- II Year Expert Lecture on AE 7th –DAB Meeting 12th –Second Saturday 23rd –DAB Meeting 23rd to 31st – Mid –I Examinations 25th –Christmas 26th –Boxing Day
17.		7	8	9	10	11	[redacted]		
18.		14	15	16	17	18	19		
19.		21	22	23	24	[redacted]			
20.		28	29	30	31				
21.	Jan					[redacted]	2	22	1st -Newyear 11th –DAB Meeting 13th-Bhogi 14th –Pongal 18th – Webinar on E- vehicles 19th – Webinar on E- vehicles 25th – Workshop on E- vehicles 26th – Republic Day 30th –DAB Meeting
22.		4	5	6	7	8	9		
23.		11	12	[redacted]		15	16		
24.		18	19	20	21	22	23		
25.		25	26	27	28	29	30		
26	Feb	01	02	03	04	05	06	24	13- Last Working Day 13- DAB Meeting 15 to 20 -Second Mid Term Exams 22-27 –Practical Classes
27		08	09	10	11	12	13		
28		15	16	17	18	19	20		
29		22	23	24	25	26	27		
Total Working Days								138	

Extra-curricular Activities	Holidays	Co-curricular Activities
[redacted]		

Student Counseling by the Faculty in the First week of every month

Term Start	Last Working Day	Practical Examination	Theory Examination	End Of Theory Examination	Next Semester Starts
01-09-2020	13-02-2021	01-03-2021 to 06-03-2021	8-03-2021	20-03-2021	22-03-2021

HOD
HEAD
Dept. of Electrical & Electronics Engineering
KG Reddy College of Engineering & Technology
Chilkur (V), Moinabad (M), R.R. Dist-501 504.

Principal

ABOUT THE DEPARTMENT

Electrical and Electronics Engineering Department, established in the year 2008, is one of the oldest departments of K G Reddy College of Engineering and Technology. The Primary objective of the department is to impart quality education and training at the undergraduate level in the areas of Electrical and Electronics Engineering.

The Department has qualified and experienced faculty in all the related fields of Electrical and Electronics Engineering. The theoretical knowledge is further supplemented by well equipped laboratories. The department regularly organizes invited lectures by experts from industries in various fields of Electrical and Electronics Engineering. Workshops and Industrial visits are regularly conducted under the association of Electro Technia Association for Empowering (EAE)**.**

The department is headed by **Mrs P.Samyuktha, Associate Professor**, who is having vast academic and research experience. Students are encouraged to participate in various Workshops, Seminars, Conferences and technical competitions at various levels.

Vision:

- To become a renowned department imparting both technical and non-technical skills to the students by implementing new engineering pedagogy's and research to produce competent new age electrical engineers.

Mission:

- To transform the students into motivated and knowledgeable new age electrical engineers.
- To advance the quality of education to produce world class technocrats with an ability to adapt to the academically challenging environment.
- To provide a progressive environment for learning through organized teaching methodologies, contemporary curriculum and research in the thrust areas of electrical engineering.

Subject allotment:

S. No.	Name of the Faculty	Name of the Subject	Mobile	E-mail Id
1	B Lingam	Power System Operation & Control	9440787910	lingam@kgr.ac.in
2	Mr. Gopala Krishna	HVDC Transmission	6301298297	gopalakrishna@kgr.ac.in
3	Dr TVV Pavan Kumar	Power Quality	9848606081	pavankumar99@gmail.com
4	D srinivas	Power semiconductor drives	8096766126	shrinudepally4304@gmail.com
5	Mrs. P. Samyuktha	Flexible AC transmission systems	9700166315	Hod.eee@gmail.com
6	Dr.T.V.V. Pavan Kumar	Electrical simulation Lab	9848606081	pavankumar99@gmail.com
7	D srinivas & B Lingam	Electrical workshop Lab	7032154067 9440787910	shrinudepally4304@gmail.com lingam@kgr.ac.in

Mentor Details:

S. No.	Name of the Mentor	Mobile	Mentees Roll No.
1	B Lingam	9440787910	18QM5A0207 to 13QM1A0225 AND 17H11A0201,202, 18H15A0201,202 (20)
2	Srinivas D	7032154067	17QM1A0201-215, 18QM5A0201-206 17QM5A0214 (20)

Class In-charges:

S. No.	Name of the Class In-charge	Mobile	E-mail Id
1	D srinivas	7032154067	shrinudepally4304@gmail.com

Class Representative Details:

S. No.	Name of the CR	Roll No.	Mobile
1	P. DIVYA	18QM5A0216	9493243914

Time Table:

(Approved by AICTE, New Delhi, Affiliated to JNTUH, Hyderabad)
Chilkur (Village), Moinabad (Mandal), R. R Dist, TS-501504

Accredited by NAAC

Department of Electrical and Electronics Engineering

KGRCET/A.Y/Dept./ Date: 07-01-2021

Time Table

Year – IV **Semester-I** **Branch-Section:** EEE **W.E.F:** 07-01-2021

Day/Date	09.30 AM to 10:15 AM	10.30 AM to 11:15NOON	11:30 AM to 12:15PM	12:30 PM to 01.15PM
Monday	PQ	FACTS	PSD	PSOC
Tuesday	FACTS	PQ	PSOC	HVDC
Wednesday	FACTS	HVDC	PQ	PSD
Thursday	PSOC	PQ	PSD	HVDC
Friday	PSD	PQ	HVDC	SWD
Saturday	PSD	FACTS	PSOC	FACTS

S.No	Subject Code	Subject Name	Faculty Name
1	EE743PE	Flexible A.C. Transmission Systems	Mrs. P. Samyuktha
2	EE732PE	Power Quality	Dr.T.V.V. Pavan Kumar
3	EE701PC	Power Semiconductor Drives	Mr.Srinivas D
4	EE722PE	HVDC Transmission	Mr. K. Gopala Krishna
5	EE702PC	Power System Operation and control	Mr.B.Lingam
6	EE705PC	Industry Oriented Mini Project	Mr.Srinivas D
		Class I/c	Mr.Srinivas D

In-charge HOD PRINCIPAL

COURSE DESCRIPTION DOCUMENTS

Year / Semester **:** IV YEAR I-SEM

Subject : Power System Operation And Control (EE702PC)

Name of the faculty : Mr. B.LINGAM

No of contact hours/week **:** 5

Course overview:

This course introduces students to the concept of power system operation control. Students will be exposed to the concept of power system management to meet load demand at optimal operating cost and various ways in controlling electrical power, unit commitment, Energy Management System and SCADA functions.

Test portion	
Test no.	**Topics**
1	**L1-L33**
2	**L34-L55**
Assignment portion	
Assignment no.	**Topics**
1	**L1-L33**
2	**L34-L55**

Approved by

Submitted by

(Signature of the faculty) **(Signature of HOD)**
Date: **Date:**

Course Objectives

- To analyze real power control and operation
- To analyze the importance of frequency control
- To analyze different methods to control reactive power
- To analyze unit commitment problem and importance of economic load dispatch
- To analyze real time control of power systems

Course Outcomes

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

CO1. Analyze the optimal scheduling of power plants

CO2. Analyze the steady state behavior of the power system for voltage and frequency fluctuations

CO3.Describe reactive power control of a power system

CO4.Design suitable controller to dampen the frequency and voltage steady state oscillations

Topic Outcomes:

S.No	Topic to be covered	Topic outcome
	UNIT I	
1	Basics of speed governing mechanism	Explain about speed governing mechanism and its working and its necessity
2	Modelling of speed governor	Obtaining the Modelling of speed governor
3	Speed load characteristics of governor	Observes Speed load characteristics of governor
4	Load sharing between two synchronous machines in parallel	Understanding the Load sharing between two synchronous machines
5	Control area concept and LFC control of a single-area system	Understanding Control area concept and LFC control of a single-area system

6	Static analysis of uncontrolled and controlled cases	Analysis of Static characteristics of uncontrolled and controlled cases
7	Dynamic analysis of uncontrolled and controlled cases	Analysis Dynamic of characteristics of uncontrolled and controlled cases
8	Integration of economic dispatch control with LFC	Analysis Integration of economic dispatch control with LFC
9	Two area system – modelling	Analysis of Two area system
10	Static analysis of uncontrolled case	Analysis of Two area system Static characteristics
11	Tie line with frequency bias control of two-area system	Analysis of Tie line with frequency bias control of two-area system
12	State variable model	Analysis of State variable model of two area system
13	Numerical problems	Applying the concepts learned
14	Tutorials	Evaluation
	UNIT – II	
16	Basics of reactive power control	Explain the basics of power control
17	Excitation systems	Explain different types of Excitation systems
18	Excitation systems –modeling	Analysis of excitation systems
19	Static analysis	Analysis of excitation system Static characteristics
20	Dynamic analysis	Analysis of excitation system dynamic characteristics
21	Stability compensation	Analysis of stability compensation
22	Generation and absorption of reactive power	Analyzing different sources and sinks of reactive power
23	Relation between voltage, active power and reactive power at a node	Analyzing the relation between reactive power and voltage
24	Methods of voltage control –off load tap-changing transformer	Understanding and analyzing of voltage control method
25	Tap setting of OLTC	Analyzing of voltage control method

	transformer	
26	Thyristors switched capacitors to maintain voltage profile	Analyzing SVC to maintain voltage profile
27	System level control using generator voltage magnitude setting	Analysis of different System level control
	UNIT – III	
29	Statement of economic dispatch problem	Analyze the economic dispatch problem
30	Cost of generation –incremental cost curve, heat-rate curve	Analyze different curves of thermal power plant
31	Co-ordination equations without loss	Analyzing the economic dispatch through Co-ordination equations without loss
32	Flow chart of economic dispatch without loss	Evaluation of economic dispatch without loss
33	Co-ordination equations with loss	Analyzing the economic load dispatch with loss
34	Flow chart of economic dispatch with loss	Evaluation of economic dispatch loss
35	Solution by direct method and λ-iteration method.	Evaluation of direct method and iteration method
36	Numerical problems	Applying the learned concepts
37	Tutorials	Evaluation
	UNIT – IV	
38	Statement of Unit Commitment problem	Analysis of Unit Commitment problem
39	Constraints-spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraint	Analysis of different constraints

40	Solution methods - Priority-list method	Evaluation of different solution methods
41	Forward dynamic programming approach	Evaluation of Forward dynamic programming approach
42	Numerical problems on priority-list method using full-load	Applying the priority list method to solve problems
43	Average production cost	Analysis of Average production cost
44	Forward DP method.	Analysis of Forward DP method.
45	Numerical problems	Applying the concepts learned
	UNIT – V	
46	Need of computer control of power systems	Analysis of Need of computer control of power systems
47	Concept of energy control centre (or) load dispatch centre and the functions	Analysis of Concept of energy control centre
48	System monitoring - data acquisition and control	Analysis of System monitoring - data acquisition and control
49	System hardware configuration	Analysis of System hardware configuration
50	SCADA functions	Analysis of SCADA functions
51	EMS functions	Analysis of EMS functions
52	Network topology	Analysis of Network topology
53	Importance of Load Forecasting	Analysis of Load Forecasting
54	Simple techniques of forecasting	Analysis of Simple techniques of forecasting
55	Numerical problems	Applying the concepts learned

Text books:

1. Power System Operation and Control, G.Sivanagaraju, G.Srinivasulu, pearson publications
2. Power System Operation and Control,N.V.Ramana,pearson publications

Reference books:

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

Activities in the class:

1. Conducted seminars by students in the form of power point presentation.
2. At the end of each class quiz will be conducted.

Evaluation Methods:

Assessment Tool	**Weightage(Marks)**
Home Assignment1	5
Home Assignment2	
Descriptive1	10
Descriptive2	
Objective1	10
Objective2	
Final Examination	75
Total	100

Year / Semester **:** IV YEAR I-SEM

Name of the Subject **:** Power Quality

Name of the faculty : Dr. T V V Pavan Kumar

No. of contact hours /week : 03

Course Overview:

The course Power Quality deals definitions and standards, also with classifications, monitoring, and measuring methods. The course also deals with Harmonic mitigation techniques

Test Portion	
Test No.	Topics
1	L1-L31
2	L32-L62
Assignment Portion	
Assignment no.	Topics
1	L1-L31
2	L32-L62

Submitted by **Approved by**

(Signature of the faculty) Date: **(Signature of HOD) Date:**

Course Objectives:

1. Definition of power quality and different terms of power quality
2. Study of voltage power quality issue – short and long interruption.
3. Detail study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
4. Overview of mitigation of power quality issues by the VSI converters

Course Outcomes: After completion of this course, the student will be able to: CO 1: Explain the severity of power quality problems in distribution system
CO 2: Explain the the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage)

CO 3: Analyze the characterization of voltage sag magnitude and three phase unbalanced voltage sag and also Investigate different power quality phenomena causes and effects.

CO 4: Explain the behavior of power electronics loads; induction motors, synchronous motor etc by the power quality issues.

CO 5: Apply the Concept of improving the power quality to sensitive load by various mitigating custom power devices

Lesson Contents:

S.N.	TOPIC	TOPIC OUTCOMES
	Unit-I: Introduction	
1	Introduction of the Power Quality (PQ) problem,	Explain PQ problem
2	Terms used in PQ	Explain terms used in PQ
3	Voltage, Sag, Swell, Surges	Explain Voltage, Sag, Swell, Surges
4	Harmonics	Explain about Harmonics
5	Over voltages, spikes	Explain Over voltages, spikes
6	Voltage fluctuations	Explain Voltage fluctuations
7	Transients, Interruption	Explain Transients, Interruption
8	Remedies to improve power quality	Explain Remedies to improve power quality

9	Power quality monitoring.	Explain Power quality monitoring.
10	**Topics beyond Syllabus:** PQ Issues in Renewable Energy System	Analyze PQ Issues in Renewable Energy System
11	Class Test – I	
12	**Tutorial**	
	Unit-II: Long & Short Interruptions	

13	Interruptions – Definition	Explain Interruptions – Definition
14	Difference between failures, outage, Interruptions	Explain difference between failures, outage, Interruptions
15	Causes of Long Interruptions	Explain causes of Long Interruptions
16	Origin of Interruptions	Explain origin of Interruptions
17	Limits for the Interruption frequency	Explain limits for the Interruption frequency
18	Limits for the interruption duration	Explain limits for the interruption duration
19	Costs of Interruption	Explain costs of Interruption
20	Overview of Reliability evaluation to power quality	Explain overview of Reliability evaluation to power quality
21	Comparison of observations and reliability evaluation	Explain comparison of observations and reliability evaluation
22	Origin of short interruptions	Explain origin of short interruptions
23	Basic principle, fuse saving	Explain basic principle, fuse saving
24	Voltage magnitude events due to re-closing	Explain voltage magnitude events due to re-closing
25	Voltage during the interruption	Explain voltage during the interruption
26	Monitoring of short interruptions	Explain monitoring of short interruptions
27	Difference between medium and low voltage systems.	Explain difference between medium and low voltage systems.
28	Multiple events, single phase tripping	Explain multiple events, single phase tripping
29	Voltage and current during fault period	Explain voltage and current during fault period
30	Voltage and current at post fault period	Explain voltage and current at post fault period
31	Stochastic prediction of short interruptions.	Explain stochastic prediction of short interruptions

MID I EXAMINATION		
Unit-III: Single and Three Phase Voltage Sag Characterization		
32	Voltage sag – definition, causes of voltage sag	Explain voltage sag – definition, causes of voltage sag
33	Voltage sag magnitude, and monitoring	Analyze voltage sag magnitude, and monitoring
34	Theoretical calculation of voltage sag magnitude	Analyze theoretical calculation of voltage sag magnitude
35	Voltage sag calculation in non-radial systems	Analyze voltage sag calculation in non-radial systems
36	Meshed systems, and voltage sag duration.	Analyze meshed systems, and voltage sag duration.
37	Three phase faults, phase angle jumps	Analyze three phase faults, phase angle jumps
38	Magnitude and phase angle jumps for three phase unbalanced sags	Analyze magnitude and phase angle jumps for three phase unbalanced sags
39	Load influence on voltage sags	Analyze load influence on voltage sags
40	**Tutorial**	
41	Class Test – II	
Unit-IV: Power Quality Considerations In Industrial Power Systems		
42	Voltage sag – equipment behaviour of Power electronic loads	Explain voltage sag – equipment behaviour of Power electronic loads
43	Induction motors, synchronous motors	Analyze Induction motors, synchronous motors
44	Computers, consumer electronics	Analyze Computers, consumer electronics
45	Adjustable speed AC drives and its operation	Explain adjustable speed AC drives and its operation
46	Mitigation of AC Drives	Explain mitigation of AC Drives
47	Speed DC drives and its operation	Analyze speed DC drives and its operation
48	Mitigation methods of DC drives	Explain mitigation methods of DC drives
49	Class Test – III	
Unit V: Mitigation of Interruptions & Voltage Sags		
50	Overview of mitigation methods – from fault to trip	Explain overview of mitigation methods – from fault to trip
51	Reducing the number of faults	Explain reducing the number of faults

52	Reducing the fault clearing time changing the power system	Explain reducing the fault clearing time changing the power system
53	Installing mitigation equipment, improving equipment immunity	Apply concept of installing mitigation equipment, improving equipment immunity
54	Different events and mitigation methods	Explain different events and mitigation methods
55	System equipment interface – voltage source converter	Explain system equipment interface – voltage source converter
56	Series voltage controller, shunt controller	Apply concept of series voltage controller, shunt controller

57	Combined shunt and series controller.	Apply combined shunt and series controller concept in mitigation
58	Introduction to standardization	Explain standardization
59	IEC Electromagnetic compatibility standards	Explain IEC Electromagnetic compatibility standards
60	European voltage characteristics standards	Explain European voltage characteristics standards
61	PQ surveys.	Apply PQ surveys.
62	**Topics beyond Syllabus**: Power Quality Measuring Instruments.	Apply
MID II EXAMINATION		

Text Books:

1. "Math H J Bollen", "Understanding Power Quality Problems" , IEEE Press, 2000.
2. "R. Sastry Vedam and Mulukutla S. Sarma", "Power Quality VAR Compensation in Power Systems", CRC Press, 2008.

Reference Books:

1. C. Sankaran, Power Quality, CRC Press 2001.
2. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, Tata McGraw Hill Education Private Ltd, 3rd Edition 2012.

Activities in the class:

- Asking Random question at the staring of the class for 5-10 min every day.
- NPTEL video presentation and discussion with the students regarding the lecture after completion of every unit.
- Surprise test /Online Quiz every fortnight.
- For every unit a quiz competition will be conducted.

Note:

- Assignments should be submitted on time.

Evaluation Scheme:

Internal Exam I (10 Descriptive+ 10 Objective+ 5 Assignments)	**:**	**25**
Internal Exam II (10 Descriptive+ 10 Objective+ 5 Assignments)	**:**	**25**
Total internal Marks (Average of Internal Exam I and Internal Exam II)	:	**25**
University Exam Marks	:	**75**
Total Marks	**:**	**100**

Year / Semester : IV YEAR I-SEM

Subject **:** Power Semiconductor Drives

Subject Cod : EE701PC
Name of the faculty : Srinivas D
No. of contact hours /week : 04

Course Overview:

Power Semiconductor Drives deals with Control of DC motors by single phase, three phase converters and choppers. Also it deals with Control of Induction Motor and Synchronous Motors.

Test Portion	
Test No.	Topics
1	L1-L28
2	L29-L62
Assignment Portion	
Assignment no.	Topics
1	L1-L28
2	L29-L62

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Submitted by **Approved by**

(Signature of the faculty) **(Signature of HOD)**
Date: **Date:**

Course Objectives:

1. Understand the basic fundamentals of the speed control of DC motor with single phase and three phase controlled rectifiers.
2. Analyze and understand the four quadrant operation of DC Drives through Dual converters.
3. To appreciate the motoring and braking operations of drive.
4. To differentiate DC and AC drives.

Course Outcomes:

CO1: Understand the speed control of DC motor with single phase and three phase controlled rectifiers
CO2: Analyze the four quadrant operation of DC drives.
CO3: Apply the knowledge of Choppers for speed control of DC Motors.
CO4: Analyze the speed control of induction motor with variable voltage and frequency control.
CO5: Apply the knowledge of CSI for speed control of synchronous Motors.

Lesson Contents:

S.N.	TOPIC	TOPIC OUTCOMES At the end of the class, student will be able to
	Unit-I: Control of DC motors by single phase and three phase converters	
1	Introduction to thyristor control drives.	Understand the importance of thyristor control drive.
2	Single phase semi controlled fed DC separately excited motor.	Analyze the operation of semi controlled fed DC drive.
3	Single phase semi controlled fed DC series motor.	Analyze the operation of semi controlled fed DC series drive.
4	Single phase full controlled fed DC separately excited motor.	Analyze the Operation of full controlled fed DC drive.
5	Single phase full controlled fed DC series motor.	Analyze the Operation of full controlled fed DC series drive.
6	Problems on DC drives fed through single phase semi and fully controlled converters.	Apply and solve Exercise problems.
7	Three phase semi controlled fed DC separately excited motor.	Explain Operation of semi controlled fed DC drive.
8	Three phase semi controlled fed DC series motor.	Explain Operation of semi controlled fed DC series drive.
9	Three phase full controlled fed DC separately excited motor.	Understand Operation of full controlled fed DC drive.
10	Three phase full controlled fed DC series motor.	Analyze Operation of full controlled fed DC series drive.
11	Solving problems on DC drives fed through three phase semi and fully controlled converters.	Apply and solve Exercise problems.

12	Solving problems on DC drives fed through three phase semi and fully controlled converters.	Apply and solve Exercise problems.
	Unit-II: Four quadrant operation of DC drives Control of DC Motors by Choppers	
13	Introduction to four quadrant operation of DC drives.	Understand Four quadrant operation of DC drives.
14	Motoring operations.	Explain Operation of DC drives in motoring mode.
15	Braking operations – plugging	Analyze Operation of DC drive in braking mode
16	Solving problems.	Apply and solve Exercise problems.
17	Dynamic braking and regenerative braking.	Explain Operation of DC drives in braking mode.
18	Dynamic braking and regenerative braking.	Understand Operation of DC drives in braking mode.
19	Solving problems.	Apply and solve Exercise problems.
20	Four quadrant operation of DC motors by dual converters.	Explain Four quadrant operation of DC motor.
21	Four quadrant operation of DC motors by dual converters.	Analyze Four quadrant operation of DC motor.
22	Closed loop operation of DC motor.	Understand Speed of DC motor with closed loop operation.
23	Solving problems.	Apply and solve Exercise problems.
24	Introduction to speed control of DC motors by choppers.	Enumerate Speed control operation of DC motors by choppers.
25	Single quadrant chopper fed DC separately excited and series motors.	Explain Operation of DC drive fed through single quadrant chopper.
26	Single quadrant chopper fed DC separately excited and series motors.	Analyze Operation of DC drive fed through single quadrant chopper.
27	Two quadrant chopper fed DC separately excited and series motors.	Understand the operation of DC drive fed through two quadrant chopper.
28	Solving problems.	Apply and solve Exercise problems.
	MID I EXAMINATION	
29	Four quadrant chopper fed DC separately excited and series motors.	Understand the operation of DC drive fed through four quadrant chopper.
30	Four quadrant chopper fed DC separately excited and series motors.	Explain the operation of DC drive fed through four quadrant chopper.
31	Continuous current operation and waveforms.	Design and plot the output voltage and current waveforms.
32	Continuous current operation and waveforms.	Design and plot the output voltage and current waveforms.
33	Speed torque expressions and characteristics.	Design and plot the speed torque characteristics.

34	Solving problems.	Apply and solve Exercise problems.
35	Closed loop operation of DC motor using choppers.	Analyze the operation of DC drive fed through chopper with closed loop.
36	Solving problems.	Apply and solve Exercise problems.
	Unit-III: Control of Induction Motor Through Stator Voltage And Stator Frequency	
37	Speed control of induction motor by AC voltage controllers with waveforms.	Analyze the waveforms of AC voltage controller fed induction motor.
38	Speed control of induction motor by AC voltage controllers with waveforms.	Analyze the waveforms of AC voltage controller fed induction motor.
39	Solving problems.	Apply and solve Exercise problems.
40	Variable frequency control of induction motor by VSI.	Design and control the induction motor with variable frequency using VSI.
41	Variable frequency control of induction motor by CSI.	Design and control the induction motor with variable frequency using CSI.
42	Solving problems.	Apply and solve Exercise problems.
43	Variable frequency control of induction motor by Cyclo converter.	Design and control the induction motor with variable frequency using Cyclo converter.
44	Comparison of VSI and CSI operations.	Compare the VSI and CSI operations.
45	Closed loop operation of induction motor drives.	Enumerate the closed loop operation of induction motor drives.
	Unit-IV: Rotor Side Control of Induction Motor	
46	Slip power recovery schemes – static scherbius drive.	Analyzthe operation of static scherbius drive.
47	Static Kramer drive and advantages of slip power recovery schemes.	Understand the operation of static Kramer drive.
48	Solving problems.	Apply and solve Exercise problems.
	Unit-V: Control of Synchronous Motors	
49	Speed control of synchronous motor with separate control with VSI and CSI cyclo converters.	Design and control the speed of synchronous motor with separate control.
50	Speed control of synchronous motor with separate control with VSI and CSI cyclo converters.	Analyze control the speed of synchronous motor with separate control.
51	Speed control of synchronous motor with self control with VSI and CSI cyclo converters.	Understand control the speed of synchronous motor with self control.
52	Speed control of synchronous motor with self control with VSI and CSI cyclo converters.	Design and control the speed of synchronous motor with self control.

53	Problem solving.	Apply and solve Exercise problems.
54	Load commutated CSI fed synchronous motor with waveforms and speed torque characteristics.	Explain operation of CSI fed synchronous motor with load commutated.
55	Load commutated CSI fed synchronous motor with waveforms and speed torque characteristics.	Explain operation of CSI fed synchronous motor with load commutated.
56	Applications, advantages of speed control of synchronous motors.	Enumerate the Applications, advantages of speed control of synchronous motors.
57	Problem solving.	Apply and solve Exercise problems.
58	Closed loop control of synchronous motor drives.	Enumerate the closed loop operation of synchronous motor drives.
59	Variable frequency control of synchronous motor with cyclo converter.	Analyze the synchronous motor operation with variable frequency control.
60	Variable frequency control of synchronous motor with PWM, VFI and CSI.	Understand the synchronous motor operation with variable frequency control.
61	Simulation of electric derives using software.	Tutorial
62	Students are introduced to the simulation using MATLAB	Guest Lecture
MID II EXAMINATION		

Text Books:

1. "G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2. "Vedam Subramanyam", Thyristor Control of Electric drives, Tata McGraw Hill

Reference Books:

1. "S K Pillai", A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989.
2. "P. C. Sen", Thyristor DC Drives, Wiley-Blackwell, 1981

Activities in the class:

- NPTEL video presentation and discussion with the students regarding the lecture.
- Surprise test every fortnight.
- For every unit a quiz competition will be conducted.

Evaluation Scheme:

Internal Exam I (10 Descriptive+ 10 Objective+ 5 Assignments)	**:**	**25**
Internal Exam II (10 Descriptive+ 10 Objective+ 5 Assignments)	**:**	**25**

Total internal Marks (Average of Internal Exam I and Internal Exam II)	:	**25**
University Exam Marks	:	**75**
Total Marks	**:**	**100**

Semester : IV year I sem
Subject : HVDC Transmission
Name of the faculty : Sugunakar Mamidala
No of contact hours/week : 5

Course overview:

High Voltage Direct Current (**HVDC**) transmission is widely recognized as being advantageous for long-distance, bulk- power delivery, asynchronous interconnections and long submarine cable crossings. **HVDC** lines and cables are less expensive and have lower losses than those for three-phase ac transmission.

Test portion	
Test no.	**Topics**
1	L1-L36
2	L37-L66
Assignment portion	
Assignment no.	**Topics**
1	L1-L36
2	L37-L66

Submitted by **Approved by**

(Signature of the faculty) **(Signature of HOD)**
Date: **Date:**

Course Objectives

(a) To compare EHV AC and HVDC systems
(b) To analyze Graetz circuit and also explain 6 and 12 pulse converters
(c) To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
(d) To describe various protection methods for HVDC systems and Harmonics

Course Outcomes

(CO1) Compare EHV AC and HVDC system and to describe various types of DC links
(CO2) Analyze Graetz circuit for rectifier and inverter mode of operation
(CO3) Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
(CO4) Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

Topic Outcomes

Lecture No.	Topic to be covered	Topic Outcome
At the end of the topic, the student will be able to		
L1	Over view of course	Explain the course objectives, outcomes, assessment methods, grading policy and basic ground rules for the subject
L2	**Unit-I :**Introduction	Introduction
L3	Necessity of HVDC systems	Necessity of HVDC systems
L4	Economics and Terminal equipment of HVDC transmission systems	Economics and Terminal equipment of HVDC transmission systems
L5	Types of HVDC Links	Types of HVDC Links
L6	Apparatus required for HVDC Systems	Apparatus required for HVDC Systems
L7	Comparison of AC and DC Transmission	Comparison of AC and DC Transmission

Lecture No.	Topic to be covered	Topic Outcome
L8	Application of DC Transmission System	Application of DC Transmission System
L9	Planning and Modern trends in D.C. Transmission.	Planning and Modern trends in D.C. Transmission.
L10	Analysis of HVDC Converters	Analysis of HVDC Converters
L11	Choice of Converter Configuration	Choice of Converter Configuration
L12	Analysis of Graetz circuit	Analysis of Graetz circuit
L13	Characteristics of 6 and 12 Pulse converters	Characteristics of 6 and 12 Pulse converters
L14	3 phase circuits	3 phase circuits
L15	3 phase converters types	3 phase converters types
L16	3 phase Y/Y converters in	3 phase Y/Y converters in
L17	3 phase converters in Y/Y mode performance	3 phase converters in Y/Y mode performance
L18	**Unit-II**: Converter and HVDC System Control	Converter and HVDC System Control
L19	Principle of DC Link Control	Principle of DC Link Control
L20	Converters Control	Converters Control
L21	Firing angle control	Firing angle control
L22	Current and extinction angle control	Current and extinction angle control
L23	Effect of source inductance on the system	Effect of source inductance on the system
L24	Starting of DC link	Starting of DC link
L25	Stopping of DC link	Stopping of DC link
L26	Power Control	Power Control
L27	Reactive Power Control In HVDC	Reactive Power Control In HVDC
L28	Reactive Power Requirements in steady state	Reactive Power Requirements in steady state

Lecture No.	Topic to be covered	Topic Outcome
L29	sources of reactive power	sources of reactive power
L30	Static VAR Compensators	Static VAR Compensators
L31	Reactive power control during transients	Reactive power control during transients
L32	**Unit-III:** Power Flow Analysis in AC/DC Systems	Power Flow Analysis in AC/DC Systems
L33	Modelling of DC Links	Modelling of DC Links
L34	DC Network	DC Network
L35	DC Converter	DC Converter
L36	Controller Equations	Controller Equations
I Mid Examination		
L37	Solution of DC load flow	Solution of DC load flow
L38	P.U. System for DC quantities	P.U. System for DC quantities
L39	Power flow Analysis	Power flow Analysis
L40	solution of AC Power flow	solution of AC Power flow
L41	solution of DC Power flow and AC-DC Power flow	solution of DC Power flow and AC-DC Power flow
L42	AC-DC Power flow- Simultaneous method	AC-DC Power flow-Simultaneous method
L43	AC-DC Power flow- Sequential method	AC-DC Power flow- Sequential method
L44	Revision	Revision
L45	**Unit-IV:** Converter Faults and Protection	Converter Faults and Protection
L46	Converter faults	Converter faults

Lecture No.	Topic to be covered	Topic Outcome
L47	Protection against over current	Protection against over current
L48	Protection against over voltage in converter station	Protection against over voltage in converter station
L49	Surge arresters	Surge arresters
L50	Smoothing reactors	Smoothing reactors
L51	DC breakers	DC breakers
L52	Audible noise	Audible noise
L53	Space charge field	Space charge field
L54	Corona	Corona
L55	Corona effects on DC lines	Corona effects on DC lines
L56	Radio interference	Radio interference
L57	**Unit V**: Harmonics and Filters	Harmonics and Filters
L58	Characteristics harmonics	Characteristics harmonics
L59	Calculation of AC Harmonics	Calculation of AC Harmonics
L60	Non- Characteristics harmonics	Non- Characteristics harmonics
L61	Adverse effects of harmonics	Adverse effects of harmonics
L62	Calculation of voltage and Current harmonics	Calculation of voltage and Current harmonics
L63	Effect of Pulse number on harmonics	Effect of Pulse number on harmonics
L64	Types of AC filters	Types of AC filters
L65	Design of Single tuned filters	Design of Single tuned filters
L66	Design of High pass filters	Design of High pass filters
II Mid Examination		

Text books and References

Text Books	
1.	"K. R. Padiyar", HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers, 1990.
2.	"S K Kamakshaiah, V Kamaraju", HVDC Transmission , TMH Publishers, 2011
3	"S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rd Edition 1999.
Suggested / Reference Books	
1.	"Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 2nd edition 1998.
2	"E. W. Kimbark", Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
3	"E. Uhlmann", Power Transmission by Direct Current, B. S. Publications, 2009

Activities in class:

Sudden test, Presentations by students, Quiz, Group discussions, and case study.

Grading:

Based on assignments and mid tests along with performance in activities held in the class room.

NOTE: Assessments should be submitted in time
Accessing the mobile phones is not acceptable in the class.

Evaluation scheme:

- Internal Assessment (sum of scores obtained in two tests) – 20
- Assignments - 5
- End Semester Examination - 75

Total - 100

Year / Semester : IV YEAR I-SEM

Subject **:** Flexible Ac Transmission Systems (EE743PE)

Name of the faculty **:** Mrs. P. Samyuktha

No of contact hours/week **:** 3

Course overview:

The course emphasizes on application of power electronics component in the power system networks and to know about the importance of real and reactive power flow in the network . To provide knowledge on Thyristor controlled devices and FACTS controllers which can make the students to understand the need of FACTS controlling and co-ordination in power systems.

Test portion	
Test no.	**Topics**
1	**L1-L23**
2	**L24-L54**
Assignment portion	
Assignment no.	**Topics**
1	**L1-L23**
2	**L24-L54**

Submitted by: Mrs. P. Samyuktha

Submitted by **Approved by**

(Signature of the faculty) **(Signature of HOD)**
Date: **Date:**

Course Objectives

1. To introduce the reactive power control techniques
2. To educate on static VAR compensators and their applications
3. To provide knowledge on Thyristor controlled series capacitors
4. To educate on STATCOM devices
5. To provide knowledge on FACTS controllers

Course Outcomes

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

CO1. Understand the concept of flexible AC transmission and the associated problems
CO2. Explain the operation of SVC controllers and its application.
CO3. Explain the operation of TCSC controller and its application
CO4. Design and modeling of UPFC and STATCOM
CO5. Design controlling of FACTS with Co-ordination.

Topic Outcomes:

S.N.	Topic to be covered	Topic outcome
	UNIT I	At the end of the class the students will be able to:
1	Introduction to FACTS	Know about FACTS
2	Power flow in an AC System	Understand Power flow in an AC System
3	Loading capability limits	Learn Loading capability limits
4	Dynamic stability considerations	Understand Dynamic stability considerations
5	Importance of controllable parameters	Know – Importance of controllable parameters
6	Basic types of FACTS controllers	Analyze Basic types of FACTS controllers
7	Benefits from FACTS controllers	Understand Benefits from FACTS controllers
8	Series FACTS controllers	Analyze different types of series FACTS controllers
	UNIT – II	
9	Voltage source converters	Learn about Voltage source converters
10	Current source converters	K now about Current source converters

11	Single phase Concept of voltage source converter	Analyze the operation of Voltage source converters
12	Single phase bridge converter	Analyze the operation of Single phase bridge converter
13	Square–wave voltage harmonics for a single–phase bridge converter	Analyze about voltage harmonics
14	Three–phase full wave bridge converter	Analyze the operation of three phase bridge converter
15	Three–phase current source converter	Analyze the operation of three phase bridge current source converter
16	Harmonics in converters, Reducing Harmonics in converters	Analyze about voltage harmonics and deduce methods to reduce them
17	24 pulse Three–phase full wave bridge converter	Analyze the operation of 24 pulse Three–phase full wave bridge converter
18	48 pulse Three–phase full wave bridge converter	Analyze the operation of 48 pulse Three–phase full wave bridge converter
19	PWM technique &Advantages of PWM technique	Understand about group problem solving and decision making
20	Comparison of current source converter with voltage source converter	Know about creativity and innovation in managerial work
21	Converter ratings	Understand the practical ratings of converters
	UNIT – III	
22	Objectives of shunt compensation	Understand the Objectives of shunt compensation
23	Mid–point voltage regulation for line segmentation	Analyze the transmission line for Mid–point voltage regulation
24	End of line voltage support to prevent voltage instability	Understand methods to prevent voltage instability
25	Revision for mid-1 exams	To attain CO1,CO2
26	Improvement of transient stability	Analyze the transmission line for stability issues
27	Thyristor Switched Capacitor(TSC)	Analyze the operation of Thyristor Switched Capacitor(TSC)
28	Static VAR compensator(SVC) and Static VAR generation	Know about Static VAR generation
29	The regulation and slope transfer function and dynamic performance	Design and analyze dynamic performance
30	Transient stability enhancement and power oscillation damping	Design and analyze Transient stability

31	Operating point control	Learn about operating control and FACTS
32	Power oscillation damping	Analyze Power oscillation damping
33	FACTS with storage devices	Learn about operating control and FACTS with storage devices
34	Thyristor Switched Reactor (TSC–TCR).	Analyze the operation of Thyristor Switched Reactor (TSC–TCR).
35	summary of compensation control	Understand about summary of compensation control
	UNIT – IV	
36	Series Compensators	Learn about Series Compensators
37	Static series compensators	Know about Static series compensators
38	Concept of series capacitive compensation	Understand about capacitive compensation
39	Improvement of transient stability	Analyze transient stability
40	Power oscillation damping	Learn about Power oscillation damping
41	Performance characteristics	Understand about Performance characteristics
42	Relationship between controller rating and current	To analyze Relationship between controller rating and current
43	Operating V-I characteristics	Learn Operating V-I characteristics
44	Summary of stability considerations	Analyze stability considerations
45	Thyristor Switched Capacitor Compensator(STATCOM)	Analyze the operation of Thyristor Switched Capacitor Compensator(STATCOM)
46	Series and shunt controller coordination	Learn about Series and shunt controller coordination
47	Static VAR generations	Know about Static VAR generations
	UNIT – V	
48	Functional requirements	To understand the Functional requirements and ratings of valves
49	GTO thyristor controlled Series Capacitor	Analyze the operation of GTO thyristor controlled Series Capacitor
50	Thyristor Switched Series Capacitor (TSSC)	Analyze the operation of Thyristor Switched Series Capacitor (TSSC)
51	Combined Controllers Schematic	To understand Combined Controllers Schematic

52	basic operating principles of Unified Power Flow Controller (UPFC)	Analyze the operation of Unified Power Flow Controller (UPFC)
53	Application on transmission lines.	To understand FACTS Application on transmission lines
54	Establishing control systems, Control frequency and Methods	Apply and analysis of Control Methods in frequency
55	Co-coordinating FACTS controllers	Know about Co-coordinating FACTS controllers

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor – Based Facts Controllers for Electrical TransmissionSystems", IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:

1. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers(IEEE), 1999.
2. V.K.Sood,HVDC and FACTS controllers – Applications of Static Converters in Power System, APRI 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System:Modelling and Control" Springer, 2012.

Activities in the class:

- JAM(Just a minute).Students have to speak about the completed topic.
- Quiz/Discussion of objective type questions for mid exams.
- Slip tests will be conducted at the end of each unit.

Basic ground rules:

1. Usage of mobile phone in class is strictly prohibited.
2. No attendance will be given to students if they are late by 10 minutes and they are expected to attend classes regularly.
3. Students must maintain separate notes, note the important points and solve all the given problems in class.

Evaluation Scheme:

- Internal Assessment (sum of scores obtained in two tests) - 20
- Assignments - 5
- End Semester Examination - 75

Total - 100

PROGRAM OUTCOMES

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.

PO 3: Design/development of solutions: design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO 4: Conduct investigations of complex problems: use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment sustainability: understand the impact of the professional engineering solutions in the societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Lifelong learning: recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broader context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO-1: Apply the engineering fundamental knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, power electronics, electrical machines and power systems and to succeed in competitive exams like GATE, IES, GRE, OEFL, GMAT, etc.

PSO-2: Apply appropriate techniques and modern engineering hardware and software tools in power systems and power electronics to engage in life-long learning and to get an employment in the field of Electrical and Electronics Engineering.

PSO-3: Understand the impact of engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.