K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

(Approved by AICTE, New Delhi, Recognized Research center, and permanently affiliated to Anna University, Chennai)
(Three times Accredited by NBA, New Delhi)

B.E. – EEE – VIII – Semester - Students Hand book – EVEN Semester of 2015 – 2016

This Hand book contains the following:

1. Vision and Mission of the College and Department, Program Educational Objectives, Program Specific Outcomes, Program Outcomes.
2. Outcome Based Education, Benefits and Significance of accreditation, Blooms Taxonomy.
3. Engineering Ethics.
4. Academic Calendar – 2015 – 2016 (Even semester).
5. Class Time Table.
6. B.E. – EEE – Syllabus – VIII Semester.
7. Lecture Schedule, Tutorial, Assignment questions, Seminar, Self-study topics (CT).
8. Anna University question papers (Previous years).
9. Reminders on Placement and Career Guidance.
10. General Reminders
11. Skill Development and Entrepreneurship Programmes-Schedule-Advanced Training Institute – Guindy Industrial Estate-Chennai.
12. Developing Leadership Skills, Tips for Effective Communication
13. TANCET - Questions & Answers.
14. Malpractices & Punishments in Anna University Examination
15. UG Project Format
16. Bonafide Certificate, Leave Letter Format.

K.L.N. COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Vision and Mission of the College

VISION

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

MISSION

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

Vision and Mission of the Department

VISION

To become a high standard of excellence in Education, Training and Research in the field of Electrical and Electronics Engineering and allied applications.

MISSION

To produce excellent, innovative and Nationalistic Engineers with Ethical values and to advance in the field of Electrical and Electronics Engineering and allied areas.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Educational Objectives of the Electrical and Electronics Engineering (EEE) Program represent major accomplishments that we expect our graduates to achieve after three to five years of graduation. More specifically our graduates are expected:

PEO1: to excel in industrial or graduate work in Electrical and Electronics Engineering and allied fields
PEO2: to practice their Professions conforming to Ethical Values and Environmentally friendly policies
PEO3: to work in international and multi-disciplinary Environments
PEO4: to successfully adapt to evolving Technologies and stay current with their Professions

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:
PSO1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

PSO2: Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.

PSO3: Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: 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.

PO6: 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.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

OUTCOME BASED EDUCATION (OBE)

In a traditional education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age. The goal of traditional education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material.

An outcome is a culminating demonstration of learning; it is what the student should be able to do, at the end of a course/program, in-terms of the knowledge, skill and behavior.

Outcome-based education is an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the course. In outcome-based education, product defines process. Outcome-based education can be summed up as results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process. Outcome-based education promotes fitness for practice and education for capability.

BENEFITS AND SIGNIFICANCE OF ACCREDITATION

The process of accreditation helps in realizing a number of benefits, such as:

- Helps the Institution to know its strengths, weaknesses and opportunities
- Initiates Institutions into innovative and modern methods of pedagogy
- Gives Institutions a new sense of direction and identity
- Provides society with reliable information on quality of education offered
- Promotes intra and inter-Institutional interactions

Accreditation signifies different things to different stakeholders. These are:

Benefits to Institutions

Accreditation is market-driven and has an international focus. It assesses the characteristics of an Institution and its programmes against a set of criteria established by National Board of Accreditation. NBA's key objective is to contribute to the significant improvement of the Institutions involved in the accreditation process. Accreditation process quantifies the strengths, weaknesses in the processes adopted by the Institution and provides directions and opportunities for future growth. NBA provides a quality seal or label that differentiates the Institutions from its peers at the national level. This leads to a widespread recognition and greater appreciation of the brand name of Institutions and motivates the Institutions to strive for more.

Benefits to Students

Students studying in NBA accredited Institutions can be assured that they will receive education which is a balance between high academic quality and professional relevance and that the needs of the corporate world are well integrated into programmes, activities and processes. It signifies that he has entered the portals of an Institution, which has the essential and desirable features of quality professional education.

Benefits to Employers

Accreditation assures prospective employers that students come from a programme where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well established technical inputs.

Benefits to the Public

Accredited status represents the commitment of the programme and the Institution to quality and continuous improvement.

Catalyst for International Accreditations

Due to accreditation from NBA, the Institution's systems and procedures get aligned with the Institution's Mission and Vision. All essential prerequisites for international accreditation are included in the accreditation process of NBA. Therefore, NBA acts as a catalyst for the Institutions planning to acquire International Accreditation.

Benefits to Industry and Infrastructure Providers

It signifies identification of quality of Institutional capabilities, skills and knowledge.

Benefits to Parents

It signifies that their ward goes through a teaching-learning environment as per accepted good practices.

Benefits to Alumni

It reassures alumni that alumni are products of an institute with a higher standing in terms of learning.

Benefits to Country

Accreditation helps in gaining confidence of stakeholders and in giving a strong message that as a country, our technical manpower is of international standards and can be very useful in enhancing the global mobility for our technical manpower.

BLOOM'S TAXONOMY

Definitions of the different levels of thinking skills in Bloom's taxonomy

1. **Remember** – recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.
2. **Understand** – the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.
3. **Apply** – being able to use previously learned information in different situations or in problem solving.
4. **Analyze** – the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.
5. **Evaluate** – being able to judge the value of information and/or sources of information based on personal values or opinions.
6. **Create** – the ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts an ideas.

List of Action Words Related to Critical Thinking Skills

REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Count	Associate	Add	Analyze	Appraise	Categorize
Define	Compute	Apply	Arrange	Assess	Combine
Describe	Convert	Calculate	Breakdown	Compare	Compile
Draw	Defend	Change	Combine	Conclude	Compose
Identify	Discuss	Classify	Design	Contrast	Create
Label	Distinguish	Complete	Detect	Criticize	Drive
List	Estimate	Compute	Develop	Critique	Design
Match	Explain	Demonstrate	Diagram	Determine	Devise
Name	Extend	Discover	Differentiate	Grade	Explain
Outline	Extrapolate	Divide	Discriminate	Interpret	Generate
Point	Generalize	Examine	Illustrate	Judge	Group
Quote	Give	Graph	Infer	Justify	Integrate
Read	examples	Interpolate	Outline	Measure	Modify
Recall	Infer	Manipulate	Point out	Rank	Order
Recite	Paraphrase	Modify	Relate	Rate	Organize
Recognize	Predict	Operate	Select	Support	Plan
Record	Rewrite	Prepare	Separate	Test	Prescribe
Repeat	Summarize	Produce	Subdivide		Propose
Reproduce		Show	Utilize		Rearrange
Select		Solve			Reconstruct
State Write		Subtract			Related
		Translate			Reorganize
		Use			Revise
					Rewrite
					Summarize
					Transform
					Specify

ENGINEERING ETHICS

Engineering Ethics is the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impact lives. When ethics is not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts, but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important.

The National Society of Professional Engineers (NSPE) decides the overall standards and codes of ethics for all the engineering professions. The Preamble of the NSPE *Code of Conduct for Engineers* (2007) states:

"*Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property, and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property, or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.*"

Electrical Engineering Ethics

Electrical Engineering is a type of engineering profession that deals with the creation of better electronics. Since our society is heading towards an era of technology, where all members of society will be affected, it is especially important for electrical engineers to follow a code of engineering ethics. For electrical engineers, an important set of guidelines is the *Electrical Engineering Code of Ethics*, published by IEEE.

IEEE code of ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;

8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Engineering Ethics in College/Education

The main engineering ethics problem that college students are face with is academic integrity. Academic integrity can show itself in the form of cheating by copying someone's work, intentional cheating, plagiarism, and/or self-plagiarism.

However, professional ethics is something that can be learned even when it conflicts with personal ethics, as for example, a situation where you are personally okay with building a product that can harm the environment, yet save lives. You can learn professional ethics and realize that something that is harmful to the environment is not okay. Ethics codes can even help you see the bigger picture. For example, in the previous scenario, these codes can help you re-evaluate your ethics and realize that something that is harmful to the environment will eventually be harmful to the people around you and yourself.

Engineering Ethics in the Professional World

In the professional world, ethical engineering problems come up in many cases. One of these includes the case of a professional using someone else's work that is published in the widespread market of publication. Another is the case of a professional using someone else's work that is not published yet and stealing their idea. Engineers who have good engineering ethics often have a good sense of the value of life. They don't hesitate to admit that they made a mistake because they know that the cost of not owning up to your mistakes can have disastrous consequences. It might even cost a human life.

Engineering Ethics in Companies

Not only do individual engineers have to be conscious of engineering ethics, but also companies. Companies have to be aware of their Corporate Social Responsibility and Environmental Responsibility. Corporate Social Responsibility is a company's responsibility to give back to the community that they profit from and to behave ethically so that both they and their community can benefit. Environmental Responsibility is a business's initiative to leave the environment (where it is taking its resources from) the same, if not better, that it is found it.

Date: 08.01.2016

ANNA UNIVERSITY: : CHENNAI – 600 025

ACADEMIC SCHEDULE

for the

February 2016 – May 2016 (EVEN SEMESTER) SESSION OF THE ACADEMIC YEAR 2015 – 2016

UG & PG Degree Programmes offered in **Affiliated Engineering Colleges**

Sl. No.	Programme	Semester	Commencement of Classes	Last working day	Commencement of End Semester Examinations
1.	**B.E. / B.Tech.(Full-Time)**	**VIII**	**30.01.2016**	**30.04.2016**	**02.05.2016**
2.	B.E. / B.Tech.(Full-Time)	II,IV,VI	01.02.2016	07.05.2016	09.05.2016
3.	B.E. (Part-Time)	III,V,VII			
4.	B.Arch. (Full-Time)	II,IV,VI,VIII,X			
5.	M.E. / M.Tech./ M.Arch.(FT/PT)	II,IV,VI			
6.	M.C.A. (Full-Time)	II,IV,VI			
7.	M.B.A. (FT/PT)	II,IV,VI			
8.	M.Sc (5 Yrs-Integrated)	II,IV,VI,VIII,X			
9.	M.Sc.(2 Yrs)	II,IV			

RE - OPENING DAY FOR THE NEXT SEMESTER: 04.07.2016 (Monday)

NOTE:

1. The Theory and Practical Examination schedules will be published in the due course (Practical Examinations will be conducted before the theory examinations).
2. All Saturdays are working days.

DIRECTOR
ACADEMIC COURSES

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM POST - 630 612
ACADEMIC CALENDER - Even Semester of 2015-2016.
IV, VI & VIII SEMESTER UG & II, IV&VI SEMESTERPG DEGREE COURSES

S.No.	Date (Day)	Programme / Events	*Day*
		JANUARY '2016'	
1.	**01.01.16 (Friday)**	NEW YEAR – HOLIDAY- FOUNDERS DAY	-
2.	**15.01.16 (Friday)**	PONGAL - HOLIDAY	-
3.	**16.01.16 (Saturday)**	THIRUVALLUVAR THINAM- HOLIDAY	-
4.	**17.01.16(Sunday)**	ULAVAR THIRUNAAL - HOLIDAY	-
5.	**26.01.16(Tuesday)**	REPUBLIC DAY - HOLIDAY	-
6.	**28.01.16(Thursday)**	Commencement of classes- II,IV,VI &VIII -B.E./B. Tech (except EEE,ECE & /AUE- VIII semester)	**01**
7.	**30.01.16(Saturday)**	Commencement of classes- VIII semester (EEE, ECE & AUE) Monday order	**03**
		FEBRUARY '2016'	
8.	**01.02.16(Monday)**	Commencement of classes-II ,IV & VI sem –M.E /M.B.A / M.C.A Class committee meeting –I (1-5 Feb 2016) Students counselor meeting –I (1-5 Feb 2016)	**04**
9.	**15.02.16(Mon day)**	Class Test –I (15^{th} Feb -20^{th} Feb 2016)	**15**
10.	**29.02.16(Monday)**	CIT -1 – 29^{th} Feb – 7^{th} March 2016	**27**
		MARCH '2016'	
11.	**12.03.16 (Saturday)**	Friday order 18^{th} Graduation Day- Tentative	**37**
12.	**18.03.16(Friday)**	Class Test –II -18^{th} – 24^{th} March 2016	**42**
13.	**24.03.16(Thursday)**	Sports Day - Tentative	**47**
14.	**25.03.16(Friday)**	GOOD FRIDAY – HOLIDAY	**-**
15.	**26.03.16(Saturday)**	Friday order Parents – Teachers Meeting	**48**
		APRIL '2016'	
16.	**06.04.16(Wednesday)**	International Conference on "Innovations in Engineering and Technology" – 6^{th} & 7^{th} April 2016 CIT-2 – 6^{th} -13^{th} April 2016	**56**
17.	**08.04.16(Friday)**	TELUGU NEW YEAR – HOLIDAY	**-**
18.	**14.04.16(Thursday)**	*TAMIL PUTTHANDU &* Dr.AMBEDKAR'S BIRTHDAY–HOLIDAY	**-**
19.	**15.04.16(Friday)**	Model Practical Examinations (15^{th} – 20^{th} April)	**62**
20.	**16.04.16(Saturday)**	Tuesday order 22^{nd} College Annual Day	**63**
21.	**19.04.16(Tuesday)**	MAHAVEER'S JEYANTHI – HOLIDAY	**-**
22.	**20.04.16(Wednesday)**	Students Feedback on faculty& College facility Course Outcome Survey- 20^{th} -23^{rd} April	**65**
23.	**21.04.16(Thursday)**	Class Test -3 – 21^{st} – 23^{rd} April 2016	**66**
24.	**25.04.16(Monday)**	Anna University Practical Examinations (25^{th} – 30^{th} April 2016) – Tentative	**69**
25.	**30.04.16(Saturday)**	Last working Day- VIII- Semester – B.E / B.Tech.,	**74**
		MAY '2016'	
26.	**01.05.16(Sunday)**	MAY DAY – HOLIDAY	-
27.	**02.05.16(Monday)**	Commencement of Anna University – Theory Examinations- VIII semester –B.E / B.Tech.,	**75**
28.	**07.05.16(Saturday)**	Last working Day- II,IV& VI sem- all UG & PG courses	**80**
29.	**09.05.16(Monday)**	Commencement of Anna University –Theory Examinations- II,IV& VI sem -all UG & PG courses	-
30.	**10.05.16(Tuesday)**	Graduate Exit Survey -2016 passed out- survey to be completed on or before 31^{st} May 2016	-
31.	**11.05.16(Wednesday)**	Collection of Alumni, Employer Survey – survey to be completed on or before 10^{th} June 2016.	-

Commencement of classes : III, V, VII Semester – B.E./B.Tech., MCA, M.E, MBA : 04^{th} July 2016.

K.L.N.COLLEGE OF ENGINEERING, POTTAPALAYAM-630612.

Department of Electrical and Electronics Engineering

CLASS WISE TIME TABLE -2015-2016 (EVEN)

Year/Sem/Sec : IV / VIII / A — *Faculty In-charge : A.S.S.Murugan*

TIME / DAY	09.00 – 09.50	09.50 – 10.40		10.55–11.45	11.45–12.35		01.15–02.05	02.05–02.55	02.55–03.45
MON	PQ SVN	PROJECT RSD	BREAK	PROJECT TG (3)	RJR(4)	LUNCH	PQ SVN	EEGUC NVRV	FACTS ASSM
TUE	FACTS ASSM	FACTS ASSM		EEGUC NVRV	PQ SVN		PROJECT SM(5)	RJR(6)	RJPP(7)
WED	PQ SVN	PROJECT TG		PROJECT RSD(3)	CMS(4)		FACTS ASSM	EEGUC NVRV	PQ SVN
THU	EEGUC NVRV	PROJECT NEG		FACTS ASSM	EEGUC NVRV		PROJECT RJPP(5)		KRJ(6,7)
FRI	PROJECT RJR			PROJECT RJR			PROJECT ASSM		

Year/Sem/Sec : IV / VIII / B — *Faculty In-charge : M.Jegadeesan*

TIME / DAY	09.00 – 09.50	09.50 – 10.40		10.55–11.45	11.45–12.35		01.15–02.05	02.05–02.55	02.55–03.45
MON	EEGUC NVRV	PQ MJ	BREAK	FACTS ASSM	EEGUC NVRV	LUNCH	PROJECT TG(5)	SR(6)	PKA(7)
TUE	EEGUC NVRV	PROJECT CMS		PROJECT PKA(3)	RJR(4)		PQ MJ	FACTS ASSM	PQ MJ
WED	FACTS ASSM	EEGUC NVRV		PROJECT NVRV	EEGUC NVRV		PROJECT VS(5)	RSD(6)	TG(7)
THU	PQ MJ	PROJECT PKA		PROJECT MJ(3)	TG(4)		FACTS ASSM	PQ MJ	FACTS ASSM
FRI	PROJECT MBL			PROJECT MJ			PROJECT NVRV		

Year/Sem/Sec : IV / VIII / C — *Faculty In-charge : Dr. S. Venkatanarayanan*

TIME / DAY	09.00 – 09.50	09.50 – 10.40		10.55–11.45	11.45–12.35		01.15–02.05	02.05–02.55	02.55–03.45
MON	FACTS SPRR	PROJECT MJM	BREAK	PROJECT PKA(3)	RSD(4)	LUNCH	FACTS SPRR	PQ MJ	EEGUC SVN
TUE	PQ MJ	EEGUC SVN		PQ MJ	FACTS SPRR		PROJECT RSD(5)	AM(6)	RSD(7)
WED	FACTS SPRR	PROJECT RJPP		PROJECT MJM(3)	TG(4)		EEGUC SVN	PQ MJ	FACTS SPRR
THU	EEGUC SVN	EEGUC SVN		PROJECT AMJ	PQ MJ		PROJECT MBL(5)		RJPP(6,7)
FRI	PROJECT NEG			PROJECT NEG			PROJECT SVN		

SUB CODE	SUBJECT NAME	ABBREVIATION	STAFF NAME		
			A – Sec	B – sec	C- Sec
EE2451	Electric Energy Generation, Utilization and Conservation	EEGUC	N.Vimal Radha Vignesh	N.Vimal Radha Vignesh	Dr.S.Venkata narayanan
EE2028	Power Quality (Elective III)	PQ	Dr. S.Venkatanarayanan	M.Jegadeesan	M.Jegadeesan
EE2036	Flexible AC Transmission Systems (Elective IV)	FACTS	A.S.S.Murugan	A.S.S.Murugan	S.P.Rajaram
EE2452	Project Work	PROJECT	A.S.S.Murugan	M.Jegadeesan	Dr. S.Venkata narayanan

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM POST - 630 612
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING
VIII SEMESTER SYLLABUS (REGULATION-2008 AUC)

EE2451 ELECTRIC ENERGY GENERATION, UTILISATION AND CONSERVATION

L T P C3 0 0 3

AIM

To expose students to the main aspects of generation, utilization and conservation.

OBJECTIVES

To impart knowledge on Generation of electrical power by conventional and non–conventional methods.

1. Electrical energy conservation, energy auditing and power quality.
2. Principle and design of illumination systems and methods of heating and welding.
3. Electric traction systems and their performance.
4. Industrial applications of electric drives.

UNIT I POWER GENERATION **9**

Review of conventional methods – thermal, hydro and nuclear based power generation. Nonconventional methods of power generation – fuel cells - tidal waves – wind – geothermal – solar - bio-mass - municipal waste. Cogeneration. Effect of distributed generation on power system operation.

UNIT II ECONOMIC ASPECTS OF GENERATION **9**

Economic aspects of power generation – load and load duration curves – number and size of units –cost of electrical energy – tariff. Economics of power factor improvement – power capacitors – power quality. Importance of electrical energy conservation – methods – energy efficient equipments. Introduction to energy auditing.

UNIT III ILLUMINATION **9**

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, and sports ground - energy efficiency lamps.

UNIT IV INDUSTRIAL HEATING AND WELDING **9**

Role electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT V ELECTRIC TRACTION **9**

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

TOTAL : 45 PERIODS

TEXT BOOKS

1. C.L. Wadhwa, ‘Generation, Distribution and Utilization of Electrical Energy’, New Age International Pvt. Ltd, 2003.
2. B.R. Gupta, ‘Generation of Electrical Energy’, Eurasia Publishing House (P) Ltd, New Delhi, 2003.

REFERENCES

1. H. Partab, ‘Art and Science of Utilisation of Electrical Energy’, Dhanpat Rai and Co, New Delhi, 2004.
2. E. Openshaw Taylor, ‘Utilization of Electrical Energy in SI Units’, Orient Longman Pvt. Ltd, 2003.
3. J.B. Gupta, ‘Utilization of Electric Power and Electric Traction’, S.K. Kataria and Sons, 2002.

EE2028 POWER QUALITY

L T P C
3 0 0 3

AIM:

To study the various issues affecting power quality, their production, monitoring and suppression.

OBJECTIVES:

I. To study the production of voltages sags, overvoltages and harmonics and methods of control.

II. To study various methods of power quality monitoring.

UNIT I INTRODUCTION TO POWER QUALITY **9**

Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients – short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS **9**

Sources of sags and interruptions - estimating voltage sag performance. Thevenin's equivalent source - analysis and calculation of various faulted condition. Voltages sag due to induction motor starting. Estimation of the sag severity - mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches.

UNIT III OVERVOLTAGES **9**

Sources of over voltages - Capacitor switching – lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection – shielding – line arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS **9**

Harmonic sources from commercial and industrial loads, locating harmonic sources. Power system response characteristics - Harmonics Vs transients. Effect of harmonics - harmonic distortion - voltage and current distortion - harmonic indices - inter harmonics – resonance. Harmonic distortion evaluation - devices for controlling harmonic distortion - passive and active filters. IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING **9**

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems- modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – quality measurement equipment - harmonic / spectrum analyzer - flicker meters – disturbance analyzer. Applications of expert systems for power quality monitoring.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill,2003.(For Chapters1,2,3, 4 and 5)

REFERENCES:

1. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
2. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
3. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', (New York: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)
4. PSCAD User Manual

EE2036 FLEXIBLE AC TRANSMISSION SYSTEMS **L T P C**
3 0 0 3

AIM: To enhance the transmission capability of transmission system by shunt and series compensation using static controllers.

OBJECTIVES:

I. To understand the concept of flexible AC transmission and the associated problems.
II. To review the static devices for series and shunt control.
III. To study the operation of controllers for enhancing the transmission capability.

UNIT I INTRODUCTION **9**

The concept of flexible AC transmission - reactive power control in electrical power transmission lines -uncompensated transmission line – series and shunt compensation. Overview of FACTS devices - Static Var Compensator (SVC) – Thyristor Switched Series capacitor (TCSC) – Unified Power Flow controller (UPFC) - Integrated Power Flow Controller (IPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS **9**

Voltage control by SVC – advantages of slope in dynamic characteristics – influence of SVC on system voltage. Applications - enhancement of transient stability – steady state power transfer – enhancement of power system damping – prevention of voltage instability.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC)AND APPLICATIONS **9**

Operation of the TCSC - different modes of operation – modeling of TCSC – variable reactance model – modeling for stability studies. Applications - improvement of the system stability limit – enhancement of system damping – voltage collapse prevention.

UNIT IV EMERGING FACTS CONTROLLERS **9**

Static Synchronous Compensator (STATCOM) – operating principle – V-I characteristics Unified Power Flow Controller (UPFC) – Principle of operation - modes of operation – applications – modeling of UPFC for power flow studies.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS **9**

FACTs Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Mohan Mathur, R., Rajiv. K. Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.

REFERENCES:

1. A.T.John, “Flexible AC Transmission System”, Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. Narain G.Hingorani, Laszio. Gyugyl, “Understanding FACTS Concepts and Technology of Flexible AC Transmission System”, Standard Publishers, Delhi 2001.

K.L.N. COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LECTURE SCHEDULE

Degree/Program: **B.E / EEE**
Course code &Name: **EE2451-ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION**

Duration: **Jan -Apr 2016** Semester: **VIII** Section: **A, B & C**

Staff: **N.VIMAL RADHA VIGNESH** Regulation: **2008/AUC**

AIM

To expose students to the main aspects of generation, utilization and conservation.

OBJECTIVE:

To impart knowledge on

- ✓ Generation of electrical power by conventional and non–conventional methods.
- ✓ Electrical energy conservation, energy auditing and power quality.
- ✓ Principle and design of illumination systems and methods of heating and welding.
- ✓ Electric traction systems and their performance.
- ✓ Industrial applications of electric drives.

COURSE OUTCOMES: After the course, the student should be able to:

CO	Course Outcomes	POs	PSO
C409.1	Discuss the effect of distributed generation on power system operation and explain the construction & working principles of conventional and non-conventional power plants.	1,2,3,6,7	1,3
C409.2	Evaluate the cost of electrical energy and discuss the importance of Electrical Energy conservation, Energy auditing	1,2,3,6,7	1,3
C409.3	Categorize different light sources and design various illumination systems for the indoor lighting schemes, factory lighting, halls, outdoor lighting schemes, flood lighting, street lighting.	1,2,3,6,7	1,3
C409.4	Design heating element, compare the different methods of electric heating and types of electric welding	1,2,3,6,7,11	1,3
C409.5	Evaluate tractive effort for the propulsion of train, name the traction motors, list the traction motor control, track equipment and collection gear.	1,2,3,6,7,11	1,3

S. No	Date	Period Number	Topics to be covered	Book No [Page No]
UNIT-I			**POWER GENERATION**	**Target Periods: 9**
1			Review of conventional methods – Thermal Power Plant	T2(29-41)
2			Hydel Power Plant	T2(20-29)
3			Nuclear based power generation	T2(41-57)
4			Nonconventional methods of power generation	T2(1-2)
5			fuel cells - tidal waves	T2(2-5)
6			wind – geothermal – solar	T2(5-18)
7			bio-mass - municipal waste	Material
8			Cogeneration	Material
9			Effect of distributed generation on power system operation	Material
10			***NPTEL Video***	
Total Periods:		**10**	***Assignment-I-DOS:***	***Test-I :***
UNIT II			**ECONOMIC ASPECTS OF GENERATION**	**Target Periods: 9**

11			Economic aspects of power generation – load and load duration curves	T2(71-77)
12			number and size of units	T2(77-83)
13			cost of electrical energy – tariff	T2(83-92)
14			Economics of power factor improvement	R4(2.42-2.45)
15			Power capacitors – power quality	R4(2.45-2.46)
16			Importance of electrical energy conservation – methods	R2(404-406)
17			Energy efficient equipments	R4(2.25-2.33)
18			Introduction to energy auditing	R4(2.33-2.42)
19			Energy management	
20			***Content Beyond Syllabus***: Energy audit in Industries	
Total Periods:		**10**	***Assignment –II-DOS:***	***CIT-I-***
UNIT III			**ILLUMINATION**	**Target Periods: 9**
21			Importance of lighting	T2(304-321)
22			properties of good lighting scheme	
23			laws of illumination	
24			Photometry, types of lamps	T2(322-328) T2(328-330)
25			Lighting calculations – Formulas	T2(322-328)
26			Lighting calculations – problems	
27			Basic design of illumination schemes for residential, commercial	T2(333-335)
28			Basic design of illumination schemes for street lighting, and sports ground	
29			Energy efficiency lamps	T2(331-332)
Total Periods:		**09**	***Assignment-III-DOS:***	***Test-3:***
UNIT IV 9+1=10			**INDUSTRIAL HEATING AND WELDING**	**Target Periods:**
30			Role electric heating for industrial applications	T2(269-271)
31			Resistance heating	T2(346-347)
32			Induction heating	T2(286-291)
33			Dielectric heating	T2(291-296)
34			electric arc furnaces	T2(279-286)
35			Brief introduction to electric welding	T2(296-297)
36			Welding generator	T2(269-271)
37			welding transformer	T2(296-297)
38			Characteristics of welding transformer	
39			***Seminar-I***	
Total Periods:		**10**	***CIT-II :***	
UNIT V 9+3=12			**ELECTRIC TRACTION**	**Target Periods:**
40			Merits of electric traction	T2(269-271)
41			requirements of electric traction system	T2(271-275)
42			supply systems	T2(275-279)
43			mechanics of train movement	T2(279-286)
44			traction motors	T2(369-396)
45			traction motors control	
46			Braking	T2(348-368)
47			Current collection systems	T2(345-346)
48			recent trends in electric traction	T2(346-347)
49			***Quiz-1***	
Total Periods:		**10**	***CIT-III :***	

Books: Text/Reference Book

S. No		Title of the Book	Author	Publisher	Year
1	**T1**	Generation, Distribution and Utilization of Electrical Energy.	Wadhwa, C.L.	New Age International Pvt. Ltd	2003
2	**T2**	Generation of Electrical Energy	Gupta, B.R.	Eurasia Publishing House (P) Ltd	2003
3	**R1**	Art and Science of Utilization of Electrical Energy	Partab, H.	Dhanpat Rai and Co	2004
4	**R2**	Utilization of Electrical Energy in SI Units	Openshaw Taylor.E	Orient Longman Pvt. Ltd	2003
5	**R3**	Utilization of Electric Power and Electric Traction	Gupta.J.B	S.K.Kataria and Sons	2002
6	**R4**	Electrical Energy Generation, Utilization and Conservation	A.Allwyn Clarence Asis, R.Pon Vengatesh	Anuradha Publications	2012

Website Reference

- http://nptel.iitm.ac.in/courses.php?disciplineId=108
- http://en.wikipedia.org/wiki/Energy_conservation

EE2451-ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION (C409)

Important Questions/Tutorials/Assignments/Self-study/Seminar topics.

1. Course outcomes

Course	Course outcomes	POs
C409.1	Discuss the effect of distributed generation on power system operation and explain the construction & working principles of conventional and non-conventional power plants.	1,2,3,6,7
C409.2	Evaluate the cost of electrical energy and discuss the importance of Electrical Energy conservation, Energy auditing	1,2,3,6,7
C409.3	Categorize different light sources and design various illumination systems for the indoor lighting schemes, factory lighting, halls, outdoor lighting schemes, flood lighting, street lighting.	1,2,3,6,7
C409.4	Design heating element, compare the different methods of electric heating and types of electric welding	1,2,3,6,7,11
C409.5	Evaluate tractive effort for the propulsion of train, name the traction motors, list the traction motor control, track equipment and collection gear.	1,2,3,6,7,11

2. Mapping of Course Outcomes (COs), Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – Before CBS[Levels of correlation:3(High),2(Medium),1(low)].

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C409.1	3	2	2	-	-	1	1	-	-	-	-	-	2	-	1
C409.2	3	2	2	-	-	1	1	-	-	-	-	-	2	-	1
C409.3	3	2	2	--	-	1	1	-	-	-	-	-	2	-	1
C409.4	3	2	2	-	-	1	1	-	-	-	2	-	2	-	1
C409.5	3	2	2	-	-	1	1	-	-	-	1	-	2	-	1
C409	3	2	2	-	-	1	1	-	-	-	1	-	2	-	1

3.PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:

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

PO2: Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO6: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.

PO7:Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO11: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.

S.No	**4. Important Questions.**	COs	POs
Q.1.1.	Describe the general layout of steam power plant with neat diagram.	C409.1	1,7
Q.1.2.	What are pumped storage plants? Describe with need sketch the principle of operation of such a plant Also discuss the role of this plant in a large inter-connected power system?	C409.1	1
Q.1.3.	With a neat diagram explain wind electric power generating system also lists its merits and demerits.	C409.1	
Q.1.4.	Explain the working of a gas turbine power plant with a schematic diagram.	C409.1	1
Q.1.5.	With neat diagram explain the operation of Nuclear power generating system and also lists its merits and demerits.	C409.1	1
Q.1.6.	What are the basic components of solar PV systems? Explain the basic solar PV system used for power generation.	C409.1	1
Q.1.7.	With a neat diagram explain wind electric power generating system also lists its merits and demerits.	C409.1	1,7
Q.2.1.	A generating stations as a maximum demand (MD) of 15 MW and the daily load curve on the station is as follows, 10pm to 05 am 2500 KW 01pm to 04pm 10000KW 05am to 07 am 3000KW 04pm to 06pm 12000KW ,07pm to 11am 9000KW 06 pm to 08pm 15000KW 11am to 01pm 6000KW 08pm to 10pm 5000KW Determine the size and the number of generator units, plant load factor, plant capacity factor, use factor and reserve capacity of plant.	C409.2	1,2,3
Q2.2.	What is cost of electrical generation? What are the various types of cost associated with power generation?	C409.2	1
Q.2.3.	The monthly reading of a consumer meter are as follows Maximum demand =150kw , Energy consumed 1* 105 units, Reactive energy = 75MVARhr, If the tariff is Rs 50per KW per month of maximum demand + 15Paise per unit + Rs 3 per KW for each 0.1 P.F below 0.8, calculate the	C409.2	1,2,3

	monthly bill of the consumer.		
Q2.4.	A generating stations as a maximum demand (MD) of 15 MW and the daily load curve on the station is as follows, 10pm to 05 am 2500 KW 01pm to 04pm 10000KW 05am to 07 am 3000KW 04pm to 06pm 12000KW 07pm to 11am 9000KW 06 pm to 08pm 15000KW 11am to 01pm 6000KW 08pm to 10pm 5000KW Determine the size and the number of generator units, plant load factor, plant capacity factor, use factor and reserve capacity of plant.	C409.2	1,2,3
Q.2.5.	What is a tariff? Discuss and compare various tariff used in practice.	C409.2	1
Q.2.6.	A plant cost inRs 65000 has a useful life of 15 years. Find the amount which should be saved annually to replace the equipment at the end of that time a) By straight line method b) By the sinking fund method if the annual rate of compound interest is 15%. Assume that the salvage value of the equipment is Rs 5000	C409.2	1,2,3
Q.3.1.	Explain the method of working of a Neon lamp with a neat sketch.	C409.3	1
Q.3.2.	Estimate the number and wattage of lamps which would be required to illuminate ever shop space 60 X 15metres, by means of lamps mounted 5metres above the working plane. The average illumination required is about 100 Flux, Co-efficient of utilization = 0.4, luminous efficiency is 16 lumens per Watt. Assume a space height ratio of unity candle power depreciation of 20%	C409.3	1,2,3
Q.3.3.	Two lamps one 200cp and another 500cp are hung at a height of 10metres and25metres respectively. The horizontal distance between the poles is 80metres. Determine the illumination at the mid-point between the poles on the ground. What is the requirement of good heating materials?	C409.3	1,2,3
Q.3.4.	Explain the working of a sodium vapour lamp with in a neat sketch.	C409.3	1
Q.3.5.	Explain the types of lamps and lighting fitments you should select for (i)A large machine shop with rows of drilling machines (ii) A drawing office and lathes.	C409.3	1,6,7
Q.3.6.	A lamp of 300 candle poweris placed 1.5 m below a reflecting plane mirror surface, which reflects 70% of the light falling on it. Find the illumination at a point 4m.	C409.3	1,2,3
Q.3.7.	Explain the principle of street lighting? Show different types of lighting with neat Sketches.	C409.3	1
Q.4.1.	Explain the various types of resistance heating.	C409.4	1
Q.4.2.	Explain the construction and working principle of dielectric heating. Calculate the energy required to melt one metric ton of brass in a single – phase Induction furnace. If the time taken is 1.5 hour, find the power input to the furnace. Specific heat of brass = 0.094 Latent heat of fusion of brass = 38 kcal / kg Melting point of brass = 920º C Furnace efficiency = 80%, Temperature of charge = 20º C	C409.4	1,2,3

Q.4.3.	With the help of neat diagrams explain in detail the various methods of resistance welding	C409.4	1,6,11
Q.4.4.	Discuss with neat diagram different types of arc welding methods	C409.4	1,6,11
Q.4.5.	Explain the working of core type induction furnace with a neat sketch.	C409.4	1
Q.4.6.	A 5KW, 440volts, 3 phase resistance oven is to have a 3star connected nichrome strip of 0.3mm thick heating element. If the wire temperature is to be 1500°c and that of the charge 1000°c, estimate the suitable width of the strip. Resistively of nichrome alloy is 1.016 X 10-6 .Assume the radiating efficiency and emissivity of the element as 0.6 and 0.91 respectively.	C409.4	1,2,3
Q.5.1.	What are the various types of electric braking used in traction? Discuss in detail	C409.5	1
Q5.2.	What is the speed controls of different system of motors used in electric train?	C409.5	1
Q.5.3.	Write about mechanics of train movement	C409.5	1
Q.5.4.	State the principle of regenerative braking. Explain regenerative braking in respect of a) DC motors, b) Induction motors.	C409.5	1,7
Q.5.5.	Derive an expression for tractive effort required to run an electric locomotive.	C409.5	1
	6.Assignments/Seminar/Self study topics.		
A.2.1.	A peak load on thermal plant of 12 MW capacity is 10MW. The plant annual load factor is 0.7.Design a two part tariff from the following data: Cost of plant Rs.7,000/KW installed capacity, Interest and depreciation = 10% of the capital cost, interest and depreciation on it =5%, the capital cost of T&D =Rs.$3x10^5$, operating cost is Rs.$3x10^5$/Year, cost of fuel = Rs.50/ton, plant maintenance cost =Rs.25,000/year (fixed) plant maintenance cost =Rs.35,000/year (running), coal used = $3x10^4$ ton per year	C409.2	1,2,3
A.2.2	Estimate the generating cost per kWh delivered from a generating station from the following data: Plant capacity = 50MW Annual load factor = 40% Capital cost = Rs. 1.2 corers, annual cost of wages, taxation etc. Rs.4 lakhs, cost of fuel, lubrication, maintenance etc. = 1 paise/kWh generated , interest 5% per annum, depreciation 6% per annum of initial value.	C409.2	1,2,3
A.2.3	From a load duration curve the following data are available: The maximum demand on the station is 25 MW. The load supplied by two units is 15 MW and 12.5 MW. Unit no 1 acts as a base load unit and unit no 2 as a peak load unit. The base load unit works for 100% of the time and peak load unit for 40% of the time. The energy generated by unit no 1 is 1x108 units and that by no 2 is 1x107 units. Determine the load factor, plant capacity factor and plant use factor of each unit and load factor of the total plant.	C409.2	1,2,3
A.3.1	A 200 c.p lamp is hung 4 m above the Centre of a circular area of 5 m diameter. Determine the illumination at the (i) Centre of the area (ii) Periphery of the area (iii) Average illumination if reflector of 80% efficiency is used.	C409.3	1,2,3,6
A.3.2	An illumination on the working plane of 32 lux is required in a room 80mx15m. The lamps are required to be hung 4.5m above the work bench. Assume a COU of 0.5, lamp efficacy of 14 lumens per watt and COD of 0.2. Estimate the number rating and disposition of the lamps. Assume suitable value of space ratio.	C409.3	1,2,3

A.5.1.	The distance between the two stations is 1.6 kms and the average speed of the train is 40kmph, the acceleration, retardation during coasting and braking are 2km/h/s, 0.16kmphps and 3.2 km/h/s respectively. Assume quadrilateral approximation of the speed time curve; determine the duration of the acceleration, coasting and braking periods and distance covered during these periods.	C409.5	1,2,3
A.5.2.	An electric train weighting 400 tonnes running along an up gradient of 1% with following speed time curve: (i)uniform acceleration of 1.5 km/h/s for 30 sec (ii) free running for 36 sec (iii)coasting for 25 sec (iv) braking at 2.6 km/h/s to rest. If tractive resistance is 45N/tonne, rotational inertia effect 10%, overall efficiency of the transmission and motor is 75%. Determine the specific energy consumption	C409.5	1,2,3

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM -630 612

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Lecture Schedule

Degree/Programme: **B.E / EEE**
Course code &Name: **EE2028- POWER QUALITY** Duration: **Jan -Apr 2016**
Semester: **VIII** Section: B Staff : **M.Jegadeesan** Regulation : **2008/AUC**

AIM: To study the various issues affecting Power Quality, their production, monitoring and suppression.

OBJECTIVES

To introduce the power quality problems
To educate the production of voltage sags, overvoltage and harmonics and methods of control
To study over voltage problems.
To study the sources and effect of harmonics in power system
To impact knowledge on various methods of power quality monitoring

COURSE OUTCOMES: After the course, the student should be able to:

CO	Course Outcomes	PO	PSO
C405E4.1	Discuss the various types of power quality problem	1,2,3,5,6,8,10	1,3
C405E4.2	Analyze the sources ,types and mitigation of voltage sag problem	1,2,3,5,6,8,10	1,3
C405E4.3	Analyze the sources ,types and mitigation of over voltage issues and model of over voltage problem with computer software tools.	1,2,3,5,6,8,10	1,3
C405E4.4	Evaluate the effects of harmonics on power system equipments and analyze the methods of controlling of harmonics.	1,2,3,5,6,8,10	1,3
C405E4.5	Explain the principle of operation of various types of power quality monitoring devices.	1,2,3,5,6,8,10,	1,3

S.No	Date	Period Number	Topics to be Covered	Book No [Page No]
UNIT I - INTRODUCTION TO POWER QUALITY				**Target Periods: 9**
1			Introduction	1 (1-10)4(1)
2			Terms and definitions: Overloading - under voltage	1(19)
3			Over voltage. Concepts of transients	1(15-19)4(3,4)
4			Short Duration variations such as an interruption	1(20-23) 4(2)
5			Long duration variation such as sustained interruption.	1(17-19)
6			Voltage sags - voltage swell - voltage imbalance	1(20-24) 4(2-6)
7			Voltage fluctuation - power frequency variations	1(28-31) 4(11-15)
8			International standards of power quality	3 (477-483)4(19-30)
9			Computer Business Equipment Manufacturers Associations (CBEMA) curve.	1(40-42)4(30-33)
10			Quiz	Material
Total Periods		**10**	Test-I [Class test-1]	
		UNIT II	**VOLTAGE SAGS AND INTERRUPTIONS**	**Target Periods: 9**
11			Sources of sags and interruptions	1(43-47)
12			Estimating voltage sags performance.	1(47-59)
13			Thevenin's equivalent source	1(52-59)
14			Analysis and calculation of various faulted condition	1(52-59)
15			Voltage sags due to induction motor starting.	1(78-80) ,3(248-251)
16			Estimation of the sag severity	1(80,81)
17			Mitigation of voltage sags	1(59-73)
18			Active series compensators.	1(64,65)
19			Static transfer switches- Fast transfer switches	1(71-73),3(404,405)

20			NPTEL Lecture	Material
Total Periods		**10**	***Assignment –I***	
			Test-II [CIT-1]	
			UNIT III OVERVOLTAGES	**Target Periods: 9**
21			Over Voltages and Sources of over voltages	1(15-19)
22			Capacitor switching	1(111-116)
23			Lightning - ferro resonance.	1(117-127)
24			Mitigation of voltage swells - surge arresters - low pass filters	1(133-136)
25			Power conditioners. Lightning protection	1(136-140)
26			Shielding - line arresters	1(145-149)
27			Protection of transformers and cables	1(149-157)
28			An introduction to computer analysis tools for transients	PSCAD Manual 1(164)
29			PSCAD and EMTP	
30			NPTEL Lecture	Material
Total Periods		**10**	***Assignment-II*** **Test-III [Class Test-2]**	
			UNIT IV HARMONICS	**Target Periods : 9**
31			Harmonic sources from commercial and industrial loads	1(184-196)4(6-11)
32			Locating harmonic sources.	1(197-199)
33			Power system response characteristics	1(199-209)
34			Harmonics Vs transients. - Effect of harmonics	1(172,209-220)
35			voltage and current distortion - Harmonic indices - inter harmonics- Resonance	1(171,181-184, 220-223,203-208) 4(34-43)
36			Harmonic distortion evaluation	1(225-233)
37			Devices for controlling harmonic distortion	1(248-264)
38			Passive and active filters.	1(252-264)
39			IEEE and IEC standards.	1(282-292)
Total Periods		09	***Assignment-III***	
			Test-IV [CIT-2]	
			UNIT V - POWER QUALITY MONITORING	**Target period -9**
40			Monitoring considerations	1(456)
41			Monitoring and Diagnostic techniques for various power quality problems.	1(457-467)
42			Modeling of power quality (harmonics)problems with mathematical simulation tools	1(237-248),
43			Modeling of power quality (voltage sag)problems with mathematical simulation tools	Material
44			Power line disturbance Analyzer	1(475)
45			Harmonic / spectrum Analyzer	1(477-479)4(132-140)
46			Combination disturbance and harmonic analyzers	1(479-480)
47			Flicker meters	1(480-487)4(144-155)
48			Applications of expert systems for power quality monitoring	1(498-502)
49			Measurement of Harmonics-A practical approach (CBS)	Practical
50			Seminar	PPT
51			Seminar	PPT
Total Periods		**12**	**Test-V [CIT-3]**	

Books: Text/Reference

S.L.No	Text/Ref	Title of the Book	Author	Publisher	Year
1	T1	Electrical Power Systems Quality	Roger. C. Dugan	McGraw Hill (For Chapters1,2,3, 4 and 5)	2004
2	R1	'Electric Power Quality	G.T. Heydt,	2nd Edition. (West Lafayette, IN, Stars in a Circle Publications). (For Chapter 1, 2, 3 and 5)	1994
3	R2	Understanding Power Quality Problems: Voltage Sags and Interruptions',	M.H.J Bollen	(New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)	1999
4	R3	Power System Quality Assessment	J. Arrillaga, N.R. Watson, S. Chen	(New York: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)	1999
5	R4	PSCAD User Manual	M.M. El-Wakil	McGraw Hill 1984	2007

Website Reference

1. **http:// en.wikipedia.org/wiki/Power_quality**
2. **http:// iitk.ac.in/infocell/announce/electric_power**
3. **http:// fluke.com/fluke/inen/solutions/pq/**
4. **http:// www.em-ea.org/**

EE2028 –POWER QUALITY [C405E4]

Important Questions/Tutorials/Assignments/Self study /Seminar topics.

1. Course outcomes

Course	Course outcomes	POs
C405E4.1	Discuss the various types of power quality problem	1,2,3,5,6,8,10,11
C405E4.2	Analyze the sources ,types and mitigation of voltage sag problem	1,2,3,5,6,8,10,11
C405E4.3	Analyze the sources ,types and mitigation of over voltage issues and model of over voltage problem with computer software tools.	1,2,3,5,6,8,10,11
C405E4.4	Evaluate the effects of harmonics on power system equipments and analyze the methods of controlling of harmonics.	1,2,3,5,6,8,10,11
C405E4.5	Explain the principle of operation of various types of power quality monitoring devices.	1,2,3,5,6,8,10,11

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – before CBS[Levels of correlation:3(High),2(Medium),1(low).

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C405E4.1	2	1	1	-	1	2	-	2	-	3	1	-	1	-	2
C405E4.2	3	3	1	-	2	3	-	3	-	2	1	-	2	1	2
C405E4.3	3	3	3	-	3	3	-	3	-	2	1	-	2	1	2
C405E4.4	3	3	3	-	3	3	-	3	-	2	1	-	2	1	2
C405E4.5	2	1	1	-	3	2	-	3	-	3	1	-	1	1	2
C405E4	**3**	**2**	**2**	**-**	**2**	**3**	**-**	**3**	**-**	**2**	**1**	**-**	**2**	**1**	**2**

3. PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:

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

PO2: Problem analysis:
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: 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.

PO6: 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.

PO8: Ethics:
Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO10: 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.

PO11: 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.

S.No.	**4. Important Questions.**	COs	POs
Q.1.1.	Define power quality. What are the major power quality issues and explain them.	C405E4.1	1
Q.1.2.	Identify the sources and analyze the impacts of power quality on power system.	C405E4.1	1,2
Q.1.3.	Discuss in detail about sags and swells.	C405E4.1	1
Q.1.4.	Discuss in detail about transients.	C405E4.1	1
Q.1.5.	Define waveform distortion and explain the waveform distortion categories.	C405E4.1	1
Q.1.6.	Explain total harmonic distortion and total demand distortion.	C405E4.1	1
Q.1.7.	Discuss about the CBEMA curves and explain the events described in the curve.	C405E4.1	1,2,6,8,10
Q.1.8.	With a waveform sketch, explain the terms. Voltage sag, Voltage interruption, Voltage swells and Sag with harmonics.	C405E4.1	1
Q.2.1.	When sag leads to interruption. What are the three levels of possible solutions to voltage sag and momentary interruption problems?	C405E4.2	1,2
Q2.2.	Discuss the sources of sags and interruption.	C405E4.2	1
Q.2.3.	Discuss in detail about the sag performance evaluation indices.	C405E4.2	1
Q2.4.	Explain the sag performance evaluation methods.	C405E4.2	1,2,3
Q.2.5.	Explain the various causes and effects of voltage sags.	C405E4.2	1
Q.2.6.	What are the different voltage sag mitigation techniques? Explain in detail.	C405E4.2	1,2,3

Q2.7.	Discuss in detail about the active series compensator.	C405E4.2	1
Q2.8.	Explain the solid state transfer switch with the transfer operation.	C405E4.2	1,2
Q2.9.	Explain the system adapted to estimate the severity of the sag occurred due to various sources.	C405E4.2	1,2
Q2.10.	Mention the standards associated with the voltage sag.	C405E4.2	1,2,6,8
Q2.11.	Analyze and calculate the various types of fault condition in power system	C405E4.2	1,2,3,5,10
Q.3.1.	What are transient over voltages? Explain the different types of transient over voltages.	C405E4.3	1
Q.3.2.	What are the different sources of transient over voltages? Discuss the Capacitor switching transient.	C405E4.3	1,2
Q.3.3.	Define lightning? Discuss in detail about the over voltages due to lightning and the problems associated with it.	C405E4.3	1,2
Q.3.4.	Draw the standardized waveform of the lightning induced voltage. Discuss about the wave shape of the lightning current.	C405E4.3	1,2
Q.3.5.	Explain the phenomena of ferro-resonance. Analyze the problems associated with ferro-resonance.	C405E4.3	1,2,3
Q.3.6.	What is the need for protection against over voltages? What are the basic principles of over voltages protection of load equipments?	C405E4.3	1,3
Q.3.7.	Explain in detail about various methods to mitigate voltage swells	C405E4.3	1,2
Q.3.8.	Explain in detail about the surge arrestors and surge suppressors. What are the advantages of surge arrestors?	C405E4.3	
Q.3.9.	Explain the following: Low pass filters (b) Power conditioners (c) Surge filters	C405E4.3	1
Q.3.10.	What is the need of Computer analysis tools for transient studies? List the advantages of computer analysis tools for transient studies. What is the need of SCAD/EMTDC? Give any two analysis examples available in PSCAD/EMTDC?	C405E4.3	1,2,3,5
Q.4.1	Differentiate between linear loads and non-linear loads. Explain in detail about classification of linear loads and non linear loads used in harmonic studies.	C405E4.4	1,2
Q.4.2	Explain for the following terms (i) Harmonic distortion (ii) Current distortion (iii) Voltage distortion	C405E4.4	1
Q.4.3	What are the two important harmonic indices used in power system? Explain about it briefly.	C405E4.4	1
Q.4.4	Explain briefly about the phenomena of how current distortion affects the voltage distortion under the presence of harmonics.	C405E4.4	1,2
Q.4.5	Explain the harmonic effects on power system equipments briefly.	C405E4.4	1
Q.4.6	What are the various classifications of harmonic sources and explain briefly about it?	C405E4.4	1
Q.4.7	Mention the IEEE and IEC standards for harmonics and discuss in detail	C405E4.4	1,6,8,10
Q.4.8	What is the need of locating harmonic sources? What are the general causes of harmonics in power system?	C405E4.4	1
Q.5.1	Bring out the significance of power quality monitoring. What are the important power quality monitoring objectives?	C405E4.5	1,8,10
Q.5.2	Write notes on power line disturbance analyzer.	C405E4.5	1,5
Q.5.3	What are the various instruments used for power quality measurements? What are the factors to be considered when selecting the instruments?	C405E4.5	1,5

Q.5.4	Explain Harmonic/Spectrum analyzer.	C405E4.5	1,5
Q.5.5	Define voltage flicker. Discuss some of the flicker sources. Write notes on common methods for mitigation of flicker.	C405E4.5	1
Q.5.6	Discuss in detail about the flicker meter.	C405E4.5	1,5
Q.5.7	Draw and explain the functional structure of expert systems.	C405E4.5	1,5
Q.5.8	Explain the steps involved in power quality monitoring. What is the information from monitoring site surveys?	C405E4.5	1,2
Q.5.9	Model the problem of harmonics and solve using mathematical simulation tools	C405E4.5	1,2,3
	5. Assignments/Seminar/Self study topics.		
A.1	Describe the function of DVR and STATCOM with its advantages and disadvantages over other devices used to mitigate voltage sag. (4 pages-assignment)	C405E4.2	1,2,3
A.2	How utilities can deal with problems related to Capacitor-switching transients. [Ref: Page No.140-144,Roger C. Dugan]	C405E4.3	1,2,3
A.3	(a). Harmonic filter design-A case study [Ref: Page No.264-273 Roger C.Dugan] (b). Describe the ideal procedure for performing a power systems harmonics study. How can we model the harmonic sources? Describe the computer tools for analysis of harmonics.(Self study topic) [Ref: Page No.238-247 Roger C.Dugan]	C405E4.4	1,2,3,5
S.1	Assessment of Power Quality Measurement Data- Example applications of expert Systems- Industrial power quality monitoring applications- Power quality monitoring and the Internet- Power Quality Monitoring Standards	C405E4.5	1,2,3,5, 6,10

K.L.N. College of Engineering, Pottapalayam- 630 611

Department of Electrical and Electronics Engineering

Lecture Schedule

Course/Branch: B.E/EEE **Subject : Flexible AC Transmission Systems**

Duration : January 2016 to April 2016 **Subject Code :** EE 2036

Staff Handling : A.S.S.Murugan/ASP **Semester :** VIII **Section:** 'A,B,C'

S.P.Rjaram,AP/EEE

Regulation : 2008 AUC/AUT/AUM: **AU-Chennai**

AIM

To enhance the transmission capability of transmission system by shunt and series compensation using static controllers.

OBJECTIVES

- To understand the concept of flexible AC transmission and the associated problems.
- To review the static devices for series and shunt control.
- To study the operation of controllers for enhancing the transmission capability.

COURSE OUTCOMES: After the course, the student should be able to:

CO	Course Outcomes	POs	PSOs
C405E3.1	Explain the reactive power control in electrical power transmission lines and the importance of FACTS devices.	**1,2,3,5,6,12**	**1,2**
C405E3.2	Analyze the operation, performance and applications of SVC	**1,2,3,5,12**	**1,2**
C405E3.3	Outline the operation, modeling and applications of TCSC	**1,2,3,5,12**	**1,2**
C405E3.4	Analyze the performance of VSC based FACTS devices	**1,2,3,5,12**	**1,2**
C405E3.5	Discuss the FACTS controller interactions and coordination of FACTS controllers.	**1,2,3,5,12**	**1,2**

S.No	Date	Period No.	Topics to be covered	Book No [Page No]
UNIT – I: INTRODUCTION				**Target Periods: 9**
1.			The concept of flexible AC transmission	T1(6),T2(1.1-1.3)
2.			Reactive power control in electrical power transmission lines	T1(16-18) T2(1.1-1.3)
3.			Uncompensated transmission line – series and shunt compensation.	T1(18-39), T2(1.4-1.14)
4.			Overview of FACTS devices - Static Var Compensator (SVC)	T1(40-91), T2(1.14-1.18), R2(16-25)
5.			Thyristor Switched Series capacitor (TCSC)	R2(22), T2(1.16-1.21)
6.			Unified Power Flow controller (UPFC)	R2(23), T2(1.21-1.24)
7.			Integrated Power Flow Controller (IPFC)	R2(21-22), T2(1.25)
				Total Periods = 9 Periods
Assignment 1 Date of Submission :				**Test – I – Class Test I**
UNIT – II: STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS				**Target Periods: 9**
8.			Voltage control by SVC	T1(142-147) T2(2.1-2.2)
9.			Advantages of slope in dynamic characteristics	T1(147) T2(2.2-2.6)
10.			Influence of SVC on system voltage. Applications	T1(149-150) T2(2.7-2.10)
11.			Enhancement of transient stability	T1(224-147) T2(2.10-2.16)

12.			Steady state power transfer	T1(221-2 T2(2.17-2.20)
13.			Enhancement of power system damping	T1(238) T2(2.20-2.28)
14.			Prevention of voltage instability	T1(263-265) T2(2.28-2.1)
				Total Periods = 9 Periods
Assignment II Date of Submission :				
Test-II- CIT-I				
UNIT- III: THYRISTOR CONTROLLED SERIES CAPACITOR(TCSC) AND APPLICATIONS				**Target Periods: 9**
15.			Operation of the TCSC	T1(280-281) T2(3.1-3.2)
16.			different modes of operation	T1(281-284) T2(3.2-3.5)
17.			modeling of TCSC	T1(304-312) T2(3.5-3.12)
18.			Variable reactance model	T1(304-312) T2(3.5-3.12)
19.			modeling for stability studies. Applications	T1(315) T2(3.5-3.13)
20.			improvement of the system stability limit	T1(321-334) T2(3.13-3.14)
21.			enhancement of system damping	T1(334-343) T2(3.14-3.20)
22.			voltage collapse prevention	T1(343-345) T2(3.20-3.22)
				Total Periods = 9 Periods
Test – III – Class Test – II				
Assignment - 3 Date of Submission :				
UNIT – IV: EMERGING FACTS CONTROLLERS				**Target Periods: 9**
23.			Static Synchronous Compensator (STATCOM)	T1(413-415) T2(4.1-4.2)
24.			Operating principle – V-I characteristics	T1(415-419) T2(4.2-4.6)
25.			Unified Power Flow Controller (UPFC)	T1(444-448) T2(4.8-4.10)
26.			Principle of operation - modes of operation – applications	R2(297-329) T2(4.8-4.10)
27.			Modeling of UPFC for power flow studies	R2(297-329) T2(4.12-4.14)
28.			**Content beyond the Syllabus**	Material
29.			**Seminar**	
				Total Periods = 12 Periods
Test – IV – CIT – II				
UNIT – V: CO-ORDINATION OF FACTS CONTROLLERS				**Target Periods : 9**
30.			FACTs Controller interactions	T1(359-360) T2(5.1-5.12)
31.			SVC–SVC interaction	T1(360-380) T2(5.12-5.21)
32.			Co-ordination of multiple controllers using linear control techniques	T1(401-409) T2(5.12-5.21)
33.			Quantitative treatment of control coordination	T1(401-409) T2(5.12-5.21)
34.			**Quiz**	-
35.			Revision	-
36.			Revision	-
				Total Periods =10 Periods
Test – V –CIT-III				

Book Reference

S.No	Title of the Book	Author	Publisher	Year
T1.	Thyristor – Based Facts Controllers for Electrical Transmission Systems	Mohan Mathur, R., Rajiv. K. Varma	IEEE press and John Wiley & Sons, Inc	1991
T2	Flexible AC Transmission System	S.Dineshkumar	Anuradha Publications	2013
R1	Flexible AC Transmission System	John, A.T	Institution of Electrical and Electronic Engineers (IEEE)	1999
R2.	Understanding FACTS Concepts and Technology of Flexible AC Transmission System	Narain G.Hingorani Laszio. Gyugyl	Standard Publishers, Delhi	2001

EE2036 FLEXIBLE AC TRANSMISSION SYSTEM [C405 E3]

Important Questions/Tutorials/Assignments/Self study /Seminar topics.

1. Course outcomes

Course	Course Outcome	POs
C405E3.1	Explain the reactive power control in electrical power transmission lines and the importance of FACTS devices	1,2,3,5,6,12
C405E3.2	Analyze the operation, performance and applications of SVC	1,2,3,5,12
C405E3.3	Outline the operation, modeling and applications of TCSC.	1,2,3,5,12
C405E3.4	Analyze the performance of VSC based FACTS devices	1,2,3,5,12
C405E3.5	Discuss the FACTS controller interactions and coordination of FACTS controllers.	1,2,3,5,12

2. Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – before CBS[Levels of correlation:3(High),2(Medium),1(low).

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C405E3.1	3	2	3	-	2	1	-	-	-	-	-	1	2	1	-
C405E3.2	3	2	3	-	2	-	-	-	-	-	-	1	2	1	-
C405E3.3	3	2	3	-	2	-	-	-	-	-	-	1	2	1	-
C405E3.4	3	2	3	-	2	-	-	-	-	-	-	1	2	1	-
C405E3.5	3	2	3	-	2	-	-	-	-	-	-	1	2	1	-
C405E3	3	2	3	-	2	-	-	-	-	-	-	1	2	1	-

3. PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

PO1: Engineering knowledge:
Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO5: 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.

PO6: 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.

PO12: Life-long learning:
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

S.No.	4. Important Questions.	COs	POs
Q.1.1.	Explain the uncompensated Transmission line	C405E3.1	1,2,3
Q.1.2.	Explain in detail about shunt and series compensation line	C405E3.1	1
Q.1.3.	Give the complete analysis of lossless distributed parameter transmission lines and drive power equations for symmetrical case	C405E3.1	1,2,3,5
Q.1.4.	Write a brief note on IPFC	C405E3.1	1
Q.1.5.	Discuss the effect of shunt and series compensation on power transmission capacity and hence compare the incremental VAR-rating requirements for the symmetrical short length transmission line.	C405E3.1	1,2,3,5
Q.1.6.	Explain the operation of thyristor switched series capacitor	C405E3.1	1
Q.1.7.	Explain the practical swinging strategies of thyristor switched series capacitor	C405E3.1	1,2
Q.1.8.	Explain the role of FACTS devices in reactive power compensation	C405E3.1	1,3,6,12
Q.1.9.	What are the needs of FACTS controller in modern power systems?	C405E3.1	1,3,6,12
Q.1.10.	Write the list of FACTS devices to control the line power flows	C405E3.1	1
Q.2.1	Derive the voltage and power expression in SVC	C405E3.2	1,2
Q.2.2	Explain prevention of voltage instability	C405E3.2	1
Q.2.3	Write the advantages of the slope in dynamics characteristics of the SVC and comment on the reason for slope.(8)	C405E3.2	1
Q.2.4	With a case study, explain how an SVC can be used to prevent voltage instability in a power system.(8)	C405E3.2	1,2,3,5,12
Q.2.5	Explain how an SVC can be used to enhance the steady-state power transfer capacity of a transmission line(8)	C405E3.2	1,2,3,5,12
Q.2.6	Using power angle curves , explain how SVC enhances transient stability of a power system.(8)	C405E3.2	1
Q.2.7	Describe the dynamic V-I characteristics of static Var compensator.(8)	C405E3.2	1
Q.2.8	Illustrate the modelling of SVC for stability studies	C405E3.2	1,2,3
Q 3.1	Derive the expression of TCSC for the time interval ($-\beta \leq wt \leq \beta$) (16)	C405E3.3	1,2,3
Q 3.2	With a neat diagram, explain the basic principle and various modes of operation of thyristor controlled series capacitor in details.	C405E3.3	1
Q 3.3	With a neat block diagram, explain the variable reactance model of the TCSC and derive transient stability and long-term stability models.	C405E3.3	1,5,12
Q 3.4	Descibe the constant current and constant angle control characteristics of the TCSC.(8)	C405E3.3	1
Q 3.5	Demonstrate the analysis of TCSC with neat sketch	C405E3.3	1,2
Q 3.6	Explain the role of TCSC in the enhancement of system damping	C405E3.3	1,12
Q 4.1	Explain the protection of UPFC	C405E3.4	1,12
Q 4.2	Derive the expression of UPFC connected at the midpoint	C405E3.4	1,2
Q 4.3	Explain the configuration, principle of operation and V-I characteristics of STATCOM.	C405E3.4	1
Q 4.4	Demonstrate the modelling of STATCOM and mention some applications.	C405E3.4	1,2,3

Q 4.5	Explain the steady-state UPFC model for power flow studies.	C405E3.4	1,5
Q 4.6	Show that real and reactive power exchange between STATCOM and a/c. Power system can be controlled independently of each other (4)	C405E3.4	1,12
Q 4.7	Explain in details about operation UPFC and IPFC.	C405E3.4	1
Q 5.1	Explain linear co-ordination technique	C405E3.5	1
Q 5.2	Explain quantitative treatment in FACTS controller	C405E3.5	1
Q 5.3	Explain the various kinds of control interactions occurring between different FACTS controller using their frequency response characteristics	C405E3.5	1
Q 5.4	Explain in detail about SVC-SVC interation	C405E3.5	1,12
Q 5.5	Explain the step by step procedure for FACTS controller design	C405E3.5	2,3
Q 5.6	Explain about co-ordination of multiple controllers using linear control techniques	C405E3.5	1,5
Q 5.7	Classify the FACTS controller interactions based on different frequency ranges and explain in details.	C405E3.5	1
Q 5.8	Briefly explain the concept of control co-ordinations of FACTS controllers	C405E3.5	1
	5. Assignments/Seminar/Self study topics.		
A 1.1	What would happen if the reactive power is below acceptable level on power system? And how solve this problem?	C405E3.1	1, 12
A 1.2	How could you justify different types of FACTs controllers used in Power Systems?	C405E3.1	1
A 2.1	Analyze the torque contributions of SVC controllers	C405E3.2	1,2
A 2.2	How can you enhance the Power System damping by using SVC controller?	C405E3.2	2,3
A 3.1	What is the function of TCSC in power system?	C405E3.3	1
A 3.2	Design the TCSC by using transient stability model.	C405E3.3	2,3,5
A.4.1	(a). Modern tools used for the design of FACTS devices (seminar). (b). Applications of Emerging FACTS controllers (seminar).	C405E3.4	1,2,3,5,12

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71518

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Eighth Semester

Electrical and Electronics Engineering

EE 2451/ EE 81/ 10133 EE 801 — ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION

(Regulation 2008 / 2010)

(Common to PTEE 2451/ 10133 EE 801 – Electric Energy Generation, Utilization and Conservation for B.E. (Part-Time) Seventh Semester – EEE Regulation 2009 / 2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the objective of load control in wind energy systems? How load control is achieved in small stand alone wind turbine?
2. List the various control rods used in nuclear reactor?
3. Differentiate load curve and load duration curve.
4. Compare two part tariff with power factor tariff.
5. How does the operation of a fluorescent tube differ when it is used on ac and dc supply?
6. If the total lumens required are 7200 and coefficient of utilization is 0.3, Calculate lamp lumens required.
7. Mention the factors which limit the choice of frequency in induction and dielectric heating?
8. What is meant by arc welding, also list its types?
9. Define specific energy consumption and discuss the factors which effect the specific energy consumption.
10. What type of braking is employed on a tram car driven by two series motor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe with neat sketch the construction and principle of operation used for Thermal power plant. (10)

(ii) Explain the working of pumped storage power plant. (6)

Or

(b) (i) Explain the working of a co-generation power plant with neat layout. (8)

(ii) Discuss various bus bar systems for distribution network. (8)

12. (a) (i) A consumer requires 10 lakh units per year and his yearly load factor is 30%. The tariff in force is Rs.420 per kw per year + Rs.19 per unit. Estimate the saving in energy costs if the load factor is improved to 100%. (8)

(ii) List the points to be considered for selection of size and number of generating units. (8)

Or

(b) (i) What is energy auditing. Explain with few examples how energy auditing can improve the performance of the power system. (10)

(ii) Explain briefly the various factors which affect the quality of power supply. (6)

13. (a) (i) State and prove laws of illumination. (6)

(ii) Design a street lighting of a road of 300 m long which is required to be illuminated by providing 40 W fluorescent lamp. The width of the road is 4 m. Illumination is 0.6 lux. Assume efficacy of lamp as 70 Lumen/watt. (10)

Or

(b) (i) With neat diagram explain the construction and working of CFL lamp. (8)

(ii) Explain the various steps followed in calculation of illumination for designing the residential lighting. (8)

14. (a) (i) Draw a neat sketch of induction furnace and explain its working. (6)

(ii) An insulating material 2 cm thick and 150 sq.cm. in area is to be heated by dielectric heating. The material has permittivity of 4 and p.f. as 0.04. Power required is 400 watts and frequency of 40 MHz. Determine the voltage and the current that will flow through the material. If the voltage were limited to 700 volts, what will the frequency to get the same loss? (10)

Or

(b) (i) Discuss the principle of arc welding and the difference between carbon and metal arc welding and their relative merits and demerits. (8)

(ii) Explain the characteristics of a welding transformer. (8)

15. (a) (i) Explain about multi motor speed control. (8)

(ii) A sub-urban electric train has a maximum speed of 65 kmph. The schedule speed including a station stop of 30 seconds is 43.5 kmph. If the acceleration is 1.3 kmphps, find the value of retardation when the distance between stops is 3 k.m. (8)

Or

(b) (i) Explain the principle and operation of a modern ac locomotive. (6)

(ii) What are the various types of electric braking used in traction? Discuss in detail. (10)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91457

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Eighth Semester

Electrical and Electronics Engineering

EE 2451/ EE 81/ 10133 EE 801 — ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION

(Regulation 2008 / 2010)

(Common to PTEE 2451/ 10133 EE 801 – Electric Energy Generation, Utilization and Conservation for B.E. (Part-Time) Seventh Semester – EEE Regulation 2009 / 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need of surge tank in Hydro Power Plant?
2. What are the essential components of nuclear reactor?
3. What are the effects of energy conservation?
4. List the components of fixed cost.
5. List the types of lighting system.
6. Define Lumen.
7. State the requirements of a good heating material.
8. What is meant by electric arc welding?
9. What are the recent trends in electric traction?
10. List the advantages and disadvantages of electric traction.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the role of distributed generation. (10)

(ii) Describe the advantages of combined operation of power station. (6)

Or

(b) (i) List the factors required to select the suitable site for thermal power station. (6)

(ii) Describe about thermal power plant with neat sketch. (10)

12. (a) (i) A generating station has a maximum demand of 20MW, a load factor of 60%, a plant capacity factor of 48% and a plant use factor of 80%. Calculate

(1) The daily energy produced,

(2) The reserve capacity of the plant,

(3) The maximum energy that could be produced daily if the plant was running all the time and

(4) The maximum energy that could be produced daily if the plant was running fully loaded and operating as per schedule. (12)

(ii) List the desired characteristics of tariff. (4)

Or

(b) (i) The monthly reading of a consumer's meter are as under :

Maximum Demand = 60KW

Energy Consumed = 24000 KWh

Reactive Energy = 15600 KVAR

1% of power factor penalty is charged from the customer for every 0.01 drop power factor from the recommended value of 0.9. If the tariff is Rs.250 per KW of maximum demand plus 3.5 paise per unit, calculate the monthly bill of the customer. (10)

(ii) What is power factor? What are the disadvantages of Low Power Factor? (6)

13. (a) Two Street lamps are 20m apart and are fitted with a 500 C.P. lamp at a height of 8m above the ground each. Find the illumination at a point

(i) under the lamps each,

(ii) midway between the lamps. (16)

Or

(b) A hall 30 m long and 12 m wide is to be illuminated and the illumination required is 50 lumens / m^2. Calculate the number of fitting required, taking Depreciation Factor of 1.3 and Utilization Factor of 0.5. Given that the outputs of different types of lamp are given below : (16)

Watts	100	200	300	500	1000
Lumens	1625	3650	4720	9970	21520

14. (a) Discuss in details about any two types of resistance welding. (16)

Or

(b) Estimate the efficiency of a high frequency induction furnace which takes 12 minutes to melt 1.3Kg of Aluminium. The input to the furnace being 4.5kW and the initial temperature is 15°C. Take specific heat of Aluminium is 880J /Kg/°C, melting point of Al is 660°C and latent heat of fusion of Al is 32KJ /Kg. (16)

15. (a) The distance between two stations is 1.6 km and the average speed of the train is 40 kmph. The acceleration is 2 kmphps, retardation during coasting is 0.16 kmphps and braking is 3.2 kmphps respectively. Assuming a simplified quadrilateral speed-time curve, determine duration of acceleration, coasting and braking periods and distance covered during braking period. (16)

Or

(b) Explain the supply system of electric traction in details. (16)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71488

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Eighth Semester

Electrical and Electronics Engineering

EE 2028/ EE 801/ 10133 EEE 31 — POWER QUALITY

(Regulation 2008/2010)

(Common to PTEE 2028/ 10133 EEE 31 — Power Quality for B.E. (Part-Time) Sixth/Seventh Semester — EEE — Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Voltage imbalance.
2. Draw the CBEMA curve of power quality.
3. What is static transfer switch?
4. What is the importance of voltage sag estimation?
5. Write the need for power conditioners.
6. List the sources of over voltage.
7. Why even harmonics are normally absent in the power converters?
8. Define harmonics.
9. What is the need for power quality monitoring?
10. What are the advantages of modeling and simulation?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the impact of poor power quality on utility and consumer.

Or

(b) Discuss the following electrical power quality issues with examples :

(i) Voltage swell (8)

(ii) Voltage interruption. (8)

12. (a) Explain various indexes used to estimate voltage sag.

Or

(b) Discuss some of the solutions for voltage sag and interruptions.

13. (a) Write short note on the followings :

(i) Surge arrester (8)

(ii) Lightning arrestor. (8)

Or

(b) Illustrate the phenomena of impulsive transients and oscillatory transients.

14. (a) Discuss the effects of harmonics on electrical power components.

Or

(b) Write short note on passive filter and active filter.

15. (a) Illustrate the importance of power quality monitoring and assessment.

Or

(b) Explain the features of spectrum analyzer and flicker meters.

Reg. No. :

Question Paper Code : 91428

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Eighth Semester

Electrical and Electronics Engineering

EE 2028/EE 801/10133 EEE 31 — POWER QUALITY

(Regulation 2008/2010)

(Common to PTEE 2028/10133 EEE 31 — Power Quality for B.E. (Part-Time) Sixth/Seventh Semester — EEE — Regulation 2009/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define, Voltage swell.
2. What are the reasons for voltage imbalances?
3. What are the causes of frequency variations?
4. What is the importance of voltage sag estimation?
5. Write the working principle of surge arrestor.
6. List the sources of over voltage.
7. Why even harmonics are normally absent in the power converters?
8. What is total demand distortion?
9. What is the need for power quality monitoring?
10. What are merits of modeling and simulation?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the following electrical power quality issues with examples.
    (i) Voltage sag (8)
    (ii) Voltage interruption (8)

Or

(b) Briefly explain some of the important electrical power quality issues.

12. (a) Briefly explain the sources of voltage sag and interruptions.

Or

(b) Discuss some of the solutions for voltage sag and interruptions.

13. (a) Analyze the sources of transient over voltages in power systems.

Or

(b) Write short note on the followings :

(i) Lightning arrestor (8)

(ii) Power conditioner. (8)

14. (a) Explain how commercial and industrial loads are responsible for harmonic distortion.

Or

(b) Write short note on passive filter and active filter.

15. (a) Illustrate the importance of power quality monitoring.

Or

(b) Enlighten the role of some of the power quality measuring instruments.

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 71495

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Eighth Semester

Electrical and Electronics Engineering

EE 2036/EE 809/10133 EEE 45 – FLEXIBLE AC TRANSMISSION SYSTEMS

(Regulation 2008/2010)

(Common to PTEE 2036 – Flexible AC Transmission Systems for B.E. (Part-Time) Seventh Semester – EEE – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the two main reasons for incorporating FACTS devices in electric power systems?
2. State the features of Interline Power Flow Controller (IPFC).
3. What are the three basic modes of SVC control?
4. How is voltage instability identified in a power system?
5. State any two advantages of TCSC.
6. What are the functions of damping control of a TCSC?
7. List any two power system performances that can be improved by STATCOM.
8. Write the applications of UPFC.
9. What is the main problem with multiple SVCs in a power system network?
10. What is the significance of 'modal-performance index'?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain briefly about load compensation. (4)

(ii) What are the objectives of line compensation? Explain the effect of shunt and series compensation on power transmission capacity of a short symmetrical transmission line. (12)

Or

(b) Describe the working principle of the two types of Static Var Compensator (SVC) with neat schematic diagrams. (8+8)

12. (a) (i) State and explain the advantages of slope in the dynamic characteristics of SVC. (8)

(ii) Explain the influence of SVC on regulating the AC system voltage for the following two cases: (4+4)

(1) Coupling transformer ignored

(2) Coupling transformer considered.

Or

(b) Explain in detail about the role of SVC in enhancing the steady state power limit and power system damping. (6+10)

13. (a) Draw the basic and practical TCSC modules. Explain the basic principle and different modes of operation of TCSC. (2+4+10)

Or

(b) Draw and explain the block diagram of the variable reactance model of TCSC and hence derive transient stability and long term stability models. (8+8)

14. (a) With neat sketches, explain the operating principle and the V-I characteristic of Static Synchronous Compensator (STATCOM). (8+8)

Or

(b) (i) Draw the phasor diagrams illustrating the concepts of various power-flow control functions by use of UPFC. (4)

(ii) Explain the modeling procedure of UPFC for power-flow studies. (12)

15. (a) What is the need for coordination of different FACTS controllers? Explain the different control interactions that are occurring in multiple FACTS controllers. (2+14)

Or

(b) Describe the following linear control techniques used for coordination of multiple FACTS controllers: (4+6+6)

(i) Linear Quadratic Regulator (LQR) based technique

(ii) Global coordination using non-linear-constrained optimization

(iii) Control coordination using Genetic Algorithms.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91432

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Eighth Semester

Electrical and Electronics Engineering

EE 2036/EE 809/10133 EEE 45 — FLEXIBLE AC TRANSMISSION SYSTEMS

(Regulation 2008/2010)

(Common to PTEE 2036 – Flexible AC Transmission Systems for B.E. (Part-Time) Seventh Semester – EEE – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the applications of FACTS devices?

2. Define Reactive Power.

3. Compute $\frac{X_{TCSC}}{X_C}$ and $\frac{I_{TCR}}{I_L}$ if

   (a) $X_{TCR}=1.5X_C$ and

   (b) $X_{TCR}=0.75X_C$.

4. What are the objectives of Static VAR?

5. What are the methods for protection against over voltage?

6. Define Transient stability control.

7. Define Linear Loads.

8. Define UPFC.

9. Draw the control characteristics of SVC.

10. Draw the Power Angle Curve of SVC.

PART B — (5 × 16 = 80 marks)

11. (a) Explain Uncompensated Transmission Line.

Or

(b) Explain Shunt and Series Compensation Line.

12. (a) Derive the Voltage and Power expression in SVC.

Or

(b) Explain prevention of voltage instability.

13. (a) Explain the operation of TCSC.

Or

(b) Derive the expression of TCSC for the time interval $(-\beta \leq \omega t \leq \beta)$.

14. (a) Explain the protection of UPFC.

Or

(b) Derive the expression of UPFC connected at the midpoint.

15. (a) Explain Linear Co-ordination technique.

Or

(b) Explain Quantitative Treatment in FACTS controller.

Placement Activity – Reminder

1. In the month of October every first year students must fill forms online in TATA CONSULTANCY SERVICES (TCS) campus recruitment using **nextsteptcs.com** website and must submit the following documents in the department.
    a. SSLC and HSC mark sheet photo copy at least 5.
    b. Latest passport size Photo at least 5.
    c. Current address proof with parent contact cell numbers.
    d. Create your own two E-mail id using Gmail.
    e. Resume with Scanned copy of passport size Photo.
    f. CT number registered in the TCS website.
2. Every semester end update CGPA in your resume and TCS profile.
3. An Engineering student from Electrical and Electronics Engineering should complete the following courses in order to enhance their software skills. This will be most helpful during their successful completion in Curriculum during 4th Semester and in the software company campus recruitment.
    a. Should complete **C Programming** before joining **2nd Semester**.
    b. Should complete **C++ Programming** before joining **3rd Semester**.
    c. Should complete **JAVA Programming** before joining **4th Semester**. (for the successful completion of object oriented Programming theory paper and laboratory during 4th Semester)
4. An Engineering student from Electrical and Electronics Engineering should complete the **Micro Processor, Micro Controller and Embedded Systems** courses before joining **5th Semester** in order to enhance their Hardware skills. This will be most helpful during their successful completion in Curriculum from 5th to 6th Semester and in the Core company campus recruitment. (for the successful completion of Micro Processor and Micro Controller theory as well as laboratory during 5th Semester and Embedded Systems during 6th Semester)
5. From 6th Semester Summer vacation onwards all should prepare for GATE Examination because all Engineering students from Electrical and Electronics Engineering should appear GATE Examination in order to settle in their life by pursuing higher education in the reputed colleges like IIT, NIT and Anna University or

else to join as a Graduate Engineer trainee in a public sector companies like IOC, BHEL, PGCI etc.,

6. Before joining 7th Semester all should get any international certification programme course like OCJP, CCNA, etc., and upload the certification details in TCS campus commune website. This will be most helpful during the TCS campus and other MNC company recruitment.

Activity	Semester							
	1	2	3	4	5	6	7	8
TCS Online form Filling in nextsteptcs.com	**In the month of October**							
Documents to be submitted in the EEE Department/ Placement Coordinator	**a. SSLC and HSC mark sheet photo copy at least 5.** **b. Latest passport size Photo at least 5.** **c. Current address proof with parent contact cell numbers.** **d. Create your own two E-mail id using Gmail.** **e. Resume with Scanned copy of passport size Photo.** **f. CT number registered in the TCS website.**							
Updating CGPA in resume and TCS online profile	✓	✓	✓	✓	✓	✓	✓	✓
C Programming	✓	✓						
C++ Programming		✓						
JAVA Programming			✓					
Micro Processor & Micro Controller				✓				
Embedded Systems					✓			
GATE / UPSC/ TNPSC Preparation			✓	✓	✓	✓	✓	
International Certification – OCJP / CCNA						✓	✓	

GENERAL REMINDERS.

I. General

1. Keep at least 5 photocopies of birth certificate, ration card, Voters ID card, College ID card,Aadhar card, 10^{th} ,+2 mark sheets, 10^{th} /+2 Transfer Certificates,[* all proofs to be kept in your bag, in your house and in your mail, all kept in a water proof file-remember Chennai flood]. This will be required at anytime, anywhere.
2. Apply for Savings Bank account in any of the nationalized banks in first year. Apply for LIC schemes, saving schemes right from the first year. [*Refer]
3. Get Driving license during third year of your Degree course[*Refer]
4. Get Passport before the completion of 6^{th} semester. [*Refer]
5. Always keep ID card issued by competent authority while moving from one city to another/ one state to another. It is better to wear ID card always.(except during bathing).
6. Never share your username and password of mail accounts to anyone even in your home/ to teachers/ friends. Never reply to un trusted mail/fake messages. Never transfer/ deposit money to any unknown mail. Beware of fraud/cheating by any one.
7. Share only legal, ethical, non-political, educational , and value based information/ photos/videos with your friends or any others through social media. Posting of illegal/political/unethical/ information/comments will spoil your career. Remember that all such communications in social media/mails are continuously monitored and recorded by intelligent agencies in the country and abroad, due to security threats.
8. Don't involve teasing of students of your class, juniors or seniors in the classrooms, laboratories or in hostels. Don't loan the cell phone to anyone. Also don't keep your cell phone easily accessible by anyone.
9. Don't send obscene messages or pictures through cell phones/ internet to anyone. Defaulters will be easily tracked by Cyber Crime Agencies. Don't purchase/loan someone's laptop/mobile phone, due to theft complaints.
10. Avoid two wheeler riding for long travelling, and night travelling. Wear helmet. Follow traffic rules. Lot of accidental deaths reported due to negligence of traffic rules. About 1.5lakhs of people lost their life in accidents in our country every year.
11. For any transaction of money, use cheques or bank accounts(for more than Rs. 10,000/-) because finding fake notes is difficult.

12. Always keep 10 passport and stamp size photographs, 10 no.s of revenue stamps, all ID proofs whenever going for banks/pass port office.
13. Keep at least email ids and good friendship of 25 students of your branch who have been placed in different companies. Collect background information on core/IT companies(minimum 25)
14. Develop good reading habit/read News papers daily/watch news channel daily/Watch films nominated for Oscar award.Watch channels like Discovery/Nat Geo/History/ any other news channels.(not more than an hour)
15. Speak in English only. Develop good writing skills by reading books.
16. Have a Desk top/Laptop, Printer before entering 5^{th} semester.
17. Have internet facility in home for educational purpose.Keep all NPTEL material.
18. Keep all kind of stationary in your table for use at any time[pencil, sharpener, eraser, ball point pen of different colours, sketches, bell clip, stapler, single punch, tag, gum, knilfe,scissors,A4 paper, cello tap, emergency lamp, scale, protractor, compass, pen drive, CD, whitener, calculator, diary, stapler pin box]

II. Education:

20 Download Anna University examination results immediately after the publication of result from AU website. Mark sheet attestation will not be given without the above copy

21 Always keep 5 copies of AU mark sheets , of each semester. Post it on your mail.

22. Discrepancy in mark sheets such as Name, Date of Birth, CGPA awarded, register number should be corrected immediately.
23. Always keep Rs 5,000/- in a semester for the payment of Book fee/AU exam fee/Training fee/purchase of competitive exam books/Educational tour/seminar/additional course/ certification course etc. Educate your parents for the above. This may be required in a particular month or in several months spread in a semester.
24. Enroll in IEEE membership during first/second year. Attend at least one programme at Chennai.
25. Collect 5 sets of AU question papers, subject wise, in a semester(within 10 days)
26. Prepare good quality Resume. Consult TPO, placed final year students. Resume preparation is an art that ensures your quality and getting jobs in reputed concern. Update

your resume, monthly (by attending value added courses, online courses, co-curricular and extracurricular activities, publishing articles in conferences, symposium, technical events, journals,News papers, inplant training, internship, new languages learnt, project developed, industrial visits, social services participated etc.)

27. Attend any courses after consulting with HOD/senior staff to avoid courses not suited to your branch.
28. Purchase text/reference books every semester.
29. Purchase competitive exam books , like Objective type QB,GATE/TANCET/IES/IAS and prepare for the exams from second year onwards.
30. Collect aptitude/reasoning/analytical/numerical/verbal/test questions from the placed students or download from the website. For successful placement, preparation from the first year in the above topics is required.
31. Collect information like Product, clients, branches, head office, annual turnover, GM,CEO, etc of 25 core companies, and 25 software companies.
32. Attend atleast one seminar/workshop/ paper presentation contest per semester, applicable to your branch of study.
33. Plan your study for current subject/assignment work/observation work/record work/aptitude training for technical /non-technical daily/weekly/monthly.
34. Decide & justify clearly, your objective before 6^{th} semester and plan accordingly. Options are placement(ON/OFF) in core/IT companies, higher studies/ civil services , parents business , start your own business. Confused mind never take a decision.
35. Attend inplant training(Min:one week,Max:One month) during semester holidays. Avoid industrial visit (Energy waste) and educational tour (Money waste).
36. Do mini project in second, third year of your study .Update these in final year.Project should be based on the need of the society/industry.

III. Health

37. Health is wealth. Read Dalailama statement on life of a man. We work hard , earn and save money sacrificing our health. Later we spent lot of money for medical treatment due to poor healthcare.
38. Have regular exercise either in the forenoon/evening. (an hour walk is must everyday).

39. Your food habits decides what you are and how long you will live with peace. Avoid junk foods/road side eatery. Use hot water for drinking.
40. Consult doctors in case of health problems. Periodical medical checkup, once in 6 months, is necessary for health and dental care. This may require Rs.2,000/- per year. Otherwise you need to pay a lot. It is advisable to stay in a house, within 500 metre (walk able distance) from a multispecialty hospital, otherwise 250 meters from any hospital. This is required to tackle emergency situations and also to avoid paying more for transport.
41. Avoid roaming/walking during summer/rainy season.
42. Attend yoga classes/ do meditation.
43. Apply group insurance medical policy at the age of 20.
44. Follow ethics and be Nationalistic.

Advanced Training Institute

Skill Development and Entrepreneurship Programmes
Ref: Advanced Training Institute,
CTI Campus, Guindy Industrial Estate, Chennai – 600 032.
Phone No.: 044- 2250 0252/1211, E mail : atichn@vsnl.com, www.ati.chennai.org.in

GROUP – I
ELECTRICAL CONTROL & MAINTENANCE

Course Coordinator

1. **Shri. M.S. Ekambaram, Dy.Director**
2. **Shri. C.C.Jose, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
01.01	Protective Relays, Circuit Breakers, & Switch Gear Protection	01	13.04.2015	17.04.2015
			18.05.2015	22.05.2015
			22.06.2015	26.06.2015
			27.07.2015	31.07.2015
			24.08.2015	28.08.2015
			21.09.2015	25.09.2015
			12.10.2015	16.10.2015
			07.12.2015	11.12.2015
			15.02.2016	19.02.2016
			21.03.2016	24.03.2016
01.02	Operation & Maintenance of Power Transformers	01	06.04.2015	10.04.2015
			11.05.2015	15.05.2015
			15.06.2015	19.06.2015
			20.07.2015	24.07.2015
			14.09.2015	18.09.2015
			30.11.2015	04.12.2015
			08.02.2016	12.02.2016
			07.03.2016	11.03.2016
			21.03.2016	24.03.2016

01.03	Trouble Shooting & Maintenance of Electric Motors	01	20.04.2015	24.04.2015
			08.06.2015	12.06.2015
			29.06.2015	03.07.2015
			03.08.2015	07.08.2015
			07.09.2015	11.09.2015
			23.11.2015	27.11.2015
			01.02.2016	05.02.2016
			29.02.2016	04.03.2016
01.04	Operation and Control of Industrial AC / DC Motors	01	25.05.2015	29.05.2015
			13.07.2015	17.07.2015
			17.08.2015	21.08.2015
			26.10.2015	30.10.2015
			18.01.2016	22.01.2016
			14.03.2016	18.03.2016
01.05	Electrical Safety at work place and first aid Practices	01	27.04.2015	01.05.2015
			01.06.2015	05.06.2015
			06.07.2015	10.07.2015
			10.08.2018	14.08.2015
			28.09.2015	01.10.2015
			14.12.2015	18.12.2015
			04.01.2016	08.01.2016
			22.02.2016	26.02.2016

GROUP – I
ELECTRONIC CONTROL & MAINTENANCE

Course Coordinator

1. **Dr.M.Jayaprakasan, Dy.Director**
2. **K.Arulselvi, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
02.01	Siemens S7 400 PLC & win CC SCADA / HMI – Programming (TIA portal)	02	13.04.2015	24.04.2015
			06.07.2015	17.07.2015
			14.09.2015	25.09.2015
			16.11.2015	27.11.2015
			01.02.2016	12.02.2016
02.00.2	PLC Siemens S7 400 Programming with step 7	01	15.06.2015	19.06.2015
			26.10.2015	30.10.2015
			04.01.2016	08.01.2016
			07.03.2016	11.03.2016
02.03	Maintenance & Servicing of SMPS and UPS	02	27.04.2015	08.05.2015
			20.07.2015	31.07.2015
			30.11.2015	11.12.2015
			15.02.2016	26.02.2016
02.04	Industrial Drives & Automation using Siemens PLC	02	15.06.2015	26.06.2015
			31.08.2015	11.09.2015
			18.01.2016	29.01.2016
02.05	Installation, Commissioning & Trouble Shooting of AC / DC Drives	01	18.05.2015	22.05.2015
			03.08.2015	07.08.2015
			18.01.2016	22.01.2016
02.06	PLC Siemens S7 400 Maintenance and Trouble Shooting	01	25.05.2015	29.05.2015
			10.08.2015	14.08.2015
			02.11.2015	06.11.2015
			21.03.2016	24.03.2016

02.07	Embedded System Programming & Applications (PIC 16F 877)	01	01.06.2015	05.06.2015
			24.08.2015	28.08.2015
			05.10.2015	09.10.2015
			14.12.2015	18.12.2015
02.08	Embedded Systems Programming & Applications (ARM 7 PLC 2378)	01	08.06.2015	12.06.2015
			28.12.2015	01.01.2016
02.09	Power Electronics and its Industrial Applications	02	20.07.2015	31.07.2015
			30.11.2015	11.12.2015

GROUP – I

PROCESS CONTROL INSTRUMENTATION

Course Coordinator

1. **Dr.M.Jayaprakasan, Dy.Director**
2. **M.Gunaseklharan, Training Officer.**

Course Code	Course Title	Duration weeks	Date	
			From	To
03.01	Agilent Veepro Graphical Programming for Industrial Instrumentation	01	13.04.2015	17.04.2015
			07.09.2015	11.09.2015
			23.11.2015	27.11.2015
03.02	Embedded System and its Application using P89C551rd2	01	20.04.2015	24.04.2015
			29.06.2015	03.07.2015
			05.10.2015	09.10.2015
			07.12.2015	11.12.2015
03.03	Industrial Automation using GE-GANUC PLC	01	18.05.2015	22.05.2015
			10.08.2015	14.08.2015
			28.12.2015	01.01.2016
			29.02.2016	04.03.2016
03.04	PLC Allen Bradley SLC 500 Programming & Applications	01	27.04.2015	01.05.2015
			13.07.2015	17.07.2015

			24.08.2015	28.08.2015
			26.10.2015	30.10.2015
			04.01.2016	08.01.2016
			15.02.2016	19.02.2016
03.05	Mixed Signal VLSI Design using PSOC	01	11.05.2015	15.05.2015
			07.09.2015	11.09.2015
			16.11.2015	20.11.2015
03.06	Configuration Networking & Troubleshooting of PLC	01	25.05.2015	29.05.2015
			17.08.2015	21.08.2015
			28.09.2015	01.10.2015
			18.01.2016	22.01.2016
			07.03.2016	11.03.2016
03.07	Testing and Calibration of Industrial Instruments (Pressure and Temperature)	01	01.06.2015	05.06.2015
			06.07.2015	10.07.2015
			07.09.2015	11.09.2015
			12.10.2015	16.10.2015
			30.11.2015	04.12.2015
			25.01.2016	29.01.2016
03.08	PLC & SCADA Based Industrial Automation using AB PLC	02	08.06.2015	19.06.2015
			14.09.2015	25.09.2015
			14.12.2015	24.12.2015
			01.02.2016	12.02.2016
03.09	Basic Industrial Instrumentation & Automation	02	06.04.2015	17.04.2015
			20.07.2015	31.07.2015
			02.11.2015	13.11.2015
			14.03.2016	24.03.2016

Developing Leadership Skills

No one is a born leader; everyone can develop leadership skills and everyone can benefit from using them. First, take time to honestly analyze yourself. Learn to understand yourself. It's the first step to understanding others. Consider these important questions:

1. What kind of leader am I? One who helps to solve problems? A leader who helps people get along? How do others see me as a leader?
2. What are my goals, purposes, and expectations in working with this particular group? Identify areas for improvement.

Ask yourself these questions:

1. Do I try to be aware of how others think and feel?
2. Do I try to help others perform to the best of their abilities?
3. Am I willing to accept responsibility?
4. Am I willing to try new ideas and new ways of doing things?
5. Am I able to communicate with others effectively?
6. Am I a good problem solver?
7. Do I accept and appreciate other perspectives and opinions?
8. Am I aware of current issues and concerns on campus or in my community?

Then after analyzing your strengths and weaknesses -- take action

Devise a strategy for upgrading your skills. Here are a few strategies to consider:

1) Communicate effectively:

Effective communication is dialogue. Barriers are created by speaking down to people, asking closed questions that elicit yes or no answers, using excessive authority, and promoting a culture that depends on unanimity. If your focus is winning the argument or if you react defensively to criticism, you'll create fear of openness and hinder the organization's growth.

Try these steps to effective communication:

• Listen actively - ask open questions. Be genuinely interested in what other's say.

• Thank people for their openness -- stress how much you value it -- even if you don't like specifically what is being said.

• Point to areas of agreement before jumping on areas of disagreement - this reduces defensiveness; members wont fear being "attacked."

• Set aside your authority to create an atmosphere of partnership to reduce fear in group members.

• Promote a culture of constructive dissent - though not to the point of paralysis.

• Portray disagreement as simply a difference of opinion. Get rid of the "I'm right, you're wrong" attitude.

2) Encourage enthusiasm and a sense of belonging. Show:

• Friendliness: others will be more willing to share ideas if you're interested in them as people too.

• Understanding: everyone makes mistakes. Try to be constructive, tolerant and tactful when offering criticism.

• Fairness: equal treatment and equal opportunity lead to an equally good effort from all group members.

• Integrity: members will take tasks more seriously if you show that you're more interested in group goals than your own personal gain.

3) Keep everyone working toward agreed upon goals:

• Remind everyone of the group's purposes from time to time. It's easy to become too narrowly focused and lose sight of the larger goals.

• Provide encouragement and motivation, by showing your appreciation for good ideas and extra effort.

• Harmonize differences and disagreements between group members by stressing compromise and cooperation.

• Involve everyone in discussions and decisions, even if asking for opinions and ideas means a longer discussion.

4) Get to know the people around you Everyone has different abilities, wants, needs, and purpose in life.

To get along with others and get results, you need to get to know them.

• Interact with group members as often as possible. The only way to get to know someone is through direct personal contact.

• Become familiar with every member of your group. Take note of each person's unique qualities and characteristics.

5) Treat others as individuals

Put your knowledge and understanding of each group member to work!

• Be aware of expectations. Everyone expects something different: recognition, a chance to learn, a chance to work with other people, etc.

• Be creative. A repetitious routine can cause boredom. A successful leader thinks of new and better approaches to old ways of doing things.

• Provide rewards. Recognition by the group is a source of personal satisfaction and positive reinforcement for a job well done.

• Delegate responsibilities. If everyone shares the work, everyone can share pride in the group's accomplishments. Let each member know what's expected of him/her, available resources, deadlines, etc.

6) Accept responsibility for getting things done

• Take the initiative. Why stand around and wait for someone else to get things started? Set an example.

• Offer help and information. Your unique knowledge and skills may be just what's needed.

• Seek help and information. Ask for advice if you need it. This will encourage group involvement and help accomplish group goals.

• Make things happen. By being decisive, energetic, and enthusiastic, you can and will help get things done!

• Know when and how to say "no."

If your time and resources are already committed, turn down extra tasks, but do it nicely.

7) Problem solve in a step - by-step way

Whether you are faced with a decision to make or a conflict to resolve, following a logical approach will help.

1. State the problem as simply and clearly as possible.

2. Gather all relevant information and available resources.

3. Brainstorm as many ideas or solutions as you can think of (with others if possible).

4. Evaluate each idea or solution and choose the best one.

5. Design a plan for using your idea or solution. Include a timetable, assigned roles, and resources to be used.

6. Follow up on your plan by asking if your idea worked and why or why not.

Tips for Effective Communication

Have courage to say what you think. Be confident in knowing that you can make worthwhile contributions to conversation. Take time each day to be aware of your opinions and feelings so you can adequately convey them to others. Individuals who are hesitant to speak because they do not feel their input would be worthwhile need not fear. What is important or worthwhile to one person may not be to another and may be more so to someone else.

Practice. Developing advanced communication skills begins with simple interactions. Communication skills can be practiced every day in settings that range from the social to the professional. New skills take time to refine, but each time you use your communication skills, you open yourself to opportunities and future partnerships.

Make eye contact. Whether you are speaking or listening, looking into the eyes of the person with whom you are conversing can make the interaction more successful. Eye contact conveys interest and encourages your partner to be interested in you in return.

Use gestures. These include gestures with your hands and face. Make your whole body talk. Use smaller gestures for individuals and small groups. The gestures should get larger as the group that one is addressing increases in size.

Manifest constructive attitudes and beliefs. The attitudes you bring to communication will have a huge impact on the way you compose yourself and interact with others. Choose to be honest, patient, optimistic, sincere, respectful, and accepting of others. Be sensitive to other people's feelings, and believe in others' competence.

Develop effective listening skills: Not only should one be able to speak effectively, one must listen to the other person's words and engage in communication on what the other person is speaking about. Avoid the impulse to listen only for the end of their sentence so that you can blurt out the ideas or memories your mind while the other person is speaking.

Enunciate your words. Speak clearly and don't mumble. If people are always asking you to repeat yourself, try to do a better job of articulating yourself in a better manner.

Pronounce your words correctly. People will judge your competency through your vocabulary. If you aren't sure of how to say a word, don't use it.

Use the right words. If you're not sure of the meaning of a word, don't use it. Grab a dictionary and start a daily habit of learning one new word per day. Use it sometime in your conversations during the day.

Slow your speech down. People will perceive you as nervous and unsure of yourself if you talk fast. However, be careful not to slow down to the point where people begin to finish your sentences just to help you finish.

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PART 01 - MATHEMATICS

(Common to all candidates)

(Answer ALL questions)

1. The unit normal to the surface $x^2y+2xz = 4$ at the point (2, -2, **3)** is

1. $-i+2j+2\bar{k}$
2. $\frac{1}{3}(-i+2j+2\bar{k})$
3. $\frac{1}{3}(i-2j+2\bar{k})$
4. $i-2j-2\bar{k}$

2. If r = $\sqrt{x^2+y^2+z^2}$, then $V\left(\frac{1}{r}\right)$ is equal to

1. $\frac{\bar{r}}{r^3}$
2. $\frac{\bar{r}}{r^2}$
3. $\frac{-\bar{r}}{r^2}$
4. $\frac{-\bar{r}}{r^3}$

3. If $\bar{A} = x^2zi-2y^3z^2\bar{j}+xy^2z\bar{k}$, then $div\,\bar{A}$ at $(1,-1,1)$ is

1. 0
2. –3
3. 3
4. 1

4. If $\bar{A} = x^2yi-2xz\bar{j}+2yz\bar{k}$, then $curlcurl\,\bar{A}$ is

1. $(x+2)\bar{j}$
2. $(2x+2)\bar{j}$
3. $(2x+1)\bar{j}$
4. $(2x+2y)\bar{j}$

5. If $\bar{V} = (x+2y+az)i+(bx-3y-z)\bar{j}+(4x+cy+2z)\bar{k}$ is irrotational, then

1. $a=4, b=-1, c=2$
2. $a=2, b=-1, c=4$
3. $a=4, b=2, c=-1$
4. $a=4, b=-2, c=1$

6. Which of the following is a factor of the determinant?

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

1. a
2. a - b
3. $a+b$
4. $a+b+c$

7. If $a+b+c=0$, one root of $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ is

1. $x=1$
2. $x=2$
3. $x=a^2+b^2+c^2$
4. $x=0$

8. If ***A*** is a 4×4 matrix. **A** second order minor of A has its value as 0. Then the rank of ***A*** is

1. < 2
2. $= \mathbf{2}$
3. $> \mathbf{2}$
4. anything

9. Given $A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 8 \end{pmatrix}$, then the determinant value of A^{-1} is

1. **32**
2. $\frac{1}{32}$
3. $\frac{1}{64}$
4. 64

10. If $\begin{pmatrix} 3 & 1 \\ 4 & 1 \end{pmatrix} X = \begin{pmatrix} 5 & -1 \\ 2 & 3 \end{pmatrix}$, then

1. $X = \begin{pmatrix} -3 & 4 \\ 14 & 13 \end{pmatrix}$
2. $X = \begin{pmatrix} 3 & -4 \\ -14 & 13 \end{pmatrix}$
3. $X = \begin{pmatrix} -3 & 4 \\ 14 & -13 \end{pmatrix}$
4. $X = \begin{pmatrix} -3 & -4 \\ -14 & 13 \end{pmatrix}$

11. C-R equations for a function $w = P(r,\theta) + iQ(r,\theta)$ to be analytic, in polar form are

1. $\frac{\partial P}{\partial r} = \frac{1}{r}\frac{\partial Q}{\partial \theta}, \frac{\partial Q}{\partial r} = \frac{-1}{r}\frac{\partial P}{\partial \theta}$
2. $\frac{\partial Q}{\partial \theta} = \frac{1}{r}\frac{\partial P}{\partial r}, \frac{\partial P}{\partial \theta} = \frac{1}{r}\frac{\partial Q}{\partial r}$
3. $\frac{\partial P}{\partial r} = \frac{-1}{r}\frac{\partial Q}{\partial \theta}, \frac{\partial Q}{\partial r} = \frac{1}{r}\frac{\partial P}{\partial \theta}$
4. $\frac{\partial P}{\partial \theta} = \frac{1}{r}\frac{\partial Q}{\partial r}, \frac{\partial Q}{\partial \theta} = \frac{-1}{r}\frac{\partial P}{\partial r}$

12. If $f(z) = u + iv$ is an analytic function and u and v are harmonic, then u and v will satisfy

1. one dimensional wave equation
2. one dimensional heat equation
3. Laplace equation
4. Poisson equation

13. In the analytic function $f(z) = u + iv$, the curves $u(x,y) = c_1$ and $v(x,y) = c_2$ are orthogonal if the product of the slopes m_1 and m_2 are

1. $m_1 m_2 = 0$
2. $m_1 m_2 = -\pi$
3. $m_1 m_2 = \frac{-\pi}{2}$
4. $m_1 m_2 = -1$

14. If the imaginary part of the analytic function $f(z) = u + iv$ is constant, then

1. u is not a constant
2. $f(z)$ is not a complex constant
3. f(z) is equal to zero
4. u is a constant

15. If $f(z) = P(r,\theta) + iQ(r,8)$ is analytic, then $f'(z)$ is equal to

1. $e^{i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial \theta}\right)$
2. $e^{-i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial \theta}\right)$
3. $e^{-i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial r}\right)$
4. $e^{+i\theta}\left(\frac{\partial P}{\partial r} + i\frac{\partial Q}{\partial r}\right)$

16. The formula for the radius of curvature in cartesian coordinate is

1. $\frac{\left(1+(y')^2\right)^{1/2}}{y''(x)}$

2. $\frac{\left(1+(y')^2\right)^{3/2}}{y''(x)}$

3. $\frac{\left(1+(y')^2\right)^{3/2}}{(y'')^2}$

4. $\frac{\left(1+(y')^2\right)^{1/2}}{(y''(x))^2}$

17. The stationary point of $f(x,y)=x^2-xy+y^2-2x+y$ is

1. $(0,1)$
2. $(1,0)$
3. $(-1,0)$
4. $(1,-1)$

18. $\int x\cos x\,dx$ is

1. $x\sin x+\cos x$
2. $x\sin x-\cos x$
3. $x\sin x-x\cos x$
4. $x\sin x+x\cos x$

19. For the following data :

x:	0	2	4	6
y:	−1	3	7	11

the straight line $y=mx+c$ by the method of least square is

1. $y=-2x-1$
2. $y=x-1$
3. $y=1-2x$
4. $y=2x-1$

20. The velocity v (km/min) of a train which starts from rest, is given at fixed intervals of time t (min) a s follows :

t:	2	4	6	8	10	12	14	16	18	20
v:	10	18	25	29	32	20	11	5	2	0

The approximate distance covered by Simpson's 1/3 rule is

1. 306.3
2. 309.3
3. 310.3
4. 307.3

21. Find the cubic polynomial by Newton's forward difference which takes the following

x :	0	1	2	3
$f(x)$:	1	2	1	10

Then f (4) is

1. 40
2. 41
3. 39
4. 42

22. The first derivative $\frac{dy}{dx}$ at $x=0$ for the given data

x :	0	1	2	3
$f(x)$:	2	1	2	5

is

1. 2
2. –2
3. –1
4. 1

23. Error in Simpson's $\frac{1}{3}$ rule is of the order

1. $-h^2$
2. h^3
3. h^4
4. $\frac{2h^3}{3}$

24. A lot consists of ten good articles, four with minor defects and two with major defects. Two articles are chosen from the lot a t random (without replacement). Then the probability that neither of them good is

1. $\frac{5}{8}$
2. $\frac{7}{8}$
3. $\frac{3}{8}$
4. $\frac{1}{8}$

25. If A , B, C are any three events such that

$$P(A)=P(B)=P(C)=\frac{1}{4};$$

$$P(A\cap B)=P(B\cap C)=0,\quad P(C\cap A)=\frac{1}{8}.$$

Then the probability that atleast one of the events A , B, C occurs, is

1. $\frac{1}{32}$
2. $\frac{3}{32}$
3. $\frac{7}{8}$
4. $\frac{5}{8}$

26. To establish the mutual independence of n events, the equations needed are

1. 2^n+n+1
2. n^2+n+1
3. $2^n-(n+1)$
4. $2^n+2(n+1)$

27. If atleast one child in a family with two children is a boy, then the probability that both children are boys is

1. 3/4
2. 1/3
3. 1/4
4. 1/2

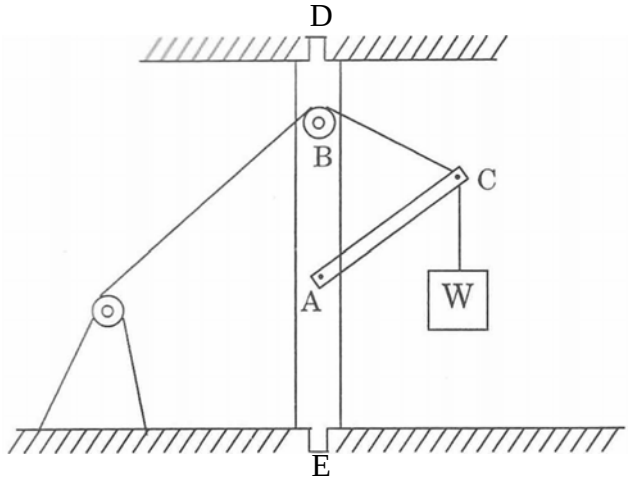
28. A discrete random variable X takes the values $a, ar, ar^2, \cdots, ar^{n-1}$ with equal probability. Then Arithmetic Mean (A.M) is

1. $a(1-r^n)$
2. $\frac{1}{n}a(1-r^n)$
3. $\frac{a}{n}\frac{(1-r^n)}{1-r}$
4. $\frac{a}{n}\frac{(r^n-1)}{1-r}$

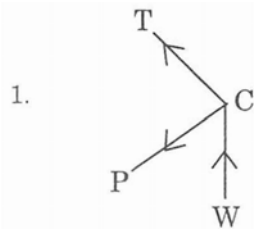
PART 02 — BASIC ENGINEERING AND SCIENCE

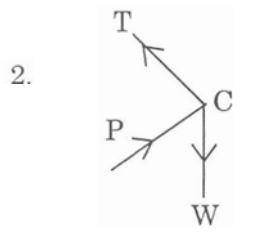
(Common to all candidates)

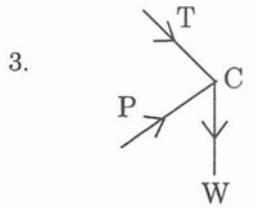
31. Free body diagram of point C of the Derrick shown below is

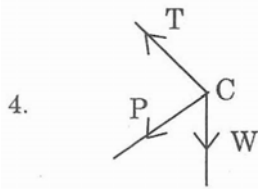


Derrick

1. 

2. 

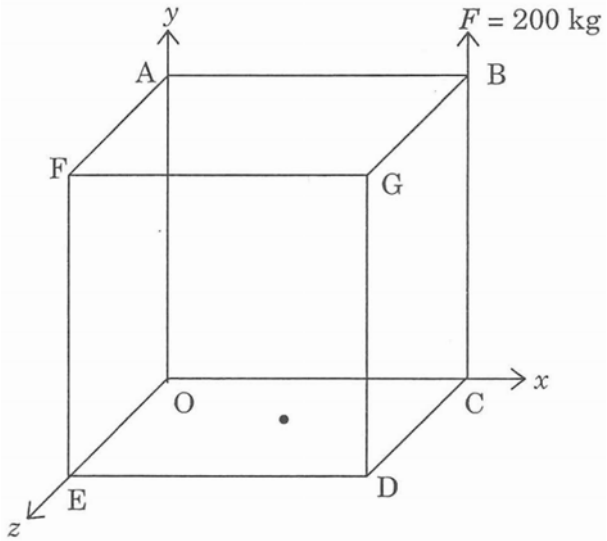
3. 

4. 

32. **A** 200 kg block is in contact with a plane inclined a t ***30"*** to the horizontal. **A** force P, parallel to and acting up the plane, is applied to the body. If the coefficient of static friction is 0.20, the value of P to just cause motion up the plane is

1. 1.35 kg
2. 13.5 kg
3. 135 kg
4. 530 kg

33. Find the moment of the Force 'F acting along the edge ***'CB*** of a cube of edge 1 m about the centre of the base of the cube OCDE, shown below.



1. 4140 Nm
2. 144 Nm
3. 1414 Nm
4. 4144 Nm

34. The motion of a particle is given by $a = 6v^{112}$ where a is in m/sec^2 and v is in m/sec, when $t = 0$, $v = 0$. Find the relation between v and t

1. $v = 9t^2$
2. $t = v/4$
3. $v^2 = 9t$
4. $t = 9v^2$

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35. A particle of mass 10 kg is moving along the circumference of a circle of radius 1 0 m. If the tangential velocity of the particle is 5 m/sec, then the kinetic energy gained by the body in **10** rotations is

1. 500 J
2. 0 J
3. 400 J
4. 1250 J

36. The packing factor for y - iron is

1. **0.34**
2. 0.52
3. 0.68
4. 0.74

37. Which one among the following is a thermoset material?

1. Rubber
2. Nylon
3. Urea formaldehyde
4. Teflon

38. Which metal among the following would not undergo corrosion?

1. Copper
2. Gold
3. Silver
4. Iron

39. Domain structure is exhibited by

1. ferromagnets
2. paramagnets
3. diarnagnets
4. both dia and paramagnets

40. At absolute zero, the probability of occupation of energy levels below the Fermi energy level, by electrons, is

1. 1
2. 1/2
3. 1/3
4. 1/4

41. A water column of volume 6.5 litres is subjected to a direct pressure of $1.8\times10^{6}\ N/m^{2}$. Determine the change in volume of water column if the bulk modulus of water is taken as $2\times10^{9}\ N/mm^{2}$

1. $5.85\times10^{-6}\ m^{3}$
2. $58.5\times10^{-3}\ m^{3}$
3. $2.05\times10^{-4}\ m^{3}$
4. $1.85\times10^{-5}\ m^{3}$

42. Density index of a material is

1. greater than one
2. less than one
3. equal to one
4. indeterminate

43. The constituent of cement that imparts quick setting quality to cement is

1. Magnesia
2. Iron oxide
3. Alumina
4. Silica

44. A surveyor's mark cut on a stone or rock or any reference point to indicate a level in a levelling survey is called

1. reduced level
2. change point
3. levelling mark
4. bench mark

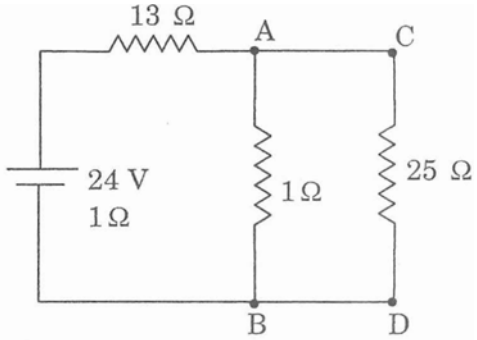
45. According to the United States Bureau of soil classification, the soil is designated as 'coarse clay' if the particle size varies from

1. 0.0001 mm to 0.002 mm
2. 0.02 mm to 0.06 mm
3. 0.2 mm to 0.6 mm
4. 0.6 mm to 2 mm

46. Two capacitors **A** and B are placed in series. Capacitors $C_A = 100\,\mu F$ and $C_B = 50\,\mu F$. The maximum energy stored in the circuit when 240 V, 50 Hz supply is applied to the circuit is

1. 19.2 J
2. 1.92 J
3. 192 J
4. 12.9 J

47. With reference to the network shown below, by applying Thevenin's theorem, find the equivalent voltage of the network when viewed from the terminals CD



1. 12 V
2. 6 V
3. 18 V
4. 21.5 V

48. "In a Delta/Star transformation of meshes, i t must be remembered that the resistance of each arm of the star is given by the of the resistance of the two delta sides t h a t meet a t its ends divided by the resistances." of the three delta

1. product, product
2. sum, product
3. product, sum
4. sum, sum

49. An alternating voltage of $(8+j6)V$ is applied to a series a.c. circuit and the current passing is $(2+j5)A$. The impedance of the circuit is

1. 8.6 Ω
2. 18.6 Ω
3. 1.68 Ω
4. 1.86 Ω

50. A moving coil ammeter is wound with 40 turns and gives full scale deflection with 5 A. How many turns would be required on the same bobbin to give full scale deflection with 20 A?

1. 10
2. 40
3. 12
4. 21

51. The percentage of carbon in eutectoid steel is

1. 0.8
2. 0.4
3. 0.02
4. 1.2

52. Which one of the following is not using electron as a source of energy?

1. Solar cell
2. MHD generator
3. Fuel cell
4. Atomic power plant

53. Temporary metal forming process is

1. Welding
2. Brazil
3. Mechanical bonding
4. Soldering

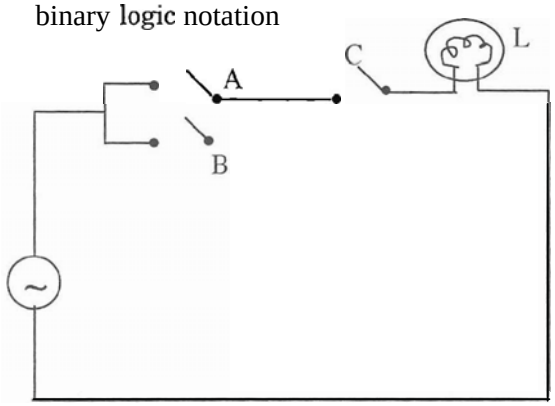
54. Under isobaric conditions, the Gibb's phase rule takes the form

1. F = C - P + 2
2. F = C - P + 1
3. F = C - P + 3
4. F = C - P

55. Which one of the following metals is more ductile?

1.. Copper
2. Silver
3. Gold
4. Nickel

56. Express the following switching circuit in binary logic notation



1. $L = (AC + BC)$
2. $L = (A + B) \cdot C$
3. $L = (A + B) + C$
4. $L = A + (B + C)$

57. Applying DeMorgan's theorem find the equivalent of $(x + yz)'$

1. $(x' + y') \cdot z'$
2. $(x' + z') \cdot y'$
3. $(y' + x') + z'$
4. $x' \cdot (y' + z')$

58. LAN stands for

1. Local Access Network
2. Local Area Network
3. Link Access Network
4. Listed Area Network

59. An electronic semiconductor device that is fabricated with permanently stored information, which cannot be erased is called

1. Random Access Memory
2. Read Only Memory
3. Memory Data Register
4. Memory Address Register

60. Which of the following are the system directories in Unix?

1. bin, etc, lib, tmp
2. local, usr, dev, bin
3. bash, etc, lib, tmp
4. sys, dev, bin, usr

61. If θ is the angle between the vectors $\vec{a}$ and $\vec{b}$ such that $|\vec{a} \times \vec{b}| = \sqrt{10}$ and $\vec{a} \cdot \vec{b} = \sqrt{30}$, then the value of $\cos\theta$ is

1. $1/3$
2. $1/2$
3. $\frac{2}{\sqrt{3}}$
4. $\frac{\sqrt{3}}{2}$

62. If $a = \sqrt{2}i$, then which of the following is true?

1. $a = (\pm\sqrt{2})i$
2. $a + i = 1$
3. $a - i = 1$
4. $a = (-\&)i$

63. The value of the determinant given below is

$$\mathbf{A} = \begin{vmatrix} \alpha^2 & a^3 & \alpha^4 \\ \alpha^3 & a^4 & \alpha^5 \\ a^4 & \alpha^6 & \alpha^7 \end{vmatrix}$$

1. a^9
2. α^{13}
3. $2\alpha^2$
4. 0

64. Which of the following points lies on the circle with centre $(3, -2)$ and radius **3** units?

1. $(3, 1)$
2. $(1, 3)$
3. $(-1, 3)$
4. $(-3, 1)$

65. **A** die and a coin are thrown together. The probability of obtaining a prime number on the die and tail on the coin is

1. $1/2$
2. $(1/2)^2$
3. $(1/2)^3$
4. $(1/2)^4$

66. Two coils connected in series have resistances of 600 Ω and 300 Ω and temperature coefficient of 0.001 and 0.004 respectively a t 20° C. The resultant of the combination at 20° C is

1. 954 Ω
2. 549 Ω
3. 1094 Ω
4. 850 Ω

67. A boat is at rest under the action of three forces, two of which are $F_1 = 4i$ and $F_2 = 6j$. Then the z–component of the third force is

1. - 4 units
2. - 6 units
3. 0 units
4. - 10 units

68. **A** body that absorbs all the radiation falling on it is called a

1. good absorber
2. perfect black body
3. black body
4. good emitter

69. Quantum nature of light is not supported by the phenomenon of

1. Compton effect
2. Photoelectric emission
3. Emission or absorption spectrum
4. Diffraction of light

70. Current carriers in an electrolyte are

1. electrons and negative ions
2. electrons and positive ions
3. positive and negative ions
4. electrons and ions

71. A real gas would approach the behaviour of an ideal gas a t

1. low temperature and high pressure
2. low temperature and low pressure
3. high temperature and low pressure
4. high temperature and high pressure

72. Boron trifluoride (BF_3) will act as

1. a base
2. an acid
3. both as a base and an acid
4. neither a base nor an acid

73. An electric current is passed through an aqueous solution given below. Which one shall decompose?

1. Urea
2. Silver Nitrate
3. Ethyl alcohol
4. Glucose

74. The element of highest electronegativity is

1. Flourine
2. Chlorine
3. Oxygen
4. Caesium

75. Which one of the following involves a polar bond?

1. Cl — Cl
2. O — O
3. Br- Br
4. H- Cl

PART 05 — ELECTRICAL, ELECTRONICS, COMMUNICATION INSTRUMENTATION ENGINEERING

(Answer ALL questions)

76. How much energy is stored by a 100 inductance with a current of 1 A?

1. 100 J
2. 1 J
3. 0.05 J
4. 0.01 J

77. If a network contains B branches and N nodes then the number of mesh current equations would be

2.

B – N – 1

4. $(B+N)-1$

78.

the current

1. leads the applied voltage
2. lags behind the applied voltage
3. is in phase with the voltage
4. is in quadrature with the voltage

79. In a certain series RC circuit, the true power is 2W and the reactive power is 3.5 VAR. What is the apparent power?

1. 3.5 VA
2. 2VA
3. 4.03 VA
4. 3VA

80. A sine wave voltage is applied across an inductor when the frequency of voltage is increased, the current

1. increases
2. decreases
3. remains the same
4. is zero

81. A shunt generator running at has generated as 200 V. If the speed increases to 1200 rpm, the generated emf will be nearly

1. 150 V
2. 175 V
3. 240 V
4. 290V

82. In a generator in case the resistance of the field winding is increased then output voltage will

1. increase
2. decrease
3. remain unaffected
4. fluctuate

83. D.C. motors are widely used in

1. Pump sets
2. Air compressors
3. Electric traction
4. Machine shops

84. The starting winding of a single-phase motor is placed in

1. armature
2. field
3. rotor
4. stator

85. An over-excited synchronous motor takes

1. leading current
2. lagging current
3. both (1) and (2)
4. in phase current

86. In open loop the control action

1. depends on the size of the system
2. depends on system variables
3. depends on the input signal
4. is independent of the output

87. A controller is essentially a

1. Sensor
2. Clipper
3. Comparator
4. Amplifier

88. A signal flow graph is a

1. topological representation of a set of differential equations
2. polar graph
3. log log graph
4. special type of graph to analyse modern control systems

89. When the gain margin is positive and the phase margin is negative, the system is

1. stable
2. unstable
3. stable or unstable depending on the system
4. undeterministic

90. The effect of adding poles and zeros can be determined quickly by which of the following?

1. Root locus
2. Nyquist plot
3. Bode plot
4. Nicholar chart

91. A Norton's equivalent is

1. parallel circuit
2. series circuit
3. series-parallel circuit
4. none of the above

92. A resistor of 5 ohms is connected in one branch of a complex network. The current in this branch is 5 A. If this 5 resistor is replaced by 10 resistor the current in this branch will be

1.
2. A
3. 5 A
4. less than 5 A

93. To determine the polarity of the voltage drop across a resistor, it is necessary to know the

value of the resistor

2. value of current through the resistor
3. direction of current through the resistor
4. power consumed by the resistor

94. In a network the number of tree branches

1. is equal to the number of links
2. cannot be equal to number of links
3. is twice the number of links
4. has no relation with the number of link branches

95. For a voltage source

1. the source emf and terminal voltage are equal
2. terminal voltage is always lower than source emf
3. terminal voltage cannot be higher than source emf
4. terminal voltage is zero

96. Kirchoffs voltage law states that the

1. total voltage drop in a series circuit is always finite
2. sum of emf and voltage drops in a closed mesh is zero
3. sum of emfs in a series circuit is zero
4. sum of emf and voltage drops in a closed mesh is not zero

97. In a thyristor, the magnitude of anode current will

1. increase if gate current is increased
2. decrease if gate current is decreased
3. increase if gate current is decreased
4. not change with variation in gate current

98. For an SCR, $\frac{di}{dt}$ protection is achieved through the use of

1. R in series with SCR
2. L in series with SCR
3. RL in series with SCR
4. RLC in series with SCR

99. Inverter gain is given by the ratio

1. dc output input voltage
2. ac output input voltage
3. dc output input voltage
4. ac output voltageldc input voltage

100. A diode works on the principle of

1. tunnelling of charge carriers across the junction
2. thermionic emission
3. diffusion of charge carriers across the junction
4. hoping of charge carriers across the junction

101. The major application of chopper drive is in

1. traction
2. computers
3. heating furnishes
4. miniature motors

102. When a thyristor gets turned on, the gate drive

1. should not be removed or it will turn off the SCR
   may or may not be removed
3. should be removed
4. should be removed in order to avoid increased losses and higher function temperature

103. Computer cannot do anything without a

1. chip
2. memory
3. output device
4. program

104. The first computer made available for use was

1. Mark–I
2. ENIAC
3.
4. UNIVAC

105. When did Intel announce its 16-bit 80286 chip?

1. 1980
2. 1982
3. 1984
4. 1986

106. How many bits can be stored in the 8 K RAM?

1. 8000
2. 8192
3. 4000
4. 4096

107. The larger the RAM of a computer, the faster its processing speed is since it eliminates the

1. need of ROM
2. need for external memory
3. frequent disk
4. need for wider data path

108. Which of the following types of transducers can be used for measuring the angular position?

(a) Circular potentiometer

LVDT

E-Pick off

Synchro

Select the correct answer using the codes given below :

1. and (d)
2. (a) and
3. and (d)
4. and

109. The most suitable thermocouple to be used for measuring temperature in the range of C to 1500" C is

1. Chromel–Constantan
2. Iron–Constantan
3.
4. Platinum–Rhodium

110. LVDT is a

1. displacement transducer
2. velocity transducer
3. acceleration transducer
4. pressure transducer

111. In a strain measuring equipment using a resistance strain gauge the output quantity is

1. resistance
2. voltage
3. current
4. impedance

112. If the temperature increases by C, the resistivity of a thermistor is likely to become

1. one half of initial value
2. one fiftieth of initial value
3. twice the initial value
4. no change

113. The purpose of duplexer is

1. to convert TDM to FDM
2. to provide same antenna both for transmission and reception
3. to convert pulsed transmission to transmission
4. both (1) and

114. In FM transmission, amplitude of the modulating signal determines

1. rate of frequency variations
2. amount of frequency shift
3. total balance of transmission
4. distance of broadcast

115. The highest harmonic generated in human voice is

1 kHz
2.
3. 3kHz
4.

116. If the reflection coefficient of a line is zero, the line is

1. Infinite line
2. Open-circuited
3. Short-circuited
4. Very short line

117. The receiving antenna most used for TV broadcasting in the UHF band is

1. turnstile antenna
2. dipole antenna
3. antenna
4. antenna

118. Generally the aircraft electrical system uses supply frequency of

1.
2. 60 Hz
3. 400 Hz
4. 115 Hz

119. In GPS Navigation, there can be integration between

1. GPS and INS
2. GPS and LORAN C
3. GPS and ILS
4. GPS and DME

120. Mach Number is defined as the ratio between True air speed and speed of the sound at

1. sea level
2. any altitude
3. a particular altitude
4. all altitudes

ANNA UNIVERSITY : CHENNAI 600 025

OFFICE OF THE ADDITIONAL CONTROLLER OF EXAMINATIONS

(UNIVERSITY DEPARTMENTS)

GUIDELINES FOR AWARDING PUNISHMENTS TO MALPRACTICE CASES OF STUDENTS

Sl.No.	Nature of Malpractice	Maximum Punishment
1.	Appeal by the candidate in the answer script to show mercy by way of awarding more than deserving marks	I. - Fine of Rs.1000/- per subject.
2.	The candidate writing his/her name in the answer script.	
3.	The candidate writing his/her registration number/college name in places other than specified in the answer script.	
4.	Any special marking in the answer script by the candidate.	
5.	The candidate communicating with neighbouring candidate orally or non-verbally; the candidate causing suspicious movement of his/her body.	
6.	Irrelevant writing by the candidate in the answer script.	
7.	The candidate either possessing the question paper of another candidate or passing his question paper to another candidate with the question paper containing no additional writing on it.	
8.	The candidate possessing cell phones/programmable calculator(s)/any other electronic storage device(s) containing no incriminating materials.	II. - Fine of Rs.2000/- per subject.
9.	The candidate facilitating the other candidate(s) to copy from his/her answer script.	IIIA. – Invalidating the examination of the particular subject written by the candidate.
10.	The candidate possessing any incriminating material(s) (whether used or not). For example:- Written or printed materials, bits of papers containing written information, writings on scale, calculator, handkerchief, dress, part of the body, Hall Ticket, etc.	IIIA, IIIB or IIIC IIIA – If the quantum of the incriminating material is less than that could normally be printed in two lines of A5 size paper, then punishment is restricted to the subject concerned only. IIIB – If the quantum is equal to or more than that could normally be printed in two lines and less than that could normally be printed in the full page of the A5 size paper then the punishment is invalidating the examination of the subject concerned and further the candidate is not considered for any moderation and revaluation in the current semester for any subject (including arrear subjects) IIIC – When the quantum is equal to or more than that could normally be printed in full page of A5 size paper, then the punishment would be invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrear subjects. If the candidate has registered for the arrear subjects only, invalidating the examinations of all the arrear-subjects registered by the candidate. The punishment does not include project work and the subjects with 100% internal evaluation.
11.	The candidate possessing cell phone(s)/programmable calculator(s)/any other electronic storage device(s) and containing incriminating materials (whether used or not)	
12.	The candidate possessing the question paper of another candidate with additional writing on it.	
13.	The candidate passing his/her question paper to another candidate with additional writing on it.	
14.	The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).	
15.	The candidate copying from neighbouring candidate.	

Contd 2..

Sl.No.	Nature of Malpractice	Maximum Punishment
16.	Vulgar/offensive writings by the candidate in the answer script.	IV. – Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears subjects registered by the candidate.
17.	The candidate possessing the answer script of another candidate.	
18.	The candidate passing his/her answer script to another candidate.	
19.	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
20.	The candidate misbehaving in the examination hall.	**Va. – For candidates who have not completed the programme:** The examinations of all the theory and the practical subjects of the current semester and all the arrear subjects registered by the candidate are invalidated. Further, the candidate is debarred from continuing his/her studies for one year i.e for two subsequent semesters. However, the student is permitted to appear for the examination in all the arrear subjects upto the last semester during the debarred period. **Vb. – For candidates who have completed the programme:** The examinations of all the arrear subjects registered by the candidate are invalidated. Further, the candidate is prevented from writing the examinations of the arrear subjects for the two subsequent semesters.
21	Involved in any one or more of the malpractices of serial no.10 to 19 for the second or subsequent times.	
22.	Cases of Impersonation.	**For both the impersonator and the bonafide student for whom the impersonation was done.** VI. – The examinations of all the subjects registered by the candidate are invalidated and further the student is debarred from continuing his/her studies and debarred from writing the examinations permanently. He/She is not eligible for any further admission to any programme of the University.

Additional Controller of Examinations
University Departments

ANNA UNIVERSITY :: CHENNAI 600 025

FORMAT FOR PREPARATION OF PROJECT REPORT

FOR

B.E. / B. TECH. / B. ARCH.

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page
2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

The table and figures shall be introduced in the appropriate places.

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be **printed in black letters** and the text for printing should be identical.

3. PREPARATION FORMAT:

3.1 Cover Page & Title Page – A specimen copy of the Cover page & Title page of the project report are given in **Appendix 1.**

3.2 Bonafide Certificate – The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14, as per the format in **Appendix 2.**

The certificate shall carry the supervisor's signature and shall be followed by the supervisor's name, academic designation (not any other responsibilities of administrative nature),

department and full address of the institution where the supervisor has guided the student. The term **'SUPERVISOR'** must be typed in capital letters between the supervisor's name and academic designation.

3.3 **Abstract –** Abstract should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.

3.4 **Table of Contents –** The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head. A specimen copy of the Table of Contents of the project report is given in **Appendix 3.**

3.5 **List of Tables –** The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.

3.6 **List of Figures –** The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.

3.7 **List of Symbols, Abbreviations and Nomenclature** – One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.

3.8 **Chapters** – The chapters may be broadly divided into 3 parts (i) Introductory chapter, (ii) Chapters developing the main theme of the project work (iii) and Conclusion.

The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

- ❖ Each chapter should be given an appropriate title.
- ❖ Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
- ❖ Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

3.9 **Appendices** – Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

3.10 List of References –The listing of references should be typed 4 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the year and other details.

A typical illustrative list given below relates to the citation example quoted above.

REFERENCES

1. Ariponnammal, S. and Natarajan, S. (1994) 'Transport Phonomena of Sm Sel – X Asx', Pramana – Journal of Physics Vol.42, No.1, pp.421-425.

2. Barnard, R.W. and Kellogg, C. (1980) 'Applications of Convolution Operators to Problems in Univalent Function Theory', Michigan Mach, J., Vol.27, pp.81–94.

3. Shin, K.G. and Mckay, N.D. (1984) 'Open Loop Minimum Time Control of Mechanical Manipulations and its Applications', Proc.Amer.Contr.Conf., San Diego, CA, pp. 1231-1236.

3.10.1 Table and figures - By the word Table, is meant tabulated numerical data in the body of the project report as well as in the appendices. All other non-verbal materials used in the body of the project work and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

4. TYPING INSTRUCTIONS:

The impression on the typed copies should be black in colour.

One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 14.

*** * * * ***

APPENDIX 1
(A typical Specimen of Cover Page & Title Page)
<Font Style Times New Roman – Bold>

TITLE OF PROJECT REPORT

<Font Size 18><1.5 line spacing>

A PROJECT REPORT
<Font Size 14>

Submitted by
<Font Size 14><Italic>

NAME OF THE CANDIDATE(S)
<Font Size 16>

in partial fulfillment for the award of the degree

of

<Font Size 14><1.5 line spacing><Italic>

NAME OF THE DEGREE
<Font Size 16>

IN

BRANCH OF STUDY
<Font Size 14>

NAME OF THE COLLEGE
<Font Size 14>

ANNA UNIVERSITY : CHENNAI 600 025

<Font Size 16><1.5 line spacing>

MONTH & YEAR
<Font Size 14>

SPECIMEN

SOME PERFORMANCE ASPECTS CONSIDERATIONS OF A CLASS OF ARTIFICIAL NEURAL NETWORK

A PROJECT REPORT

Submitted by

SANDHYA. A

GAYATHRI.R

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

INSTRUMENTATION AND CONTROL ENGINEERING

XXX ENGINEERING COLLEGE, KANCHEEPURAM

ANNA UNIVERSITY:: CHENNAI 600 025

MAY 2005

APPENDIX 2
(A typical specimen of Bonafide Certificate)
<Font Style Times New Roman>

ANNA UNIVERSITY : CHENNAI 600 025

<Font Style Times New Roman – size -18>

BONAFIDE CERTIFICATE

<Font Style Times New Roman – size -16>

<Font Style Times New Roman – size -14>

Certified that this project report **"…….TITLE OF THE PROJECT……..."**

is the bonafide work of "**……..NAME OF THE CANDIDATE(S).……"**

who carried out the project work under my supervision.

<<Signature of the Head of the Department>>
SIGNATURE

<<Name>>
HEAD OF THE DEPARTMENT

<<Department>>

<<Full address of the Dept & College >>

<<Signature of the Supervisor>>
SIGNATURE

<<Name>>
SUPERVISOR

<<Academic Designation>>

<<Department>>

<<Full address of the Dept & College >>

APPENDIX 3
(A typical specimen of table of contents)
<Font Style Times New Roman>

TABLE OF CONTENTS

K.L.N. COLLEGE OF ENGINEERING - 630612

Ref: KLNCE/EEE/project/2016 Date:

Project-Guide/Topic Selection

1. Details of Students

Sl. No.	Roll No.	Name of the Student	Semester/ Section	Email Id / Mobile No.	Signature of the student

2. Details of Supervisor(Internal/External)

(a) Details of Internal Supervisor

Sl.No.	Name of the Supervisor & Designation	Willingness (Yes/No)	Batch No.*	Signature of the Guide

(b) Details of External Supervisor

Sl.No.	Name of the Supervisor & Designation	Department/ Section, Place of Work	Contact Information

3. Title of the Project

4. About the project

5. Societal Importance (Write few lines)

6. Tentative Budget :
7. Applied for funding Agency (Yes/No/In progress) If Yes, give details of funding agency

8. Applied for competitions (Yes/No/In progress) If Yes, give details of competitions:

9. Mapping of COs with POs and PSOs, in terms of level 1 (Low), 2 (medium) and 3 (High)

POs												PSOs		
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3

Declaration

The proposed project is based on the materials collected from the various references and an implementation version of the existing Module, added with new features. It is not the duplicated version of the already available/existing project.

Signature of the Project Coordinator Signature of the Guide Signature of the Student

*Project Guidance - Batch No.

Note: A faculty permitted to guide 2 batches only (Maximum)

K.L.N. COLLEGE OF ENGINEERING, Pottapalayam 630612
(11 km from Madurai City)

STUDENTS LEAVE APPLICATION FORM

Department of Electrical and Electronics Engineering

Date:

Name of the Student :

Roll No.: : Sem / Yr. / Sec.

No. of days, leave, already availed :

%of Attendance as on : _____ is _____

Date & Day :

Reason for Leave :

Signature of the Student **Name, Mobile No. & Signature of Parent / Guardian**

Recommended / Not Recommended

Class Tutor **Class Coordinator** **HOD/EEE**

K.L.N. COLLEGE OF ENGINEERING, Pottapalayam 630612
(11 km from Madurai City)

STUDENTS LEAVE APPLICATION FORM

Department of Electrical and Electronics Engineering

Date:

Name of the Student :

Roll No.: : Sem / Yr. / Sec.

No. of days, leave, already availed :

%of Attendance as on : _____ is _____

Date & Day :

Reason for Leave :

Signature of the Student **Name, Mobile No. & Signature of Parent / Guardian**

Recommended / Not Recommended

Class Tutor **Class Coordinator** **HOD/EEE**

TO Date

The Principal

KLNCE

Pottapalayam

Sub: Requisition for Bonafide Certificate

****

Dear Sir,

Kindly issue Bonafide Certificate to me

Purpose :

Venue :

Name :

Father's Name:

Roll No. :

Department :

Year & Sem/Sec:

Thanking You,

Yours Sincerely

Date :

Station:

Recommended by :

Received :