

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	ELECTRICAL SAFETY		
Course Code	ME 674	No. of Credits	3
Course Code of Pre-requisite subject(s)	ME 653	ME 655	
Session	JANUARY 2018	Section (if, applicable)	
Name of Faculty	Dr. Kevin Ark Kumar Dr.K.Muthukumar	Department	Electrical
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Name of Course Coordinator(s) (if, applicable)	Dr.K.Sankaranarayananasamy		
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Course Type	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Elective course	

Syllabus (approved in BoS)

CONCEPTS AND STATUTORY REQUIREMENTS

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation(CPR).

ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity.

Energy leakage-clearances and insulation-classes of insulation-voltage classificationsexcess energy-current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI.

Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

PROTECTION SYSTEMS

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no

load protection-earth fault protection.

FRLS insulation-insulation and continuity test-system grounding-equipment grounding earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

SELECTION, INSTALLATION, OPERATION AND MAINTENANCE

Role of environment in selection-safety aspects in application - protection and interlock self diagnostic features and fail safe concepts-lock out and work permit system-discharge rod and earthing devices-safety in the use of portable tools-cabling and cable joints preventive maintenance.

HAZARDOUS ZONES

Classification of hazardous zones -intrinsically safe and explosion proof electrical apparatus (IS, API and OSHA standard) -increase safe equipment-their selection for different zones- temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

COURSE OBJECTIVES

To understand the concepts, statutory requirements, electrical hazards, protection systems , selection, installation, operation and maintenance and hazardous zones

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Understanding on concepts, statutory requirements	1,2,3,4,5,6,7,9,10
2. Electrical hazards, energy leakage, lighting protection and earthing	1,2,3,4,5,7,8,9,11
3. Equipment and personnel protection systems	1,2,3,7,8,9,10,11
4. Selection, installation, operation and maintenance of protection systems	1,2,3,4,8,9,10,11
5. Classification and selection hazardous zones	1,2,3,4,5,6,7,8,9,10,11

COURSE PLAN – PART II

COURSE OVERVIEW

This course covers the statutory requirements of electrical safety and concepts of Electrical hazards, energy leakage, lighting protection and earthing, Equipment and personnel protection including Fuse, circuit breakers and overload relays, equipment grounding, earth leakage circuit breaker, Selection, installation, operation and maintenance of protection systems covering protection and interlock self diagnostic features and fail safe concepts Classification and selection hazardous zones.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact	Topic	Mode of Delivery
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Commissioning, Production, Modification, Shutdown and Maintenance and Decommissioning and provides suitable solutions. It gives practical solutions regarding Emergency planning in process and chemical industries. It discuss briefly about various hazards associated with storage and transportation of chemicals.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1-2	Design process, conceptual design and detail design, assessment, inherently safer design chemical reactor, types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities.	Chalk and talk and Power point presentation
2	3-4	Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems failures in pressure system.	Chalk and talk and Power point presentation
3	5-6	Commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation	Chalk and talk and Power point presentation
4	7-8	Plant inspection, pressure vessel, pressure piping system, non destructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection	Chalk and talk and Power point presentation
5	9-10	Management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit	Chalk and talk and Power point presentation

	Hours		
1	2 nd week of January – 3 hrs	Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference	PPT / Chalk & Talk
2	3 rd week of January – 3 hrs	Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation(CPR).	PPT / Chalk & Talk
3	4 th week of January –3hrs	Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classificationsexcess energy-current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity.	PPT / Chalk & Talk
4	1 st week of February –3 hrs	Hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.	PPT/Chalk & Talk
5	2 nd week of February – 2 hrs Cycle test-1 : 1 hr	Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit	PPT / Chalk & Talk Written Exam

3	Case Study	2nd week of March 2018	1hr	5%
4	II Cycle Test (Written examination covering 3 rd & 4 th Units)	3rd week of March 2018	1hr	20%
5	Compensation Assessment*		1hr	
6	Final Assessment *	2nd week of April 2018	3hrs	50%

***mandatory; refer to guidelines on page 6**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students during class committee meetings
Anonymous feedback through questionnaire

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail.
2. Queries (if required) may be emailed to me / contact me during 4.45 pm to 5.10 pm on Tuesday and Thursday with prior intimation for any clarifications.

ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours. Every student should maintain minimum 75 % physical attendance in these contact hours to attend the end semester examination.
2. Any student, who fails to maintain 75% attendance needs to appear for the compensation assessment (CPA). Student who scores more than 60 % marks in the CPA will be eligible for attending the end semester examination.
3. Students not having 75% minimum attendance at the end of the semester and also fail in CPA (scoring less than 60%) will have to RE DO the course.

COMPENSATION ASSESSMENT

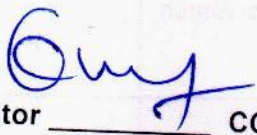



One compensation assessment for absentees in assessments (other than final assessment) in the first week of April.

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
2. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.
3. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.
4. Any evidence of such academic dishonesty will result in the loss of marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD for necessary action.

ADDITIONAL INFORMATION

FOR APPROVAL

Subject Coordinator  CC-Chairperson  HOD 


Guidelines:

- a) The number of assessments for a course shall range from 4 to 6.
- b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. This is not applicable for project work/industrial lectures/internship.
- d) The policy for attendance for the course should be clearly specified.
- e) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.