

**DEPARTMENT OF MECHANICAL ENGINEERING**  
**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
<b>Name of the programme and specialization</b>	<b>M.Tech – Industrial Safety Engineering</b>		
<b>Course Title</b>	<b>Safety in Engineering Industry</b>		
<b>Course Code</b>	<b>ME 657</b>	<b>No. of Credits</b>	<b>3</b>
<b>Course Code of Pre-requisite subject(s)</b>			
<b>Session</b>	<b>July 2021</b>	<b>Section (if, applicable)</b>	
<b>Name of Faculty</b>	<b>Dr. R. Prakash</b>	<b>Department</b>	<b>Mechanical Engg.</b>
<b>Email</b>	<b>rprakash@nitt.edu</b>	<b>Telephone No.</b>	<b>9444810545</b>
<b>Name of Course Coordinator(s) (if, applicable)</b>			
<b>E-mail</b>		<b>Telephone No.</b>	
<b>Course Type</b>	<input type="checkbox"/> <b>Core course</b> <input checked="" type="checkbox"/> <b>Elective course</b>		
<b>Syllabus (approved in BoS)</b>			
<p><b>Safety in Metal Working Machinery and Wood Working Machines</b>            General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards.</p> <p><b>Principles of Machine Guarding</b>            Design aspects of machine guarding, Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening.            Selection and suitability:lathe-drilling-boring-milling-grinding-shaping-sawing-shearing presses- forge hammer-flywheels-shafts-couplings-gears-sprockets wheels and chains-pulleys and belts-authorized entry to hazardous installations-benefits of good guarding systems.</p> <p><b>Safety in Welding and Gas Cutting</b>            Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling</p>			

of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety-storage and handling of gas cylinders.

### **Safety in Cold Forming and Hot Working of Metals**

Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes.

Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures.

Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment, material handling in foundries, foundry production cleaning and finishing foundry processes.

### **Safety in Finishing, Inspection and Testing**

Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, Indian Boilers Regulation.

### **COURSE OBJECTIVES**

- i. To identify the hazards present in metal working machinery, wood working machinery, welding, gas cutting, hot and cold metal working operations.
- ii. To design appropriate guards for machines to protect humans from mechanical hazards.
- ii. To demonstrate safe practices in heat treatment operations.
- iii. To evolve safe operating procedures in hazardous inspection processes.
- iv. To select and use suitable personal protective equipment.

### **COURSE OUTCOMES (CO)**

<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
At the end of the course student will be able to	
1. Interpret the hazards present in metal working machinery, wood working machinery, welding, gas cutting, hot and cold metal working operations.	<b>1-3,6,7,8,12</b>
2. Design appropriate guards for machines to protect humans from mechanical hazards.	<b>1-3,6,7,8,10,12</b>
3. Demonstrate safe operating procedures in hazardous inspection processes.	<b>1-3,5,6,7,10,12</b>
4. Exhibit safe practices in heat treatment operations.	<b>1-3,6,7,12</b>
5. Utilize suitable personal protective equipment.	<b>1-3,6,7,12</b>

**COURSE PLAN – PART II****COURSE OVERVIEW**

This course provides the specific safety operating procedures for different manufacturing process.

**COURSE TEACHING AND LEARNING ACTIVITIES**

<b>S.No.</b>	<b>Week/Contact Hours</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1	1 <sup>st</sup> Week	General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines.	Online mode - PPT
2	2 <sup>nd</sup> Week	CNC machines, Wood working machinery, types, safety principles, electrical guards, work area.	Online mode - PPT
3	3 <sup>rd</sup> Week	Material handling, inspection, standards and codes- saws, types, hazards.	Online mode - PPT
4	4 <sup>th</sup> Week	Design aspects of machine guarding, Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices.	Online mode - PPT
5	5 <sup>th</sup> Week	Machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening.	Online mode - PPT
6	6 <sup>th</sup> Week	Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawing-shearing presses- forge hammer-flywheels-shafts-couplings-gears sprockets wheels and chains- pulleys and belts-authorized entry to hazardous installations-benefits of good guarding systems.	Online mode - PPT
7	7 <sup>th</sup> Week	Gas welding and oxygen cutting, resistance welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care.	Online mode - PPT

8	8 <sup>th</sup> Week	Maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – Leak detection-pipe line safety-storage and handling of gas cylinders.	Online mode - PPT
9	9 <sup>th</sup> Week	Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism	Online mode - PPT
10	10 <sup>th</sup> Week	Hand or foot-operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes.	Online mode - PPT
11	11 <sup>th</sup> Week	Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures.	Online mode - PPT
12	12 <sup>th</sup> Week	Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment, material handling in foundries, foundry production cleaning and finishing foundry processes.	Online mode - PPT
13	13 <sup>th</sup> Week	Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers.	Online mode - PPT
14	14 <sup>th</sup> Week	Pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, Indian Boilers Regulation.	Online mode - PPT

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	7 <sup>th</sup> week	1 hr 30 min	25
2	Cycle Test 2	11 <sup>th</sup> week	1 hr 30 min	25
3	Seminars	After 6 <sup>th</sup> week	30 min	20
CPA	Compensation Assessment*	14 <sup>th</sup> week	1 hr 30 min (syllabus – upto last week class teaching)	25

4	Final Assessment *	15 <sup>th</sup> week	2 hrs	30
<b>*mandatory; refer to guidelines on page 4</b>				
<b>COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)</b>				
<ol style="list-style-type: none"> <li>1. Feedback from the students during class committee meeting.</li> <li>2. At the end of every cycle test, feedback will be obtained for the lecture improvement</li> <li>3. End semester feedback on Course Outcomes.</li> </ol>				
<b>COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)</b>				
<b><u>MODE OF CORRESPONDENCE (email/ phone etc)</u></b>				
<ol style="list-style-type: none"> <li>1. Per Email (<a href="mailto:rprakash@nitt.edu">rprakash@nitt.edu</a>) only, NO MOBILE PHONE communications.</li> <li>2. Student meeting hours: Monday to Thursday 16:00 – 19:00 (during this time period, students can come and discuss their doubts, projects, and assignment works)</li> <li>3. Strictly not by phone after the working hours (09:00 – 19:00)</li> </ol>				
<b><u>COMPENSATION ASSESSMENT POLICY</u></b>				
Whomever missed the cycle test 1 or 2, can compensate with extra exam. Syllabus for the test should be the topics covered up to last week before the test.				
<b><u>ATTENDANCE POLICY</u> (A uniform attendance policy as specified below shall be followed)</b>				
<ul style="list-style-type: none"> <li>➤ <b>At least 75% attendance in each course is mandatory.</b></li> <li>➤ <b>A maximum of 10% shall be allowed under On Duty (OD) category.</b></li> <li>➤ Students with <b>less than 65% of attendance</b> shall be prevented from writing the final assessment and <b>shall be awarded 'V' grade.</b></li> </ul>				
<b><u>ACADEMIC DISHONESTY &amp; PLAGIARISM</u></b>				
<ul style="list-style-type: none"> <li>➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.</li> <li>➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.</li> <li>➤ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.</li> </ul>				

The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION**

Course materials can be obtained from MS Teams/ME 657 Safety in Engineering Industry

**FOR APPROVAL**

Course Faculty 

CC-Chairperson  16/09/2021

HOD  16/09/2021

**Guidelines:**

- a) The number of assessments for a course shall range from 4 to 5.
- 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. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.