

**DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING**  
**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

| <b>COURSE PLAN – PART I</b>  |                                     |                                 |                      |
|--|-------------------------------------|---------------------------------|----------------------|
| <b>Name of the programme and specialization</b>  | <b>M.Tech – Welding Engineering</b> |                                 |                      |
| <b>Course Title</b>  | <b>Design of Weldments</b>          |                                 |                      |
| <b>Course Code</b>   | <b>MT601</b>                        | <b>No. of Credits</b>           | <b>4</b>             |
| <b>Course Code of Pre-requisite subject(s)</b>   | <b>NIL</b>                          |                                 |                      |
| <b>Session</b>   | <b>July 2021</b>                    | <b>Section (if, applicable)</b> | <b>NA</b>            |
| <b>Name of Faculty</b>   | <b>Dr. S. Muthukumar</b>            | <b>Department</b>               | <b>MME</b>           |
| <b>Email</b>   | <b>smuthu@nitt.edu</b>              | <b>Telephone No.</b>            | <b>(0431)2503468</b> |
| <b>Name of Course Coordinator(s) (if, applicable)</b>  | <b>NA</b>                           |                                 |                      |
| <b>E-mail</b>  | <b>smuthu@nitt.edu</b>              | <b>Telephone No.</b>            | <b>3468</b>          |
| <b>Course Type</b>   | <b>Core course</b>                  |                                 |                      |
| <b>Syllabus (approved in BoS)</b>  |                                     |                                 |                      |
| <p>Weld joints, weld symbols, and joint design principles.</p> <p>Weld design for static loading: Designing for strength and rigidity, Material – section properties, design under different loading.</p> <p>Weld design for dynamic loading: Design for fluctuating and impact loading - dynamic behavior of joints - stress concentrations - fatigue analysis - fatigue improvement techniques - permissible stress- life prediction. Principles and methods and practical approach for crack arresting</p> <p>Concept of stress intensity factor - LEFM and EPFM concepts - brittle fracture- transition temperature approach - fracture toughness testing, application of fracture mechanics to fatigue, weldments design for high temperature applications.</p> <p>Welding residual stresses - causes, occurrence, effects and measurements - thermal and mechanical relieving; types of distortion - factors affecting distortion - distortion control methods - prediction - correction, jigs, fixtures and petitioners</p> |                                     |                                 |                      |
| <b>COURSE OBJECTIVES</b>   |                                     |                                 |                      |
| <ul style="list-style-type: none"> <li>• Design weld joints operating under static and dynamic loading conditions.</li> <li>• Analyze and predict the life of weld joints using the concepts of fracture mechanics</li> </ul>  |                                     |                                 |                      |

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| and identifying the effects of stress concentration build up.  |  |
| <ul style="list-style-type: none"> <li>Learn the various types of stresses and distortions induced in a component as a result of welding.</li> </ul>   |  |
| <b>COURSE OUTCOMES (CO)</b>  |  |
| <b>Course Outcomes</b>   | <b>Aligned Programme Outcomes (PO)</b> |
| Design weld joints for strength and rigidity under static loading conditions.  | 1, 2 & 4                               |
| Design weld joints for dynamic loading and high temperature applications.  | 1, 2 & 4                               |
| Analyze and predict the life of weld joints subjected to fatigue and evaluate the effect of stress concentration on fatigue life of such joints.   | 2, 3, 4 & 5                            |
| Estimate the ductile to brittle transition temperatures based on fracture toughness testing and understand the LEFM and EPFM concepts in Fracture Mechanics to propose solutions for improvements to fatigue life. | 4, 5 & 6                               |
| Identify the various types of stresses and distortions to a component during welding and takes measures to minimize or eliminate such effects.   | 7, 8 & 9                               |

| <b>COURSE PLAN – PART II</b>                   |                           |  |                         |
|--|---------------------------|--|-------------------------|
| <b>COURSE OVERVIEW</b>                         |                           |  |                         |
| <b>COURSE TEACHING AND LEARNING ACTIVITIES</b> |                           |  |                         |
| <b>S.No.</b>                                   | <b>Week/Contact Hours</b> | <b>Topic</b>                                     | <b>Mode of Delivery</b> |
| 1  | 1&2                       | Principle of Weld Joint Design & welding symbols | Online Lectures         |
| 2  | 2-4                       | Weld design for static loading                   | Online Lectures         |
| 3  | 5-7                       | Weld design for dynamic loading                  | Online Lectures         |
| 4  | 8-10                      | Fracture mechanics and residual life estimation  | Online Lectures         |
| 5  | 11-14                     | Welding residual stresses and distortion         | Online Lectures         |

| <b>COURSE ASSESSMENT METHODS (shall range from 4 to 6)</b>   |   |                                |                 |                    |
|--|---|--------------------------------|-----------------|--------------------|
| <b>S.No.</b>   | <b>Mode of Assessment</b>               | <b>Week/Date</b>               | <b>Duration</b> | <b>% Weightage</b> |
| 1  | Mid-Sem Test                            | 3 <sup>rd</sup> week Oct '21   | 1 hr 30 min     | 25                 |
| 2  | Assignment                              | 2 <sup>nd</sup> week Nov'21    | -               | 20                 |
| 3  | Seminar cum Viva / Report on case study | 1 <sup>st</sup> week Dec '21   | -               | 25                 |
| CPA  | Compensation Assessment                 | 1 <sup>st</sup> Week Dec '21   | -               | 25                 |
| 5  | End semester exam                       | 4 <sup>th</sup> Week of Dec'21 | 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>  |   |                                |                 |                    |
| Whether the prescribe syllabus is competed.<br>Whether the faculty clarified the doubts of the students<br>Whether the teacher is impartial with the students<br>Whether the study materials are given to the student??<br>Whether sufficient numbers of numerical problems are being solved?  |   |                                |                 |                    |
| <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>  |   |                                |                 |                    |
| Email ID: <a href="mailto:smuthu@nitt.edu">smuthu@nitt.edu</a> ,<br>Phone : (0431) 2503468   |   |                                |                 |                    |
| <b><u>COMPENSATION ASSESSMENT POLICY</u></b>   |   |                                |                 |                    |
| <b>Only one retest will be conducted and students may be permitted for valid reasons.</b>  |   |                                |                 |                    |
| <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> </ul>   |   |                                |                 |                    |




- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- 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.

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

**ADDITIONAL INFORMATION**

NIL

**FOR APPROVAL**

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|--|---|--|
| <br><b>Dr.S.Muthukumaran</b><br><b>Course Faculty</b> _____ | <br><b>Dr. K. Sivaprasad</b><br><b>CC-Chairperson</b> _____ | <br><b>B.Ravisankar</b><br><b>HOD</b> _____ |
|--|---|--|

**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. 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 |      | Peak/3 or class average/2 |      | 40%  |

|                       |                    |  |
|-----------------------|--------------------|--|
| whichever is greater. | whichever is lower |  |
|-----------------------|--------------------|--|

- 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.