



# MSc in Materials Eng. Welding



DANESHPAJOOHAN PISHRO HIGHER EDUCATION INSTITUTE

- **COURSE CHART**
- **SYLLABUS**
- **SEMESTER CHART**

## MSc. Materials Engineering – Welding Course Chart

### Welding Engineering Courses

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022011	Advanced Welding Methods	3	3	0	-----	-----
3022012	Welding Advanced Metallurgy	3	3	0	-----	-----
3022013	Advanced Solidification Processes	2	2	0	-----	-----
3022014	Inspection & Quality Control of Welding	2	2	0	-----	-----
3022015	Error in Materials Measurement & Investigation	1	1	0	-----	-----
3022016	Seminar	2	2	0	-----	Welding advanced metallurgy
3022017	New Methods of Studying Materials & Lab	3	2	1	-----	-----
3022019	Advanced Welding lab	1	0	1	-----	Welding advanced metallurgy
3022020	Fracture Mechanics	3	3	0	-----	-----
3022023	Thesis	6	0	6	-----	-----
<b>Total Credits</b>		26				

### Elective Courses (not complete)

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022043	Diffusion in Solids	2	2	0	-----	-----
3022044	Mechanical Aspects of Corrosion in Welding Parts	2	2	0	-----	-----
3022045	Special Content	2	2	0	-----	-----
<b>Total Credits</b>		-	Note: students have to pass 6 credits from elective courses.			

## Advanced Welding Methods

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022011	Advanced Welding Methods	3	3	0	-----	-----

- Overview of advances in welding technologies
- MIG/MAG welding
- Precision TIG and plasma welding
- High productivity hot wire and twin wire cladding
- Plasma powder welding with special materials
- Laser welding with powder and wire feed
- Applications of micro-welding
- Selection of welding process for various industrial applications
- Advances in welding metallurgy
- Weldability of various industrial materials

## Welding Advanced Metallurgy

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022012	Welding Advanced Metallurgy	3	3	0	-----	-----

During this course students study heat flow on welding metal and its surrounding area, as well as the solidification of welding metals and their influencing parameters. In addition, an introduction to non-ferrous alloys and their applications and the effect of cold working and impurity on the DBT temperature of refractory metals is provided.

## Advanced Solidification Processes

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022013	Advanced Solidification Processes	2	2	0	-----	-----

The course includes mathematical descriptions of heat flow during casting in simple geometries, nucleation and phase boundary kinetics, growth of crystals with planar front, cells and dendrites. Multiphase reactions including eutectic and peritectic solidification. Flow of melt during solidification will be treated as well as micro- and macro segregation including inverse segregation. Precipitation of secondary phases including slags and gasses will be described.

Introduction to modeling of solidification

## Inspection & Quality Control of Welding

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022014	Inspection & Quality Control of Welding	2	2	0	-----	-----

The role of the welding inspector; Quality Assurance, Quality Control and Inspection reporting; Codes and standards; Equipment for Welding Inspection; Cutting, gouging and edge preparation methods; Weldability of steels; Residual stress and distortion; Approval testing; Mechanical Testing of welds; Welding imperfections (defects); Repairs; Health and Safety in Welding; Non destructive testing and approvals and In-service failures.

## Error in Materials Measurement & Investigation

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022015	Error in Materials Measurement & Investigation	1	1	0	-----	-----

This course provides an introduction to analysis of results and measurement of real values. Afterwards, errors, unreliability, and static measurement of forces are discussed. Design in welding and measuring the variables in welding processes are also studied.

## Seminar

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022016	Seminar	2	2	0	-----	Welding advanced metallurgy

In this course students, with the help and supervision of their instructor, will choose a topic (usually the same as their thesis), and study and investigate all the previous and modern researches and facts about it. Subsequently they have to prepare and present their results and conclusions for the whole class, in the form of a seminar.

## New Methods of Studying Materials & Lab

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022017	New Methods of Studying Materials & Lab	3	2	1	-----	-----

This course provides both theoretical and practical introductions to study and analyze materials using modern and advanced methods and tests.

## Advanced Welding lab

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022019	Advanced Welding lab	1	0	1	-----	Welding advanced metallurgy

This course provides a practical introduction to welding and soldering processes and their variables on the quantity and quality of welding.

## Fracture Mechanics

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022020	Fracture Mechanics	3	3	0	-----	-----

Fracture Mechanics is an essential tool to evaluate whether a component is likely to fail or not. This course has been planned in a simple and step-wise manner to help students familiarize with the basic and advanced topics. Elements of Fracture Mechanics comprehensively covers: - Stress Intensity Factor - Energy Release Rate - J-Integral - Experimental techniques - Fatigue Failure - Environment assisted fracture - FEA of cracks - Mixed mode fracture - Non-destructive test methods.

## Thesis

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022023	Thesis	6	0	6	-----	-----

In this project students will choose and study a specific subject or problem and find its answer or solution, through practical analyzing, experiencing, and experimenting. Eventually, students will compile their theses and present them as their final project.

## Diffusion in Solids

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022043	Diffusion in Solids	2	2	0	-----	-----

## Mechanical Aspects of Corrosion in Welding Parts

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022044	Mechanical Aspects of Corrosion in Welding Parts	2	2	0	-----	-----

In the beginning of this course a review of fracture is discussed, and then principles of fracture mechanics and corrosion along with fatigue corrosion is provided.

## Special Content

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Co-requisite
3022045	Special Content	2	2	0	-----	-----

This course provides an introduction to fields of welding design and quality control, and the relationship of nanoparticles with welding processes.

