

Government College of Engineering, Salem - 11
Department of Metallurgical Engineering
M.E. - WELDING TECHNOLOGY
COs - POs and PSO Mapping
Course Articulation Matrix – 18 Regulation

Semester - I																
18WTC11-Advanced Mathematics and statistics																
		Program Outcomes												Program Specific Outcomes		
Course Outcomes		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Obtain the numerical solution of linear and non-linear equations and fitting curves by method of least squares.	2	2	2	2	2	-	-	-	-	-	-	-	1	-	-
2	Obtain the solutions of diffusion and wave equation involved in engineering problems by using Laplace and Fourier transform techniques.	2	2	2	1	2	-	-	-	-	-	-	-	1	-	-
3	Gain the knowledge on statistical sampling and its applications, analysis of variance by one and two way classification.	2	2	2	2	2	-	-	-	-	-	-	-	1	-	-
Average		2	2	2	1.67	2	-	-	-	-	-	-	-	1	-	-

Semester - I																
18WTC12-Welding Processes-I																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Identify and list the broad classification of various welding processes.	2	2	-	2	2	2	-	-	-	-	-	-	2	-	-
2	Explain the principle of operation, advantages, limitations and applications of SMAW process.	2	2	-	2	2	2	-	-	-	-	-	-	2	-	-
3	Explain the principle of operation, advantages, limitations and applications of GTAW and PAW processes.	2	2	-	2	2	2	-	-	-	-	-	-	2	-	-
4	Explain the principle of operation, advantages, limitations and applications of GMAW and FCAW processes.	2	2	-	2	2	2	-	-	-	-	-	-	2	-	-
5	Explain the principle of operation, advantages, limitations and applications of SAW, SW and CAW processes.	2	2	-	2	2	2	-	-	-	-	-	-	2	-	-
Average		2	2	-	2	2	2	-	-	-	-	-	-	2	-	-

Semester - I																
18WTE11-Electrical Aspects of Welding																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Explain the static and dynamic characteristics of electric arc and its associated power characteristics.	2	2	-	2	2	2	-	-	-	-	-	-	1	-	-
2	Select the right choice of welding power sources.	2	2	-	2	2	2	-	-	-	-	-	-	1	-	-
3	Recognize and list the wire feed systems and seam tracking devices.	2	2	-	2	2	2	-	-	-	-	-	-	1	-	-
4	Measure the welding current, voltage, temperature, load and displacement.	2	2	-	2	2	2	-	-	-	-	-	-	1	-	-
5	To gain knowledge in electrical measurements in welding and special power sources.	2	2	-	2	2	2	-	-	-	-	-	-	1	-	-
Average		2	2	-	2	2	2	-	-	-	-	-	-	1	-	-

Semester - I																	
18CS101-Fundamentals of Problem Solving and C Programming																	
Course Outcomes		Program Outcomes												Program Specific Outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Formulate and apply logic to solve basic problems.	1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-
2	Write, compile and debug programs in C language.	1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-
3	Apply the concepts such as arrays, decision making and looping statements to solve real time applications	1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-
4	Solve simple scientific and statistical problems using functions and pointers	1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-
5	Write programs related to structures and unions for simple applications.	1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-
Average		1	1	-	1	1	-	-	-	-	-	-	-	-	1	-	-

Semester - I																	
18WTE12-Design Of Weldments																	
Course Outcomes		Program Outcomes												Program Specific Outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Gain knowledge on design basics of the welding operations.	2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-
2	Gain knowledge on the weld design for static loading processes.	2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-
3	Gain knowledge on the weld design for dynamic loading processes.	2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-
4	Gain detailed knowledge on factors influencing the distortion and residual stresses.	2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-
5	Get familiarized in the failure analysis sector.	2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-
Average		2	2	-	2	2	-	-	-	-	-	-	-	-	1	-	-

Semester - I																
18WTE21-Materials And Behaviour																
		Program Outcomes												Program Specific Outcomes		
Course Outcomes		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Understand the formation of solid solutions, construct the phase diagrams and understand the heat treatment of steels using TTT and CCT diagrams.	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-
2	Understand the principal effects on properties of the major alloying elements used in steels and analyse the basic structure and properties of different types of cast irons.	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-
3	Gain knowledge on the properties and applications of some important non-ferrous metals such as Cu, Al, Ti, Ni, Mg and their alloys.	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-
4	Explain the various fracture and mechanisms for different fractures, the fracture toughness and the various theories describing it.	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-
5	Define and elaborate the Stress cycles, S-N curves, fatigue testing machines; state the Creep curve, creep mechanisms, metallurgical factors affecting creep and explain about creep testing machines	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-
Average		1	1	-	1	-	-	-	-	-	-	-	-	1	1	-

Semester - I																
18WTE22-Failure Analysis in Weldments																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Understand the concepts of types of failures and analysis	2	2	-	2	2	-	-	-	-	-	-	1	2	2	-
2	Learn the various factors affecting/causing failures of weldments	2	2	-	2	2	-	-	-	-	-	-	1	2	2	-
3	Design new materials that can withstand failures, especially in weldments considering different environment.	2	2	-	2	2	-	-	-	-	-	-	1	2	2	-
4	To understand failure in welded products.	2	2	-	2	2	-	-	-	-	-	-	1	2	2	-
5	To learn various concepts in reliability.	2	2	-	2	2	-	-	-	-	-	-	1	2	2	-
Average		2	2	-	2	2	-	-	-	-	-	-	1	2	2	-

Semester - I																
18WTE23-Non-Metallic materials																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Gain knowledge on polymers and select different polymer materials for various applications.	2	2	-	2	1	-	-	-	-	-	-	-	2	2	-
2	Understand different methods to synthesize polymer materials.	2	2	-	2	1	-	-	-	-	-	-	-	2	2	-
3	Know the structure and properties of different ceramics.	2	2	-	2	1	-	-	-	-	-	-	-	2	2	-
4	Understand the properties and applications of important ceramic materials and glass.	2	2	-	2	1	-	-	-	-	-	-	-	2	2	-
5	Emphasis the need of modern materials like composites over conventional metal and alloys.	2	2	-	2	1	-	-	-	-	-	-	-	2	2	-
Average		2	2	-	2	1	-	-	-	-	-	-	-	2	2	-

Semester - I																
18WTC14-Welding Lab																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Generate arc in different welding machines for various welding processes.	-	-	2	2	1	1	-	-	-		-	-	2	2	-
2	Identify the process parameters and their effects during welding	-	-	2	2	1	1	-	-	-		-	-	2	2	-
3	Selection of process parameters for bead practices	-	-	2	2	1	1	-	-	-		-	-	2	2	-
4	Perform welding to produce butt and fillet joints.	-	-	2	2	1	1	-	-	-		-	-	2	2	-
5	Identify the anomalies in weld bead.	-	-	2	2	1	1	-	-	-		-	-	2	2	-
Average		-	-	2	2	1	1	-	-	-		-	-	2	2	-

Semester - I																	
18MLC01-Research Methodology and IPR																	
Course Outcomes		Program Outcomes												Program Specific Outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Understand research problem formulation.	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1
2	Analyze research related information	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1
3	Follow research ethics	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1
4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1
5	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1
Average		-	-	-	-	-	1	1	1	1	1	1	1	1	-	-	1

Semester - II																
18WTC21-Welding Processes-II																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Explain the principle of operation, advantages, limitations and applications of various solid state welding processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	1
2	Explain the principle of operation, advantages, limitations and applications of FRW and ISW processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	1
3	Explain the principle of operation, advantages, limitations and applications of EBW and LBW processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	1
4	Explain the principle of operation, advantages, limitations and applications of ESW and Resistance welding processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	1
5	Explain the principle and features of various special joining techniques and thermalcutting methods.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	1
Average		2	2	-	2	2	1	-	-	-	-	-	-	2	-	1

Semester - II																
18WTC22-Welding Metallurgy																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	To understand heat flow in welding, structures formed and effect of various parameters.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
2	To gain knowledge in various types of weldability tests.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
3	To know about weldability of carbon steels and low alloy steels and weldability issues.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
4	To understand welding of stainless steels.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
5	To get familiar in the area of welding of cast iron.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
Average		2	2	-	2	2	1	-	-	-	-	-	-	2	2	-

Semester - II

18WTE31-Testing And Inspection of weldments

Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Understand the basics and overview of destructive testing such as tensile test, impact test and hardness test.	2	2	-	2	2	-	-	-	-	-	-	-	2	2	-
2	Understand the recent developments, modifications and applications in surface NDT and apply them in real time problems associated with failure analysis and regular testing for industries.	2	2	-	2	2	-	-	-	-	-	-	-	2	2	-
3	Know about X ray radiography and gamma ray radiography in detail.	2	2	-	2	2	-	-	-	-	-	-	-	2	2	-
4	Gain knowledge about ultrasonic inspection and related details	2	2	-	2	2	-	-	-	-	-	-	-	2	2	-
5	Troubleshoot the problems involved on the shop floor in fabrication industries with the help of knowledge in codes, standards and specifications.	2	2	-	2	2	-	-	-	-	-	-	-	2	2	-
Average		2	2	-	2	2	-	-	-	-	-	-	-	2	2	-

Semester - II																
18WTE32-Finite Element Analysis																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Demonstrate understanding of FE formulation for axi-symmetric problems in heat transfer and elasticity	1	1	-	1	1	1	-	-	-	-	-	-	1	-	-
2	To identify the primary and secondary variables of the problem and choose correct nodal degrees of freedom and develop suitable shape functions for an iso-parametric element.	1	1	-	1	1	1	-	-	-	-	-	-	1	-	-
3	Able to solve contact problems by using the techniques of non-linear equations of equilibrium	1	1	-	1	1	1	-	-	-	-	-	-	1	-	-
4	Understand to solve the dynamic flow problems by iterative methods	1	1	-	1	1	1	-	-	-	-	-	-	1	-	-
5	Solve non-Newtonian Flow-Navier Stokes Equation by FE equations.	1	1	-	1	1	1	-	-	-	-	-	-	1	-	-
Average		1	1	-	1	1	1	-	-	-	-	-	-	1	-	-

Semester - II																
18WTE41-Materials Characterization																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Know the principles of metallurgical microscope, X-ray Diffractometer (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Thermal analysis and dilatometer.	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
2	Describe the various sample/specimen preparation techniques for XRD, SEM, TEM and thermal analysis and quantitative metallography	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
3	Determine crystal structure, lattice parameter, phase identification, solvus line estimation and residual stress analysis using XRD	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
4	Select the appropriate tool to characterize the material by knowing its merits and demerits.	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
5	Analyze the material in lattice level by using different modes of TEM like bright and dark field imaging, selected area diffraction and microchemical analyses.	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
6	Evaluation of the specimen chemical and thermal analysis advanced methods.	2	2	-	2	2	-	-	-	-	-	-	1	2	-	1
Average		2	2	-	2	2	-	-	-	-	-	-	1	2	-	1

Semester - II

18WTE42-Automation And Robots in Welding

Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Gain knowledge on automation of the arc welding processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	-
2	Gain knowledge on the different kinds of welding processes.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	-
3	Gain knowledge on the welding equipment and work motions of the automated devices.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	-
4	Gain detailed knowledge on standardized arc welding machines, controls and sensors.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	-
5	Get familiarized in the area of Robotic Arc welding.	2	2	-	2	2	1	-	-	-	-	-	-	2	-	-
Average		2	2	-	2	2	1	-	-	-	-	-	-	2	-	-

Semester - II																
18WTE43-Welding Application Technology																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Select the suitable welding procedures for the fabrication of structural elements and conventional pressure vessels and solve the difficulties in welding of pressure vesselsteels.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
2	Choose the correct materials, electrodes, type of joint, welding processes and fittings for the fabrication of storage tanks, piping as well as pipelines.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
3	Solve the problems involved in welding of oil refinery components, fertilizer components and cryogenic materials.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
4	Explain the shipbuilding activities and solve the problems involved in welding of submarine steels and railway materials.	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
5	Gain knowledge on materials used in Aerospace and Automobile components andtheir weldments	2	2	-	2	2	1	-	-	-	-	-	-	2	2	-
Average		2	2	-	2	2	1	-	-	-	-	-	-	2	2	-

Semester - II																
18WTC23-Quality Control in Weldment Lab																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Gain knowledge in practical aspects of welding gauges and their applications.	-	-	2	-	-	1	-	-	-	-	-	-	1	1	-
2	Hands on experience in Material testing and their sample preparation.	-	-	2	-	-	1	-	-	-	-	-	-	1	1	-
3	Exposure of Quality control documents - Read and understand the various reports	-	-	2	-	-	1	-	-	-	-	-	-	1	1	-
4	Read and understand welding documents (WPS, PQR & WPQ).	-	-	2	-	-	1	-	-	-	-	-	-	1	1	-
Average		-	-	2	-	-	1	-	-	-	-	-	-	1	1	-

Semester - II																
18WTC24-Material Characterization Lab																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Observe and explain the Wulff net diagram, Stereographic projections and polefigure.	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
2	Interpret the DSC curves, analyse the SEM and TEM images of metal and alloys.	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
3	Determine the Volume fraction of phases using image analysis	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
4	Determine the nodularity and nodule count in cast iron.	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
5	Determine the corrosion rate of specimens by weight loss method	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
6	Analyse the effect of inhibitor on rate of corrosion	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
7	Evaluate the corrosion characteristics by Polarization method	-	-	2	1	1	-	-	-	-	-	-	-	1	1	1
Average		-	-	2	1	1	-	-	-	-	-	-	-	1	1	1

Semester - III																
18WTE51-Corrosion and Surface Engineering																
Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Different types of corrosion and their mechanism	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
2	Estimate corrosion resistance by different tests	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
3	Understand corrosion behaviour of different metals at different conditions	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
4	Define different forms of processing techniques of surface engineering materials Select the type of deposition and spraying technique with respect to application	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
5	Select the type of deposition and spraying technique with respect to application.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
Average		2	2	-	2	2	1	1	-	-	-	-	1	2	2	1

Semester – III

18WTE52-Brazing, Soldering, Surfacing and Cutting

Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Explain the concepts of brazing and soldering.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
2	Understand the fluxes and atmosphere for brazing and soldering.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
3	To gain knowledge about brazing and soldering.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
4	To understand surfacing techniques	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
5	To get familiar in the areas of thermal cutting processes.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	1
Average		2	2	-	2	2	1	1	-	-	-	-	1	2	2	1

Semester - III																
18WTE53-Welding Code sand standards																
		Program Outcomes												Program Specific Outcomes		
Course Outcomes		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Identify various design requirements and applicability of AWS D1.1.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	-
2	Apply API 1104 and AP15L for pipe welding applications.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	-
3	Apply ASME II, V, VIII and IX for boiler fabrication.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	-
4	Understand and apply WPS, PQR and performance qualification variables for aspecific welding application.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	-
5	Understand different materials standard, testing methods and consumable testing.	2	2	-	2	2	1	1	-	-	-	-	1	2	2	-
Average		2	2	-	2	2	1	1	-	-	-	-	1	2	2	-

Semester - IV

18WTC41-Dissertation Phase- II

Course Outcomes		Program Outcomes												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Students will be able to use different experimental techniques.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
2	Students will be able to use different software/ computational/analytical tools.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
3	Students will be able to design and develop an experimental set up/ equipment/testrig.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
4	Students will be able to conduct tests on existing setups/equipments and draw logical conclusions from the results after analyzing them.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
5	Students will be able to either work in a research environment or in an industrial environment.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
6	Students will be conversant with technical report writing.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
7	Students will be able to present and convince their topic of study to the engineering community.	-	-	-	2	2	-	1	1	1	1	1	1	2	2	2
Average		-	-	-	2	2	-	1	1	1	1	1	1	2	2	2