	Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni - 625 531 (Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)	Format No	NAC/ILP-07a 2
		Rev No	03
		Date	29-11-2019
		Total Pages	05

Course Plan (Theory)

For the Academic Year 20 - (Odd/Even Semester)

Staff Name	Mr. J.Eswaran	**Dept. / Designation**	AP/MECH	**Strength**	34
Course/Branch	B.E/ MECH	**Year / Semester**	III/ VI	**Credit**	03
Course Code/ Subject Code/Choice	M606 / PR8592 / PE	**Subject Name**	Welding Technology		

I. Objective (5) : The student should be made to :

OB1: To understand the basics of welding and to know about the various types of welding processes

OB2: To know about the resistance welding process.

OB3: To understand the concept of various solid state welding process.

OB4: To understand the various special welding processes.

II. Pre requisites :

- Student should know about the basic knowledge in welding like arc and gas welding.
- Also know about the various special welding processes.

III. Guidelines (Paper's Nature) :

- Industrial Application

IV. Course Out Come (5) : At the end of this course, the students will be able to

COs	Outcomes	Bloom's Taxonomy	BTS
M606.1	Understand the construction and working principles of gas and arc welding process.	Understand	3
M606.2	Understand the construction and working principles of resistance welding process.	Understand	3
M606.3	Understand the construction and working principles of various solid state welding process.	Understand	3
M606.4	Understand the construction and working principles of various special welding processes.	Understand	3
M606.5	Understand the concepts on weld joint design, weldability and testing of weldments.	Understand and analysis	3

V. CO – PO, PSO Mapping: (3- > Strong, 2- > Moderate, 1 – >Low)

CO-PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
M606.1	3	2											2	
M606.2	3	2											2	
M606.3	3	2											2	1
M606.4	3	2											2	1
M606.5	3	1					1						1	1

VI. Books to be Referred :

T1: Little R.L., "Welding and welding Technology", Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.

T2: Parmer R.S., "Welding Engineering and Technology", 1st Edition, Khanna Publishers, New Delhi, 2008.

T3: Parmer R.S., "Welding Processes and Technology", Khanna Publishers, New Delhi, 1992.

R1. AWS- Welding Hand Book. 8th Edition. Vol- 2. "Welding Process"

R2. Christopher Davis. "Laser Welding- Practical Guide". Jaico Publishing House.
R3. Davis A.C., "The Science and Practice of Welding". Cambridge University Press, Cambridge. 1993
R4. Nadkarni S.V. "Modern Arc Welding Technology". Oxford IBH Publishers. 1st Edition,2005.
R5. Schwartz M.M. "Metals Joining Manual". McGraw Hill Books, 1979.
R6. Tylecote R.F. "The Solid Phase Welding of Metals". Edward Arnold Publishers Ltd. London.
R7 R.K.Rajput. "Manufacturing Technology Manufacturing Process" Laxmi Publication (P) Ltd.

VII. E-Learning Resources :

EL1: https://www.youtube.com/results?search_query=welding+technology
EL2: https://www.youtube.com/watch?v=44Db1Z59_eo
EL3: https://www.youtube.com/watch?v=-hLwyhDRcJM
EL4: https://www.youtube.com/results?search_query=various+welding+process
EL5 : https://www.youtube.com/results?search_query=welding+techniques

VIII. Method of Evaluation (Considered for CO Assessment) :

CO Assessment Direct									
CO Evaluation Internal :									CO Eval Ext
Int 1,2/ Mod 1,2	Unit / CAT	Case Study	Assign.,	Seminar	Quiz	GD	RP	Project/Lab	University
Yes	Yes	Yes	Yes	Yes	No	No	NA	NA	Yes
CO Assessment Indirect									
Course Exit Survey								Yes	

IX. Attainment Levels & Calculation :

Target Competence Threshold (Level)	50%	Internal	Others	University
		50 Marks and Above	50% Marks	Equivalent to [B / E] or Higher
Benchmark & Attainment Level	70% Students Got More Than Target Competence Level			3
	60% Students Got More Than Target Competence Level			2
	50% Students Got More Than Target Competence Level			1
	If Students Below 50% of Target			0

CO Attainment Calculations	Attainment Scores in Scale of 3	
	Direct Attainment of COs	= 0.8 * CO attainment (University) + 0.2 * CO attainment (Internal Overall)
	Overall Attainment of CO	= 0.9 * CO attainment (Direct) + 0.1 * CO attainment (In-Direct)
PO Individual Attainment Calculations	= Overall Attainment of CO *(Average of CO-PO Mapping Score of Individual POs / 3)	
PSO Individual Attainment Calculations	= Overall Attainment of CO *(Average of CO-PSO Mapping Score of Individual PSOs / 3)	

X. Lesson Plan:

S. No.	Topic	CO	BTL	Content Delivery Mode *	Reference Book no. & Page no.	No. of Periods Required	Cumulative Periods
UNIT I- GAS AND ARC WELDING PROCESSES							
1	Fundamental principles – Air Acetylene welding	M606.1	L1	BB	R7 301	1	1
2	Oxyacetylene welding , Carbon arc welding	M606.1	L2	BB	T2 17, T2 5	2	3
3	Shielded metal arc welding, Submerged arc welding	M606.1	L2	BB	T2 6-7	2	5

4	TIG & MIG welding	M606.1	L2	BB/PPT	R7 314-315	1	6
5	Plasma arc welding	M606.1	L2	PPT	R7 320	1	7
6	Electroslag welding processes advantages, limitations and applications	M606.1	L2	BB/PPT	T2 4	2	9
	UNIT-II- RESISTANCE WELDING PROCESSES						
7	Spot welding, Seam welding	M606.2	L2	BB/PPT	T2 23-25	2	11
8	Projection welding	M606.2	L2	BB/PPT	R7 299	1	12
9	Resistance Butt welding, Flash Butt welding	M606.2	L2	PPT	T2 29-32	2	14
10	Percussion welding	M606.2	L2	BB/PPT	T2 32-33	1	15
11	High frequency resistance welding processes advantages, limitations and applications	M606.2	L1	BB	T2 28	3	18
	UNIT-III- SOLID STATE WELDING PROCESSES						
12	Cold welding, Diffusion bonding, Explosive welding	M606.3	L1	PPT/BB	T2 35, T2 38-41	2	20
13	Ultrasonic welding	M606.3	L2	PPT/BB	T2 36	2	22
14	Friction welding, Forge welding	M606.3	L2	PPT/BB	T2 33-34	2	24
15	Roll welding and Hot pressure welding processes advantages, limitations and applications.	M606.3	L2	PPT/BB	T2 36	3	27
	UNIT-IV- OTHER WELDING PROCESSES						
16	Thermit welding, Atomic hydrogen welding	M606.4	L2	PPT/BB	T2 3	2	29
17	Electron beam welding	M606.4	L2	PPT/BB	T2 15	1	30
18	Laser Beam welding	M606.4	L2	PPT/BB	T2 16	1	31
19	Friction stir welding, Under Water welding	M606.4	L2	BB/PPT	R7 326	2	33
20	Welding automation in aerospace, nuclear and surface transport vehicles	M606.4	L2	BB/PPT	T2 54	3	36
	UNIT-V- DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS						
21	Various weld joint designs – Welding defects	M606.5	L4	PPT	T2 815- 819, T2 659	2	38
22	causes and remedies - Weldability of Aluminium	M606.5	L1	PPT/BB	T2 613-621	1	39
23	causes and remedies - Weldability of Copper	M606.5	L1	BB/PPT	T2 602-607	2	41
24	causes and remedies - Weldability of Stainless steels	M606.5	L1	PPT/BB	T2 526	2	43
25	Destructive and non destructive testing of weldments	M606.5	L4	PPT	T2 433-498	2	45

* **BB** - Blackboard, **VD** – Videos, **GD** – Group Discussion, **RP** – Role Play, **SEM** –Seminar, **DM**-Demo/Lab, **WS**-Web Search, **MPJ** – Mini Project., **AS**-Assignment, **TUT**- Tutorial, **CO** – Course Outcome, **BTL**- Blooms Taxonomy Level.

XI. Content Beyond Syllabus:

Course Code & Title	Syllabus of content beyond syllabus	Total Number of contact hours				Contributing COS	Contributing POs & PSOs
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours		
M606 & Heavy welded process	Boilers, pressure vessel and shipbuilding	3			3	M606.4	PO1, 4, 5 &7 PSO1, 2

XII. Lesson Schedule (Planned with Timetable):

No.	Unit No / Description	Duration (Date)		Total No of Periods	Course Outcome	Remarks (if any Deviation)
		From	To			
1.	Unit – 1/ Gas and Arc Welding Processes			9		
2.	Unit – 2 / Resistance Welding Processes			9		
3.	Unit – 3 / Solid State Welding Processes			9		
4.	Unit – 4 / Other Welding Processes			9		
5.	Unit – 5 / Design of Weld Joints, weldability and Testing of Weldments			9		

XIII. Unit Test / CAT Test:

No.	Date	UNIT / CAT Portion	No.	Date	UNIT / CAT Portion
1		UNIT-I	4		UNIT-IV
2		UNIT-II	5		UNIT-V
3		UNIT-III			

XIV. Internal / Model Test:

No.	Tentative Date	Portion	Total	Appear	Pass	%
1		INTERNAL – I / UNIT – I & II				
2		INTERNAL – II / UNIT – III & IV				
3		MODEL EXAM / UNIT – I -V				

XV. Assignments:

Unit No.	Topic	Suggestion*	Group / Individual	Course Outcome	Announced Date	Submitted Date
1	Gas and arc welding processes	Books	Individual	M606.1		
2	Solid State Welding Processes	Books	Individual	M606.3		
3	Welding automation in aerospace, nuclear and surface transport vehicles	Books	Individual	M606.4		

*** Suggestion:** Books / Journals / Magazines / Web Resources

XVI. Tutorial:

Unit No.	Topic * (Questions /Problem /Exercises)	Course Outcome	Question Count	Discussed Date	Completed Date
1.	Arc Welding Processes	M606.1	01		
2.	Destructive and non destructive testing of weldments	M606.5	02		

***Attach Proof of Tutorial Sheets Separate in given Format.**

Staff In Charge

Head of the Department

Principal 14/12/19