Estd. 1962
NAAC 'A' Grade
MHRD-NIRF- 28th Rank

SHIVAJI UNIVERISTY, KOLHAPUR-416 004. MAHARASHTRA
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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग– २६०९०९४)
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

Ref. No. SU/BOS/Sci & Tech/ 0669 **Date: 31/10/2018**

To,

The Principal/ Director,
All affiliated Engineering Colleges/ Institute
Shivaji University, Kolhapur

Subject: Regarding syllabus of Production Engineering S.Y B. Tech. Part II (Sem III-VI Program under Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabus Production Engineering S.Y B. Tech. Part II (Sem III=VI)Program under Faculty of Science and Technology.

This syllabus and equivalence shall be implemented from the academic year 2019-2020 (i.e. from July, 2019) onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in. (Online Syllabus)

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October /November 2019 & March/April 2020. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Sd/-
Dy Registrar

Copy to:

1	I/C Dean, Associate Dean, Faculty of Science & Technology	7	Computer Centre
2	The Chairman, Respective Board of Studies	8	Affiliation Section (T.1)
3	I/C Director, Examination and Evaluation	9	Affiliation Section (T.2)
4	Eligibility Section	10	P.G.Admission Section
5	O.E. – 4	11	P.G.Seminar Section
6	Appointment Section	12	Meeting Section

SHIVAJI UNIVERSITY, KOLHAPUR

REVISED STRUCTURE AND SYLLABUS

SECOND YEAR (B. Tech) CBCS

PRODUCTION ENGINEERING

Tobeintroducedfromtheacademicyear2019-20 (i.e. from June 2019)onwards

SECOND YEAR PRODUCTION ENGINEERING – CBCS PATTERN

SEMESTER – III																										
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME															
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK						
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min				
1	BSC-PE201	3	3	3	1	1	1	-	-	-		CIE	30	100	40	As per BOS Guidelines	-	-	2	25	10				
												ESE	70												
2	BSC-PE202	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10				
												ESE	70												
3	PCC-PE203	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10				
												ESE	70												
4	PCC-PE204	2	2	2	-	-	-	2	4	4		CIE	30	100	40		25	10	2	25	10				
												ESE	70												
5	PCC-PE205	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10				
												ESE	70												
6	PCC-PE206	2	2	2	-	-	-	1	2	2		-	-	-	-		50	20	2	25	10				
7	PCC-PE207		-	-	-	-	-	1	2	2		-	-	-	-		-	-	-	50	20				
	TOTAL	16	**16**	**16**	**1**	**1**	**1**	**7**	**14**	**14**		**-**	**-**	**500**	-		**100**	-		**200**						

SEMESTER – IV																								
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME													
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK				
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min			
1	PCC - PE208	3	3	3				1	2	2		CIE	30	100	40	As per BOS Guidelines	25	10	2	25	10			
												ESE	70											
2	PCC - PE209	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
3	PCC - PE210	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
4	PCC - PE211	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
5	PCC - PE212	1	1	1	-	-	-	1	2	2		-	-	-	-		25	10	2	50	20			
6	PCC - PE213	3	3	3	-	-	-	1	2	2		-	-	-	-		-	-	2	25	10			
7	PCC - PE214		-	-	-	-	-	1	2	2		-	-	-	-		-	-	-	50	20			
8	MC PE215	3	3	3	-	-	-	-	-	-		CIE	30	100	40		-	-	-	-	-			
												ESE	70											
	TOTAL	19	19	**19**	-	-	-	**7**	**14**	**14**		-	-	**500**	-		**75**	-		**225**				
	TOTAL	**35**	**35**	**35**	**1**	**1**	**1**	**14**	**28**	**28**		-	-	**1000**			**175**	-		**425**				

CIE- Continuous Internal Evaluation ESE- End Semester Evaluation

• Candidate contact hours per week : 30 Hours(Minimum)	• Total Marks for S.E. Sem III & IV:**1600**
• Theory/TutorialDuration:60MinutesandPracticalDuration:120 Minutes	• Total Credits for S.E. Sem III & IV :**50**
• IntheoryexaminationtherewillbeapassingbasedonseparateheadofpassingforexaminationofCIEandESE.	
• There shall be separate passing for theory and practical (term work)courses.	

Note :

1. Basic Science Courses – Production Engineering (BSC-PE) are compulsory.
2. Professional Core Course – Production Engineering (PCC-PE) are compulsory.
3. Mandatory Course (MC-PE)Environmental Studies which isicompulsory for theory 70 marks and project work 30marks.

COURSE CODE AND DEFINITION

Semester III

Sr. No.	Code No.	Subject	Credits
1	BSC-PE201	Engineering Mathematics III	**4**
2	BSC-PE202	Electrical & Electronics Engineering	**4**
3	PCC-PE203	Machine Tools & Processes	**4**
4	PCC-PE204	Machine Drawing	**4**
5	PCC-PE205	Thermal Engineering	**4**
6	PCC-PE206	Object Oriented Programming with C++	**3**
7	PCC-PE207	Workshop Practice III	**1**
		Total	**24**

Semester IV

Sr. No.	Code No.	Subject	Credits
1	PCC-PE208	Foundry Technology	**4**
2	PCC-PE209	Advanced machine tools & Processes	**4**
3	PCC-PE210	Theory of Machines-I	**4**
4	PCC-PE211	Analysis of Machine Elements	**4**
5	PCC-PE212	Computer Aided Solid Modeling	**2**
6	PCC-PE213	Welding Technology	**4**
7	PCC-PE214	Workshop Practice IV	**1**
8	MC-PE215	Environmental Studies	**3**
		Total	**26**

THIRD YEAR PRODUCTION ENGINEERING – CBCS PATTERN

SEMESTER – V																									
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME														
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK					
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min			
1	PCC - PE301	3	3	3	-	-	-	1	2	2		CIE	30	100	40	As per BOS Guidelines	-	-	2	25	10			
												ESE	70											
2	PCC - PE302	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
3	PCC - PE303	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
4	PCC - PE304	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
5	PCC - PE305	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
6	PCC - PE306	-	-	-	-	-	-	1	2	2		-	-	-	-		-	-	2	25	10			
7	OEC - PE307	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
	TOTAL	18	**18**	**18**	-	-	-	**7**	**14**	**14**		-	-	**600**	-		**25**		-	**175**				

SEMESTER – VI																								
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME													
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK				
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min			
1	PCC - PE308	3	3	3	-	-	-	1	2	2		CIE	30	100	40	As per BOS Guidelines	25	10	2	25	10			
												ESE	70											
2	PCC - PE309	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10			
												ESE	70											
3	PCC - PE310	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
4	PCC - PE311	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
5	PCC - PE312	-	-	-	-	-	-	2	4	4		-	-	-	-		50	20	-	-	-			
6	OEC - PE313	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10			
												ESE	70											
7	PCC - PE314	-	-	-	-	-	-	1	2	2		-	-	-	-		-	-	2	25	10			
8	PCC - PE315	-	-	-	-	-	-	2	2	2		-	-	-	-		25	10	2	25	10			
	TOTAL	15	15	**15**	-	-	-	**10**	**18**	**18**		-	-	**500**	-		**125**	-		**175**				
	TOTAL	**33**	**33**	**33**	-	-	-	**17**	**32**	**32**		-	-	**1100**			**150**	-		**350**				

• Candidate contact hours per week : 30 Hours(Minimum)	• Total Marks for T.E. Sem V & VI:**1600**
• Theory/TutorialDuration:60MinutesandPracticalDuration:120 Minutes	• Total Credits for S.E. Sem III & IV :**50**
• IntheoryexaminationtherewillbeapassingbasedonseparateheadofpassingforexaminationofCIEandESE.	
• There shall be separate passing for theory and practical (term work)courses.	
• Sem V &SemVI :-Open Elective Course has 3+1 credits for one course. Each Department/branch has to run atleast one Open Elective Course in Sem V &Sem VI from the list of Elective Course. It is compulsory	

Note:

1.Professional Core Course – Production Engineering (PCC-PE) are compulsory

2.Open Elective Courses- Production Engineering (OEC-PE) are compulsary

.

COURSE CODE AND DEFINITION

Semester V

Sr. No.	Code No.	Subject	Credits
1	PCC-PE301	Metallurgy	4
2	PCC-PE302	Theory of Machines-II	4
3	PCC-PE303	Design of Machine Elements	4
4	PCC-PE304	Metrology	4
5	PCC-PE305	Manufacturing Technology	4
6	PCC-PE306	WS Practice -V	1
7	OEC-PE307	OPEN ELECTIVE	4
		TOTAL	25

Semester VI

Sr. No.	Code No.	Subject	Credits
1	PCC-PE308	Industrial Hydraulics and Pneumatics	**4**
2	PCC-PE309	Design of jigs, fixtures and Dies	**4**
3	PCC-PE310	Industrial Management and Quality Management	**4**
4	PCC-PE311	Machine Tool Design	**4**
5	PCC-PE312	CAM laboratory and CNC Workshop Practice	**2**
6	OEC-PE313	Open Elective	**4**
7	PCC-PE314	Research Seminar	**1**
8	PCC-PE315	Mini Project	**2**
		Total	**25**

FOURTH YEAR PRODUCTION ENGINEERING – CBCS PATTERN

SEMESTER – VII																									
Sr. No	**Course (Subject Title)**	**TEACHING SCHEME**									**EXAMINATION SCHEME**														
		THEORY			**TUTORIAL**			**PRACTICAL**			**THEORY**					**PRACTICAL**			**TERM WORK**					
		Credits	**No. of Lecture**	**Hours**	**Credits**	**No. of Lecture**	**Hours**	**Credits**	**No. of Lecture**	**Hours**	**Hours**	**Mode**	**Marks**	**Total Marks**	**Min**	**Hours**	**Max**	**Min**	**Hours**	**Max**	**Min**
1	PCC-PE401	3	3	3	-	-	-	1	2	2		CIE	30	100	40	**As per BOS Guidelines**	-	-	2	25	10
												ESE	70								
2	PCC-PE402	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10
												ESE	70								
3	PCC-PE403	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10
												ESE	70								
4	PCC-PE404	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10
												ESE	70								
5	PCE-PE405	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10
												ESE	70								
6	SI-PE406	-	-	-	-	-	-	1	2	2		-	-	-	-		-	-	-	25	10
7	PW-PE407	-	-	-	-	-	-	4	4	4							50	20	4	25	10
	TOTAL	15	**15**	**15**	**-**	**-**	**-**	**10**	**16**	**16**		**-**	**-**	**500**	**-**		**125**		**-**	**175**	

SEMESTER – VIII																								
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME												
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK		
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min
1	PCC - PE408	3	3	3	-	-	-	1	2	2		CIE	30	100	40	As per BOS Guidelines			2	25	10
												ESE	70								
2	PCC - PE409	3	3	3	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10
												ESE	70								
3	PCC - PE410	3	3	3	-	-	-	2	4	4		CIE	30	100	40		25	10	2	25	10
												ESE	70								
4	PCE - PE411	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10
												ESE	70								
5	PCE - PE412	3	3	3	-	-	-	1	2	2		CIE	30	100	40		-	-	2	25	10
												ESE	70								
6	PW - PE413	-	-	-	-	-	-	4	4	4							75	30	4	50	20
	TOTAL	15	15	**15**	**-**	**-**	**-**	**10**	**16**	**16**		**-**	**-**	**500**	**-**		**125**	**-**		**175**	
	TOTAL	**30**	**30**	**30**	**-**	**-**	**-**	**20**	**32**	**32**		**-**	**-**	**1000**			**250**	**-**		**350**	

CIE- Continuous Internal Evaluation

ESE- End semester Examination

• Candidate contact hours per week : 30 Hours(Minimum)	• Total Marks for B.E. Sem VII& VIII:**1600**
• Theory/TutorialDuration:60MinutesandPracticalDuration:120 Minutes	• Total Credits for B.E. Sem III & IV :**50**
• IntheoryexaminationtherewillbeapassingbasedonseparateheadofpassingforexaminationofCIEandESE.	
• There shall be separate passing for theory and practical (term work)courses.	
• SemVII&Sem VIII :-	

Note :

1.Professional Core Course – Production Engineering (PCC-PE) are compulsory.

2.Profssional Core Electives - Production Engineering (PCE-PE) are compulsory.

3. Summer Internship -Production Engineering (SI-PE) is compulsory.

4. Project Work Production Engineering (PE-PE) is compulsory.

COURSE CODE AND DEFINITION

Semester VII

Sr. No.	Code No.	Subject	Credits
1	PCC-PE401	Operation Research	**4**
2	PCC-PE402	Mechatronic System	**4**
3	PCC-PE403	Production and Operations Management	**4**
4	PCC-PE404	Process Engineering	**4**
5	PCE-PE405	Elective I	**4**
6	SI-PE406	Industrial Training	**1**
7	PW-PE407	Project Work Phase-1	**4**
		Total	**25**

Semester VIII

Sr. No.	Code No.	Subject	Credits
1	PCC-PE408	Costing and Cost Control	**4**
2	PCC-PE409	Industrial Engineering	**4**
3	PCC-PE410	Finite Element Analysis	**5**
4	PCE-PE411	Elective II	**4**
5	PCE-PE412	Elective III	**4**
6	PW-PE413	Project Work Phase II	**4**
		Total	**25**

S.Y.B. Tech.(PRODUCTION ENGINEERING) SEM- III
ENGINEERING MATHEMATICS-III

Course Code- BSC -PE 201

Teaching Scheme
Lectures: 3hours/week
Tutorial:-1hour/week
Credits: 4

Examination Scheme
ESE: 70 Marks
CIE: 30Marks
Term Work: 25Marks

Course Objectives:

1) Todevelopmathematical skills and enhance thinking power of students.
2)To give the knowledge to the students of Statistics, Linear Differential Equations, Vector Differential Calculus,Laplacetransforms ,Fourierserieswithanemphasisontheapplicationof solving engineering problems
3) Topreparestudentstoformulateamathematicalmodelusingengineeringskills&interpret the solution in real world.

Course Outcomes:the student will be able to:

1) Solve Linear Differential Equationswith constant coefficients.
2) Describe the statisticaldata numerically by using Lines ofregressionandCurvefittings.
3) FindLaplacetransformsofgivenfunctionsanduseittosolvelineardifferentialequations.
4) Applyknowledgeofvectordifferentiationtofinddirectionalderivatives,curlanddivergenceofvector fields.
5) DevelopFourierseriesexpansionofafunctionoverthegiveninterval.
6) Make use of Partial Differential Equation to solve the Mechanical Engineering problems.

Unit 1.Linear Differential Equations: (**7)**

1.1 Linear Differential equationswithconstant coefficients.
1.2 Rules tofindcomplementaryfunction.
1.3 Methodsto find particular Integral (e^{ax},$\sin ax$ or $\cos ax$,x^m, $e^{ax}x^m$, $e^{ax}\sin ax$or $e^{ax}\cos ax$)
1.4 Cauchy'shomogeneous linear differential equations.

Unit 2. Correlation, Regression & Curve Fitting:(7)

2.1 Introduction.
2.2 Karl Pearson's Coefficient of Correlation.
2.3 Lines of regression of bivariate data.
2.4 Fitting of Curves by method of Least-squares:
  2.4.1 Fitting of Straight lines.
  2.4.2 Fitting of exponential curve
  2.4.3 Fitting of second degreeParabolic curves.

Unit 3.Laplace Transform and itsApplications: (7)

3.1 Laplace transformofelementaryfunctions.
3.2 Properties of Laplacetransform (First Shifting, Change ofscaleproperty,and Multiplication& Division byt).
3.3 Laplace transforms ofderivatives and integral.
3.4 Inverse Laplace transforms bypartial fractions & convolution theorem.
3.5 Solutionof Linear differential equation with constant coefficients usingLaplace transforms.

Unit 4.Vector Differential **(6)**

4.1 Differentiation of vectors.
4.2 Gradientof scalar point function.
4.3 Directional derivative.
4.4 Divergence of vectorpoint function.
4.5 Curl of avector point function.
4.6 Irrotational, Solenoidal and Scalar potential function of a vector field.

Unit 5. Fourier series **(6)**

5.1 Introduction
5.2 Definition, Euler's formulae.
5.3 Dirichlet's conditions.
5.4 Change of interval.
5.5 Expansions of odd and even functions.
5.6 Half range series.

Unit 6 Partial Differential Equations and Applications: **(9)**

6.1 Formation of partial differential equation
6.2 Method of separation of variables.
6.3 Wave Equation and its solution
6.4 One dimensional heat flow equation
6.5 Solutions of Laplace equations by the Gauss – Seidel iterative method

ReferenceBooks:

1) AdvanceEngineeringMathematicsbyErwinKreyszig (WileyIndia.)
2) Mathematical Methodsof Science and Engineering, by Kanti B. Datta (Cengage Learning.)
3) AdvancedEngineering Mathematics, 3e, byJackGoldberg (OxfordUniversity Press.)
4) Engineering Mathematics byV. Sundaram(Vikas Publication.)
5) Higher Engineering Mathematics, byB. S.Grewal (Khanna Publication Delhi.)
6) Higher Engineering Mathematics, byB. V.Ramana(Tata McGraw-Hill)
7) AdvancedEngineering Mathematics, byH.K.Das (S. ChandPublication.)
8) AppliedMathematics by NavneetD.Sangle (Cengage Publication)

GeneralInstructions:

1) Forthetermworkof25Marks, batch wisetutorialsaretobeconducted.Thenumberof students per batch per tutorial should be as per University rules.

2) Number of assignments should be at least six (All units should be covered).

S.Y.B.Tech (PRODUCTION ENGINEERING) –Sem. III
ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE CODE: BSC-PE202

Teaching Scheme	**Examination Scheme**
Lectures: 3hours/week	**ESE: 70 Marks**
Practical:2hours/week	**CIE: 30 Marks**
Credits: 4	**Term Work: 25 Marks**

Pre-requisites: Basic Electrical Engineering

Course Objectives:

1) To understand Essential concepts & applications of Electric motors
2) To Select suitable drives for different mechanical systems.
3) To understand concepts of various switching devices and electronic controllers
4) To understand concept of electrical heating.

Course Outcome: The students should be able to

1) Understand the theoretical and practical's concepts of Electric motors
2) Design various speed control techniques for Electric motors.
3) Decide complete Electrical drive system for Industrial applications
4) To study electronic controllers
5) Apply Electrical heating methods for Industrial furnaces

Unit 1: (6)

D C Motor: Construction, working, types, back emf, speed equation, torque equation, speed torque characteristics, power losses, applications, Need of starter, 4 point starter, reversal of rotation

Unit 2: (6)

3 Phase Induction Motor: Construction, working, types, speed equation, torque equation, speed torque characteristics, power losses, applications, Need of starter, star delta starter, DOL starter, reversal of rotation

Unit 3:(6)

Electric Drives and Their Control– group drive, individual drive, Selection of a drive for different types of mechanical load(Based on speed-torque variation, based on duty period, active/passive. Determination of power rating of an electric motor for continuous duty-constant load.Speed control of 3 phase induction motor - voltage control*, VFD control* (*Numerical treatment)

Unit 4:(6)

Solid State Switches- Switching phenomenon in SCR, IGBT, Electronic controllers* - AC to DC converter(1 quadrant, 2 quadrant, 4 quadrant), DC to AC converter(Inverter) for voltage and frequency control. (Numerical treatment)

Unit 5:(6)

Sensors And Transducers- Parameters, Classifications, resistance transducers, inductance transducers, proximity sensors, tachogenerator, torque measurement using strain gauge.

Unit 6:(6)

Electric Heating- Construction and working of indirect resistance furnace, 3 phase direct arc furnace, indirect arc furnace, coreless induction furnace, High frequency eddy current heat treatment. (Numerical treatment)(Topics marked by * co-related.)

Internal Semester Evaluation (ISE):

Minimum 8 experiments based on following topics:

1. Speed control of d c motor and 3 phase inductionmotor
2. Reversal of rotation of d c motor and 3 phase inductionmotor
3. 4 point starter and induction motorstarter
4. Electroniccontrollers
5. Measurement using sensors / sensorParameters
6. Switching action of s s switches / characteristics of s sswitchingdevices.
7. Energy calculations for electricfurnace.
8. Industrial visit to study electricfurnace.

Text Books:

1. Electrical Technology (Vol. II)- B. L. Theraja , S. ChandPubl.
2. Utilization of Electric power- R.K.Rajput,LaxmiPubl.
3. Mechatronics – M D Singh, J G Joshi,PHI
4. Power electronics - P CSen, Tata McGraw Hill

Reference Books:

1. Electrical power – S. L. Uppal, DBSPublication
2. Mechatronics-Integrated Mechanical Electronic Systems- Ramchandran, Vijayraghavan, Balsundaram, Wiley India.

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: III

MACHINE TOOLS & PROCESSES

Course Code : PCC-PE203

Teaching Scheme
Lectures: 3hours/week
Practical:2hours/week
Credits: 4

Examination Scheme
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks
Oral Examination :25 Marks

Pre-requisites: Engineering Physics, Workshop practice

Course Objectives:

1) Study and understand the various conventional and basic machine tools and manufacturing processes carried out on these machines for different applications-outsight.
2) Identification of basic knowledge about machine tools and their overall idea ofconstruction.
3) To study various parts of the machine tools used in manufacturing machine shopsonly
4) To study the constructional design aspect of various engineering machine toolsonly.
5) To study the assembly (Fitment of parts- detailing) of various engineering machine toolsonly.
6) To study assembly of various machine tools, actual fitments of components / assembly of conventional and present era machinetools.

Course Outcomes: Students will be able to

1. Know various kinds of machine tools of previous and present era machinetools.
2. Visualize positions of each components of the machinetool.
3. Know the different components and their work contribution through different operations performed on the particular machinetool.
4. Design/ alternate designs of the same machine tool or different machinetool.
5. Students will learn visualize and design components/ shapes demanded by the present / advanced machine tools.
6. Process plan and manufacture the newly designed components of their own design for betterment, lesser time and economy ofproduction.

Unit 1: Lathe: **(8)**

Specification, types of lathe; different parts, Apron mechanism; operations on lathe, accessoriesand attachments, lathe tools, machining time calculation for turning.

Unit 2: Shaping & Planning Machine: **(5)**

Different elements of shaping & planning machines; specification. Shaper drive, feedmechanism, work holding devices, different machining operations in shaper & planer: flatsurfaces, slot cutting, grooving, T- slot, dovetail, machining time calculation, shaping andplanning tools, difference between planer &shaper.Slotting Machine: specification of slotter, slotting drive

Unit 3: Drilling Machine: **(5)**

specification, classification of drilling machine; work and tool holding devices, differentmachining operations in drilling, nomenclature of drill, reamer, machining time calculation,center drilling,Boring machine: specifications, Types of boring machines, different operations, boring barand head

Unit 4: Milling Machine: **(8)**

Introduction, Classification, Principal parts of column and knee type milling machine andvertical milling machine, work holding devices, Milling machine attachments, Milling cutterstypes, fundamentals of the Milling process- Up milling and down milling, Milling operationconcepts, Indexing- Direct, Simple, Compound, Differential and Angular indexing,calculations, problems, machining time calculations

Unit 5: Gear Manufacturing and Broaching: **(4)**

Gear shaper, hobbing and gear finishing processes Broaching: Construction and working ofhorizontal, vertical pull type and push type Broaching machine, Use of broach head andfixtures.

Unit 6: Grinding Machine: **(6)**

specification of grinding wheel; different types of grinding processes:-surface, cylindrical &internal grinding, tool & cutter grinding; wheel mounting, wheel dressing, wheel truing, wheelbalancing, machining time calculation

Term work:

1. At least two industrial visits to study applications related to the subject and submission of the relevant reports.
2. Center lathes (Calculation and creation of setup for a taper turning exercise. Each group of about five students should create a setup for a different exercise along with submission of schematic sketch anddescription.)
3. Milling machines - Setting up of indexing mechanism on Universal Dividing Head for one exercise (Each group of about five students should create a setup for a different exercise along with submission of schematic sketch anddescription.

Study of construction, working mechanism and applications of any two of the following

4. GrindingMachines
5. DrillingMachines
6. Gear Manufacturing and Broaching

Recommended Text Books:

1. Workshop Technology Vol. I & II by HajraChaudhary, (Media Promoters & Publishers Pvt. Ltd.Mumbai)
2. Workshop Technology Vol. I , II and III by W.A.J. Chapman, (ELBS)
3. Manufacturing Processes & Systems by Phillip F. Ostwald &JairoMinoz (John Willey &Sons.)
5. Manufacturing Processes by BegemanAmstead,(Wiley.)
6. Manufacturing Processes by Rusinoff, (Tata McGraw Hill Publishing Co.Ltd.)
7. Advanced Manufacturing Technology by Kalpakjian (Addison Wesley)
8. Manufacturing Technology – Metal Cutting & Machine Tools by P. N. Rao(TMH)
9. Workshop Technology Vol. II by Bawa H. S.(TMH)

Reference Book:

1. Production Technology – HMT Handbook(HMT)
2. Production Technology by Jain Gupta, (Khanna Publishers, New Delhi)
3. Ghosh and A. K. Malik, Manufacturing Science, Affiliated East West Press Pvt. Ltd., New Delhi,2008.
4. H. El Hofy, Fundamentals of Machining Processes, Taylor and Francis, 2006.
5. G.C.SenandA.Bhattacharyya,PrinciplesofMachineTools,NewCentralBookAgency(P)Ltd., Calcutta, 2nd Revised Edition, 2009.
6. V. K. Jain, Advanced Machining processes, Allied publishers, New Delhi, 2008.J. A. McGeough, Advanced methods of machining, Chapman & Hall, London, 1st Edition,1988

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: III

MACHINE DRAWING

COURSE CODE:PCC- PE204

Teaching Scheme
Lectures: 2hours/week
Practical:4hours/week
Credits: 4
Oral Examination : 25 Marks
Pre-requisites: Engineering Graphics

Examination Scheme
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks

Course Objectives:

1) Understanding, preparation and reading of 2D drawings of various machine parts and assemblies used in industry.

2) To develop primary knowledge of working drawings.

3) To develop skills to produce assembly and detail drawings of machine parts.

Course Outcomes: Students should be able to:

1) Read and interpret engineering drawings.

2) Represent machine components using standard conventions.

3) Selection of required fits and tolerances for the designed components.

4) Draft 2D drawings of assembly and details of systems, along with preparation of bill of materials.

5) Free hand sketching of engineering components.

Unit 1 Study of I.S. conventions: (4)

Designation of drawing sheet sizes according to ISO A-series. Title blocks details and sizes. Screw thread terminology.Various parts of screw threads.Forms of screw threads.Conventional representation of threads [internal & external]. Different types of nuts and bolts, studs, set screws, cap screws, lock nuts, washers and split pins. To draw views of hexagonal, square nuts and bolts according to scale. IS conventions for- chamfers, tapped and drilled holes, slope and taper & welded joints, countersunk and counter bores. Conventions for showing different metals and materials on drawing. IS a convention of different types of gears like spur gears, helical gears, worm & worm wheel, bevel gears and rack &pinion. Conventions of different types of springs like helical spring, disc spring, spiral spring and leaf springs. Conventions for splined and serrated shafts. Conventions for straight & diamond Knurling, broken ends of shafts and rods. I.S. conventional representation of ball and roller bearings. Identification of bearings with reference to manufacturing catalogues.

Unit 2 Dimensioning with tolerances: (4)

Study of Limits, Fits and Tolerances.Hole base and shaft base system for selection of fits.Selection of class and grade of hole & shaft by using hole base system and shaft base system. Designation of fundamental deviation, types of fits and selection of fits between various parts.

Unit 3 Assembly and details of general units: (4)

Meaning and use of machine drawing.Purpose of making assembly and detail drawings.Classification of machine drawing production drawings, working drawings. Practice in making assembly and detail drawings of units consisting of not more than 8 to10 parts [excluding fasteners], giving dimensions with limits fits and tolerances. (Indicative list for assembly, details drawing) Engine parts and other machine parts – stuffing boxes, cross heads, Eccentrics, connecting rod, Piston assembly, Screws jacks, Machine Vices, Tailstock, Crane hook, Simple drill jig & milling fixture, simple press tool assembly, Tool holders etc.

Unit 4 Free hand sketching: (4)

To draw free-hand proportionate sketches of the machine parts like-

4.1 All types of taper and parallel keys. Flanged coupling, protected type flanged coupling, muff coupling, solid coupling, pin type flexible coupling and universal coupling.

4.2 Flat belt pulleys, V-belt pulleys, rope pulleys and fast and loose pulleys.

4.3 Simple solid bearing, bushed bearing, pedestal bearing, foot step bearing.

Unit 5 Preparation of working drawings: (4)

Preparation of working drawings of units and assemblies using suitable drafting software- Geometrical requirements like surface finish, flatness, straightness, parallelism, perpendicularity, concentricity, etc. Machining symbols, welding symbols, and other Surface texture, roughness values (Ra) and roughness grade numbers. Introduction to the basics of suitable drafting software.

Unit 6 Interpenetration of solids: (4)

Introduction, interpenetration of prism with prism, prism with cylinder, prism with cone, prism with pyramid, (prism and pyramid limited up to rectangular), cylinder with cylinder , cone with cylinder

Notes:-

1) Components mentioned above to be shown to the students before they draw it for understanding practical applications.

2) The Practicals for unit 5 should be conducted in the computer laboratory.

3) The Drafting Software based questions should not be covered in Theory Exam.

4) The focus should be given on ―Reading of Industrial Drawings by the students and the same should be considered during external orals.

Term Work: Each candidate has to draw following submission sheets on A-2 size drawing sheets-

1. IS conventions mentioned in topic 1.

2. Drawing details and assembly by taking actual measurements.

3. One sheet showing assembly from given details showing limits fits. (Given problem of details to be attached and need not be drawn. Extensive practice sheets required)

4. One sheet showing details from given assembly showing tolerances using suitable drafting software. (Given problem of assembly to be attached and need not be drawn).

5. Preparation of working drawings of simple machine parts, showing machining symbols, geometrical requirements, surface finish, welding symbols etc. using suitable drafting software.

6. One sheet based on free hand sketching of machine parts mentioned in topic 4.

7. One sheet based on interpenetration of solids.

Oral Examination: External oral will be conducted based on the term work, suitable drafting software and above syllabus. Note: The practical sessions for the drafting software shall be conducted in the computer laboratory. Appropriate adjustments should be made in the time table for the said practical sessions.

Text Books:

1. Machine Drawing by N.D.Bhatt, (Charotar Publication, Anand)

2. Machine Drawing by N. Sidheswar, Shastri, Kanaiah, (TMH.)

3. Machine Drawing by K.L.Narayanan., (New Age International Publishers)

4. Machine Drawing by R.K.Dhavan, G.R. Nagpal, and (S. Chand & Co.)

5. Machine Drawing by P.S. Gill, (S. K. Kataria, Delhi)

6. Engineering drawing by N. D. Bhatt, (Charotar Publication, Anand)

Reference Books:

1 IS: SP 46- Engineering drawing practice for schools and colleges, BIS Publication.

2. Graphic Science & Design by French, Vierck& Foster (McGraw Hill)

3. Production Drawing: K L Narayana, P Kannaiah,KVenketa Reddy, (New Age International)

4. Machine drawing with Auto CAD GoutamPurohit&GoutamGhosh, Pearson Edition

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: III

THERMAL ENGINEERING

COURSE CODE: PCC-PE205

Teaching Scheme	Examination Scheme
Lectures: 3hours/week	ESE: 70 Marks
Practical:2hours/week	CIE: 30 Marks
Credits: 4	Term Work: 25 Marks

Prerequisites: Engineering Physics, Engineering Chemistry

Course Objectives:

1. To apply the fundamentals of thermodynamics to various power producing and power absorbingdevices.
2. To analyze the performance of thermodynamic systems and understand theirapplications.
3. To understand the basic modes of heat transfer and applications of thesame.
4. To understand the use of steam for power generation and processheating.
5. To become familiar with the working of air standard cycles and application of thesame.
6. To get acquainted with the basic principles of refrigeration andair-conditioning.
7. To understand the basic concepts of aircompressors.

Course Outcomes:student should be able to:

1. Implement the laws of thermodynamics to various power producing and power absorbingdevices.
2. Comprehend the application of the modes of heat transfer to devices such as heatexchangers.
3. Understand the use of steam for power generation, process heating and relevant calculations for the efficiency of a powerplant.
4. Analyze IC engines and evaluate their performance using relevantparameters.
5. To understand the working of refrigeration systems and measure theirperformance.
6. To get acquainted with air conditioning systems and the determination of physical and thermodynamic properties of gas vapormixtures.
7. To evaluate an air compressor and the methods of enhancing efficiency (multi-staging)

UNIT 1

Thermodynamics (6)

Limitations of the first law of thermodynamics, Second Law, Clausius Statement, Kelvin - Planck statement, Equivalence of the two statements, Corollaries of the second law, Refrigerators and Heat pumps, Reversibility and irreversibility, causes of irreversibilities, Carnot Theorem, Phase propertydiagram.

UNIT 2

VapourPowerCycles(9)

Properties of steam, Ideal Rankine Cycle, Thermal efficiency,

Nozzles

Flow of steam through Nozzles, critical pressure ratio, maximum discharge, effect of friction, calculation of throat and exit areas, nozzle efficiency, Use of Mollier Chart

Turbines and Condensers

Introduction to steam turbine, Types, Compounding Introduction to condensers, Types

UNIT 3

HeatTransfer(5)

Modes and laws of heat transfer, steady state heat conduction, thermal resistance, Insulating materials, Heat Exchangers - Classification and Types

UNIT 4

InternalCombustionEngines (8)

Analysis of air- standard Otto, Diesel and Dual combustion cycles, Mean effective pressure, Classification of IC engines, Construction and working of two stroke, four stroke, S.I and C.I engines, Systems for IC engines - Cooling and lubrication system, Governing of IC engines, Performance of IC engines - IP, BP, Thermalefficiency, Specific fuel consumption, Heat balance, Applications and Testing of IC engines.

UNIT 5

Compressors(5)

Applications of compressed air, Classification of air compressors, Thermodynamic analysis of single stage and multi stage reciprocating air compressors without clearance volume, Work and power calculations, Volumetric efficiency, FAD, Construction and working of Centrifugal and Axial flow air compressor

UNIT 6

Refrigeration andAirconditioning(7)

Applications of refrigeration, Reversed Carnot Cycle, Bell Coleman Cycle, Analysis of Simple Vapour Compression Cycle, Representation on T-S and P-H diagrams, COP and power calculations, Introduction to Vapour Absorption Cycle, Types and properties of refrigerants, Eco-friendly refrigerants,
Psychrometry - basic concepts, terms and processes
Summer, Winter and Industrial Air conditioningSystems.

Term Work

1. Study of constructional details of boilers.
2. To determine the thermal conductivity of a metallicrod.
3. To determine experimental heat transfer coefficient for naturalconvection.
4. A trial on IC engine to determine Brake specific fuel consumption (BSFC) and thermalefficiency.
5. A trial on reciprocating air compressor to determine isothermal and volumetricefficiency.
6. Industrial visit to study refrigeration / air conditioning plant and submission of relevantreport.
7. Visit to a steam power plant to understand the working of its primaryconstituents and submission of relevant report.
8. Determination of COP of a vapour compression refrigerationsystem.

Text Books:

1. Basic and Applied Thermodynamics by P.K.Nag (TMH).
2. Thermal Engineering by R.K. Rajput (LaxmiPublications).
3. Thermal Engineering by P.L. Ballaney (KhannaPublishers).
4. Thermal Engineering by B.K. Sarkar (TMH).
5. Thermal Engineering by Kodandaraman (New Age International Publication).

Reference Books:

1. Thermodynamics - an engineering approach by Y.A. Cengel (TMH).
2. Heat Transfer by Holman J.P (TMH).
3. Basic Refrigeration and Air conditioning by Ananthanarayanan (TMH).
4. I.C. Engines by Mathur and Sharma (DhanpatRayandCo.).
5. Heat Transfer by S.P. Sukhatme (OrientLongman).
6. Power Plant Engineering by Domkundwar (DhanpatRayandCo.).
7. Basic Engineering Thermodynamics by Rayne Joel (ELBS).

S.Y. B. Tech (PRODUCTION ENGINEERING) Semester: III

OBJECT ORIENTED PROGRAMMING WITH C++

COURSE CODE:PCC-PE 206

Teaching Scheme **Examination Scheme**
Lectures: 2hours/week
Practical:2hours/week **Term Work : 25 Marks**
Credits: 3Practical oral Examination: 50 Marks

Pre-requisites: C Programming

Course Objectives:

1) To understand basic concepts of C++ language.

2) To develop programming skills using object oriented programming with C++.

3) To develop basic skills of office automation.

Course Outcomes:

1) Student will be able to create program using C++ language.

2) Student will be able to create document, data spread sheet using MS-Excel.

3) Increase in logic development capability of student.

Unit 1. Introduction to C++: **(5)**

Introduction, Applications of C++, C++ statements, Structure of C++ program, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types..

Unit 2. ArraysandFunctions: **(5)**

One dimensional and two dimensionalFunction types, Recursive function, Function & Arrays, Function with default argument

Unit 3. Pointers, Virtual Function & Polymorphism: **(3)**

Declaration, Pointer arithmetic, Pointers & functions, Pointers to a function, Pointer & arrays

Unit 4. Virtual Function & Polymorphism: **(4)**

Virtual Function and Pure virtual function, Function Overloading, Operator Overloading

Unit 5. Inheritance, File Handling: (4)

Forms of Inheritance, Direct & Indirect base class, Types of derivations (public, private, protected), Opening file, writing data, reading data, closing file, file copy, file opening modes Templates, Function template, Class template, Exception handling

Unit 6. Templates and Exception Handling: (3)

Templates, Function template, Class template, Exception handling

Term Work:

1) Development of minimum two Programs on each unit.

Note: For Practical Examination: One candidate on one PC terminal.

The practical examination shall include the following points:

1) At least one program in C++ to be compiled and executed

2) Followed by Oral Examination in C++

Text Books:

1) Let Us C++ -YashwantKanetkar (BPB Publications)

2) Mastering C++- K. R. Venugopal (Tata McGraw Hill)

3) Programming with C++ -Ravichandran (Tata McGraw Hill)

Reference Books:

1) Object Oriented Programming –E.Balgurusamy (TMH)

2) Programming with C++ --Hubbard (Schaum Series) Tata McGraw Hill

3) Waite Group‘s Object Oriented Programming in C++, Robert Lafore, Galgotia

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: III

WORKSHOPPRACTICE-III

COURSECODE :PCC-PE207

Teaching Scheme:	Examination scheme
Practical: 2 Hrs. per week	Term Work: 50 Marks
Credit 1	

Course Objective:
To practice basic metal cutting processes and acquire elementary skills.

Course Outcomes:
After completion of this course a student will be able to perform basic metal cutting processes and acquire elementary skills to produce the specified jobs.

Term Work

1 Machine shop – Two jobs (Mating parts).

Job 1-20Marks.

Facing, Plain turning, Step turning, External taper turning, External threading, knurling, Parting-off,

Job 2-20Marks.

Facing, Plain turning, Drilling (Using Radial drilling machine), Boring, Internal threading. Flat machining (Using milling machine or shaping machine)

2 Hand forging and grinding ofdummytools **10Marks.**

Note:-
1 Practical load should be allotted to Teaching Faculty and instructor will help him to complete the term work.
2 Students should prepare setup wise process drawings showing all the details in work diary.
3 Dimensional accuracy is of prime importance.
4 Student must maintain work diary showing regular progress in the semester.
4. Assessment of the term work should be carried out considering the above points.

S.Y. B. Tech (PRODUCTION ENGINEERING) Semester: IV

FOUNDRY TECHNOLOGY

COURSE CODE:PCC-PE208

Teaching Scheme
Lectures: 3hours/week
Practical:2hours/week
Credits: 4
Oral Examination: 25 Marks

Examination Scheme
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks

Pre-requisite: Engineering Physics, Engineering Chemistry

Course Objectives:

1) To understand the basic casting process, sequence of operations be followed through design of pattern and gatingsystem.
2) To gain fundamental knowledge of various traditional and special castingprocesses.
3) To understand cause and effect of various defects incasting.
4) To Understand optimizing yield though use of casting simulationsoftware

Course outcome: Students should be able to

1) Know activities related to converting raw material in to a finishedproduct.
2) Understand use of CAD/CAM in designing and manufacturing pattern anddies.
3) Know means of improving castingyield.

Unit 1 Overview of Metal CastingTechnology:

Introduction (2)

- Importance of casting process as a manufacturingprocess
- Advantages and disadvantages of castingprocess
- Classification of foundries based on differentcriteria
- Flow chart describing basic steps & major foundryactivities
- Layout of different types of foundries
- Introduction to different ferrous and non-ferrous cast alloys and theirapplications

Unit 2 Introduction to FoundryTooling:
Patterns, core boxesanddies. (3)

- Types of patterns
- Material used for patternmaking
- Tools for patternmaking
- Criteria for selection of patternmaterial
- Functions of patterns, core boxes anddies
- Design and layout of patterns, core boxes anddies
- Application of allowances and selection of partingline
- Use CAD- CAM in Designing and manufacturing of patterns

Unit 3 Gating and Risering System, Sand Conditioning

(3a) Gating andRiseringsystem (4)

- Components of gatingsystem,
- functions andimportance
- design parameters of gatingsystem
- Gatingratio,
- Pressurized and un-pressurized gatingsystems.
- Risers, functions andmodulus.
- Directional solidification,
- Methods of improving castingYield
- Numerical treatment to be given to design of and gating system and riserdesign.
- Use of simulation software for designing, optimization of gating,risering.

(3b) Sand molding,coremaking: (6)

- Sand mullers and mixers, continuous and intensive mixers, sandslinger
- Sand conditioning and sandreclamation.
- Green sandmixes.
- Ingredients of green sand and their effect on properties of green sand like – Strength, Permeability, Compatibility, Permeability, Wet-tensile, Friability, andCollapsibility.
- Introduction to resin sands – Alkyd resins, Phenolic resins, Furansands
- Hand molding tools and machine moldingmachines.
- High pressure line, disamatic (flask less) and shell molding, magnetic molding, vacuum CO2 molding
- Simple sand mixes for coremaking,
- Oil sand, cold box processes,
- Shell core making. Core shooters for shell core making and coldbox
- Core assembly, Use of core prints and chaplets, Core and mouldventing

Unit 4 Special casting technology

Introduction to special casting techniques (4)

- Investment, full mold, ceramic castings and theirapplications.
- Squeeze casting, vacuum casting, slush casting, Centrifugal casting and Die castingTypes

and applications

Unit 5 Melting technology

Melting practices **(8)**

- Types of melting furnaces: Cupola: construction and working of cupola, lining material,
  Raw material for melting, Charge calculations (numerical treatment), Latest designs and
  Modifications in cupola melting. Rotary furnaces, Oil fired furnaces. Electric furnaces–
  Induction and arc furnaces (Construction, working, applications and selection parameters
  for furnaces)
- Composition, physical properties and applications of ferrous and non-ferrous castings–
  Grey cast iron, S. G. iron, White cast iron, malleable cast iron, Al,Cu,Mg based alloys.
- Importance and methods of inoculation in cast irons and De-oxidation practices insteel
  castings.
- Degassing and modification treatments in aluminum, copper and magnesium alloycastings.
- Ladles – Types, Use, Lining materials. Automatic ladlesystem
- Instruments for process control: Composition tests – CE meter, Wedge test, Fluiditytest,
  Wet chemical analyses, and Spectrometers. Temperature tests – Pyrometers
- Maintenance and energy savingconcepts

Unit 6 Post melting operations

Fettling and cleaning of castings **(2)**

- Knock out, Cutting of in-gates,Risers
- Shot blasting
- Finishing by using pneumatic chippers andgrinders
- Salvaging ofcastings

Defects, inspection and testing of castings **(3)**

- Casting defects –Analyses andremedies.
- Testing of strength andhardness
- Non-destructive testing of castings-Visual and dimensional inspections, dye penetranttest,
  magnetic particle inspection, ultrasonic test, Leak test.
- Casting rejectionanalysis

Heat treatment and paintingofcastings: **(2)**

- Purposes, methods.(Annealing, normalizing, hardening and stress relieve hardening)
- Age hardening of Al alloycastings
- Painting of castings: Purpose types and methods of painting ofcastings

Pollution and safetyinfoundries (2)

- Possible hazards infoundries,
- Safety measures, Safetydevices
- Types and sources of pollution infoundries,
- Measures for pollution control

Term Work:

1. Two industrial visits one each to a ferrous and a non-ferrous foundry to study foundry practices and submission of the relevantreport.
2. Drawing sheet based on Design of pattern, Pattern layout, Pattern allowances, Selection of parting line, gating and riseringsystemdesign.
3. Pattern making based on the exercise no. 2 above. (4 practical turns for pattern making job in patternshop)
4. Study of types and different tests on raw and preparedsand.
5. Sand tests of minimum three types (Sieve analyses, Sand preparation, green/dry Strength, clay content, moisture content, Mould and corehardness)
6. Study of types of molds and cores.
7. At least one simple exercise for pattern making and metal pouring for the same separately for a group of about five students.
8. One presentation of 10 minutes by each student related to the subject and submission of the write up on the presentation.(Optional)

Text Books:

1. Manufacturing Technology: Foundry, Forming & Welding by P. N. Rao (TMH)
2. Metal Casting – Principles & Practice by T. V. Rama Rao (New Age International Pvt.Ltd.)
3. A Text Book on Foundry Technology by M. Lal, O. P. Khanna (DhanpatRai&Co.)
4. A Course on Workshop Technology – Vol. 1 by B. S. Raghuvanshi; (DhanpatRai&Co.)
5. Fundamentals of Metal Casting by P. C. Mukharjee (Oxford & IBH PublishingCo).
6. Principles of Foundry Technology by P. L. Jain (Tata McGraw-Hill)
7. Foundry Practice by N. D. Titov (MIR)
8. Foundry Engineering by Taylor, Flemings, Wulff (Wiley EasternLtd.)
9. Principles of Metal Casting by Heine, Loper,Rosenthal

Reference Books:

1. Casting Technology and Casting Alloys by A.K.Chakraborty, (PHL Learning PvtLtd.)
2. Iron and steel making by AhindraGhosh, AmitChatterjee (PHL Learning PvtLtd.)
3. Complete Casting Handbook-Metal Casting Publication)Processes, Metallurgy, Techniques & Design by John Campbell (BHPublication)
4. The FOSECO Foundry man's handbook 10^{th} edition by Butter Worth-Heinemann (BH)

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: IV

ADVANCED MACHINE TOOLS & PROCESSES

COURSE CODE: PCC-PE209

Teaching Scheme
Lectures: 3hours/week
Practical:2hours/week
Credits: 4
Oral Examination: 25 Marks

Examination Scheme
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks

Course Objectives:

1) Study and understand the various nonconventional and CNC machine tools and manufacturing processes carried out on these machines for different applications- outsight.

2) Identification of basic knowledge about Composite material and Manufacturing Processes for composites material.

3) Identification of basic knowledge about advanced machine tools and their overall idea of construction.

4) To study various parts of the machine tools used in manufacturing machine shops only

5) To study the constructional design aspect of various engineering machine tools only.

6) To study the assembly (Fitment of parts- detailing) of various engineering machine tools only.

7) To study assembly of various machine tools, actual fitments of components / assembly of conventional and present era machine tools.

Course Outcomes: Students will be able to

1) Know various kinds of machine tools of previous and present era machine tools.

2) Visualize positions of each components of the machine tool.

3)To know the different components and their work contribution through different operations performed on the particular

machine tool.

4) Design/ alternate designs of the same machine tool or different machine tool.

5) Visualize and design components/ shapes demanded by the present / advanced machine tools.

6) Process plan and manufacture the newly designed components of their own design for betterment, lesser time and economy of production

Unit no: 1

Non-Conventional Machining Processes and Rapid manufacturing Non-Conventional Machining: (5)

Importance & scope of various non-conventional machining processes like Electro-Chemical machining (ECM), Electro-Discharge machining (EDM), Wire Electro-Discharge machining (WEDM), Abrasive Jet Machining (AJM), Laser Beam Machining (LBM), Ultrasonic Machining (USM),Abrasive water Jet Machining (AWJM), Photochemical machining(PCM) Rapid manufacturing:
(2) Definition of rapid manufacturing, Process overviews, Selective Laser Sintering, Fused deposition modeling, Laminated object manufacturing, Laser powder forming.

Unit no: 2

Gear Manufacturing: (6)

Gear Manufacturing – Different methods of gear manufacturing (for Spur, Helical, Bevel Gears), Casting, Rolling, Extrusion, Stamping, Powder Metallurgy of Gears, Machining of Gears (Forming, Template generating). Gear finishing by Shaving, Lapping, Grinding, and Burnishing.

Unit no:3

Thread manufacturing processes & Super Finishing processes Thread manufacturing processes: (3)

Thread Cutting on Lathe, Thread milling, Thread Grinding, Thread Whirling, Thread Rolling, Use of Chasers & Dies for thread manufacturing.

Super Finishing processes: (3)

Working, Scope & Importance – Lapping, Honing, Burnishing, Buffing, Electro polishing, Polishing & allied processes.

Unit no: 4

Introduction to Computer Numerical Control Computer Numerical Control: (5)

Principle of Operation of Numerically controlled (NC) machine tools, control of axis motion, Advantages and limitations, Computer Numerical Control (CNC)– advantages over NC machine tools, Types of controls in CNC:- Point-To-Point (PTP), Para-axial, 2 axis and 3 axis Continuous Path, Closed and Open Loop; CNC elements:- structure, spindle, Drives-DC & AC Servomotors, Stepper Motors, Linear Motors, Lead screws and ball screws, Feedback Devices, Coordinate system and Axis nomenclature

Unit no: 5

Introductions to CNC Machining Centers & Turning Centers CNC Machining Centers: (5)

Types and construction:- Vertical-Traveling Column, Gantry type, Multiple spindle; Horizontal, Use of rotary table, Types of Operations on VMC and HMC, Pallets and pallet changers, Tools for machining centers- Tool Holder (Adaptor), Retention knob, Collets, Various cutting tools and materials- HSS, Solid carbide, index able insert type, Cemented carbide, coated carbide, ceramics, Concept of Tool Presetting, Tool Magazines, Automatic Tool Changer

CNC Turning Centers: (4)

CNC Lathes, Types and construction, Slant bed, Vertical, Twin turret, Multiple Spindle; Tool Turret, Feed and indexing, Turn-mill centers, Live spindle tool adaptors, Types of operations on Turn-mill centers, Coordinate system for CNC lathes, Work Holding, Tools for CNC Lathes, ISO coding system for turning tools and inserts.

Unit no: 6

Composite material & CNC Support Systems: CNC Support Systems: (2)

Automatic Chip removal, Machine control unit (MCU), MCU operation control panel, Benefits, Control program, External inputs, External outputs, Additional programming facility, Communication, Tool Management, Graphic Proving,

Concept of a CNC Part Program Composite material: (3)

Definition of composite material – Classification - Application – Merits and Demerits. Manufacturing Processes for composites such as hand lay, filament winding, pultrusion, RTM, DMC etc.

Term Work: (To be assessed on the basis of Submission of Report of the following assignments)

1. Thread manufacturing: Calculation of Gear Trains for three different pitch values-Single and Double Start

2. Industrial visit to study Broaching, Thread Cutting and super finishing Processes

3. Industrial Visit to study Gear manufacturing Processes, (Gear cutting on Milling/ Shaping /Hobbing, Gear Grinding)

4. Industrial visit to study Construction, Operation and accessories of VMC, HMC and Turning centers

Recommended Text Books:

1. Workshop Technology Vol. I & II by HajraChaudhary, (Media Promoters & Publishers Pvt. Ltd. Mumbai)

2. Workshop Technology Vol. I , II and III by W.A.J. Chapman, (ELBS)

3. Production Technology by Jain, Gupta, (Khanna Publishers, New Delhi)

4. Manufacturing Processes by BegemanAmstead, (Wiley.)

5. Manufacturing Processes by Rusinoff, (Tata McGraw Hill Publishing Co. Ltd.)

6. Fundamentals of Modern Manufacturing – Materials, Processes & Systems (2/e) by Grover, Mikell P. (John Wiley & Sons)

7. Advanced Manufacturing Technology by Kalpakjian (AddisonWesley)

8. Manufacturing Technology – Metal Cutting & Machine Tools by P. N. Rao (TMH)

9. Workshop Technology Vol. II by Bawa H. S. (TMH)

10. CAD / CAM- Principles & Application (2/e) by P. N. Rao (TMH)

11. Computer Numerical Control - Machining & Turning Centers by Quesada &Jayapoovan (Pearson)

12. CNC Machines – M. Adithan, B.S.Pabala (New Age International Publication)

Reference Books:

1. Production Technology – HMT Handbook

2. Production Technology by Jain Gupta, (Khanna Publishers, New Delhi)

3. Ghosh and A. K. Malik, Manufacturing Science, Affiliated East West Press Pvt. Ltd., New Delhi, 2008.

4. H. El Hofy, Fundamentals of Machining Processes, Taylor and Francis, 2006.

5. G. C. Sen and A. Bhattacharyya, Principles of Machine Tools, New Central Book Agency (P) Ltd., Calcutta, 2nd Revised Edition, 2009.

6. V. K. Jain, Advanced Machining processes, Allied publishers, New Delhi, 2008.

7. J. A. McGeough, Advanced methods of machining, Chapman & Hall, London, 1st Edition, 1988

8. Non Conventional Machining Processes – Prof. P.K.Mishra(IIT, Kharagpur)

9. Rapid Manufacturing: An Industrial Revolution for the Digital Age – Editors N. Hopkinson, R.J.M. Hague and P.M. Dickens, (2006) John Wiley & Sons, Ltd., ISBN-10 0-470-01613-2

10. R.F. Gibson, Principles of Composite material mechanics, McGraw-Hill, Inc, Newyork, International edition 1994.

11. Robert M Jones, Mechanics of composite material, Taylor & Francis 2nd edition, Newyork, Indian Print 2010

12. G. Benedict, Nontraditional manufacturing processes, Marcel Dekker, New York, 1st Edition, 1987. 13. D. T. Pham and S. S. Dimov, Rapid manufacturing, Springer-Verlag, 1st Edition, 2001.

S.Y.B.TECH. (PRODUCTION ENGINEERING) – Sem. IV

THEORY OF MACHINES – I

COURSE CODE:PCC-PE210

Teaching Scheme	**ExaminationScheme**
Lectures: 3hours/week	**ESE: 70 Marks**
Practical:2hours/week	**CIE: 30 Marks**
Credits: 4	**Term Work: 25 Marks**

Pre-requisite: Engineering Physics

Course Objective:

1) To be familiar with common mechanisms used in machines and everydaylife.
2) To provide basic concept of kinematics and kinetics of machineelements.
3) To develop the ability to understand the concepts of mechanisms and the kinematic analysis ofmechanisms.
4) To study basics of powertransmission.

Course Outcomes: Students shall be able to

1) Define various components ofmechanisms.
2) Construct/Compose mechanisms to provide specificmotion.
3) Draw velocity and acceleration diagrams of variousmechanisms.
4) Construct CAM profile for the specific followermotion.
5) Select appropriate power transmissionmechanism.

Unit 1

Introduction:**(4)**

Theory of machines – scope, definitions-machine, mechanism, link, kinematic pair, degrees of freedom, mobility criteria, classification of kinematic pairs, conversion, inversion and expansion of mechanism, study of four bar chain, single slider and double slider crank chain and is inversions.

Unit 2

Kinematic Analysis of Mechanisms:

Velocity Analysis **(6)**

Concept of position, displacement and velocity of a point and link of a given mechanism, Kinematic analysis of mechanisms by - Relative velocity method, graphical method,

(mechanisms up to 6 links) Instantaneous Center method, (mechanisms up to 4 links) (Numerical

treatment expected)

Acceleration Analysis(6)

Concept of acceleration of a point and link of a given mechanism, Kinematic analysis of mechanisms by Relative method, graphical method, Corioli's Component of Acceleration , Klein's construction (Numerical treatment expected)

Unit 3

Simple Mechanisms: (4)

Condition for steering, Ackerman's steering mechanism, Davis steering mechanism, Hooke's Joint, Ratchet mechanism, Geneva mechanism. (Numerical treatment expected on Hooke's Joint)

Unit 4

Cam and Follower: (4)

Classification of cam and follower, Follower displacement, Simple Harmonic Motion, Constant Velocity, Uniform Acceleration and Retardation, Cycloidal motion, Graphical layout of cam, cam with specifiedcounters.

Unit 5

Friction: (4)

Friction, friction between screw and nut, square thread and v threads, friction in turning pairs-slider crank chain, four bar chain, friction at pivot and collar bearings uniform pressure and uniform wear theory, Greasy friction , Film Friction or Viscous Friction, Study of friction clutches. (Numerical treatment expected)

Unit 6

Belt, Rope, Brakesand Dynamometers: (4)

Belt Drives: Types of Belt and rope drive, angular velocity ratio, effect of belt thickness, effect of slip, length of belt, angle of contact, angle of lap, law of belting, crowning of pulley, limiting tension ratio, power transmission, centrifugal tension in the belt and its effect on power transmission, initial tension and its effect on power transmission. Creep of belt (Numerical treatmentexpected).

Brakesand Dynamometers (5)

Introduction, External Shoe Brakes, Block Brakes, Double Shoe Block Brake, Internal Shoe Brake, Band Brakes, Band and Block Brake, Heat Generated in Braking.(Numerical treatment expected on Brakes) Dynamometers, Absorption Dynamometers & Transmission Dynamometers.

Term Work:

1. Atleastoneindustrialvisittostudyapplicationsrelatedtothesubjectandsubmissionoftherelevantreport.(Compulsory)

2. One presentation (minimum 10 minutes duration) by each student related to the subject and submission of the write up on the presentation. **(Optional)** and **Minimum seven experiments from the followinglist.**

1. Study of machine andmechanisms.
2. Velocity analysis. - By Instantaneous Centermethod
3. Velocity and Acceleration analysis. - By relativemethod.
4. Study of mechanisms with lowerpairs.
5. Graphical layout of camprofile.
6. Study of frictionclutches.
7. Study ofdynamometers.
8. Study of Belt and RopeDrive.

Text Books:

01. Theory of Machines and Mechanisms, by P. L. Ballaney, (KhannaPublishers,Delhi)
02. Theory of Machines, by S. S. Ratan,(TMH)
03. Theory of Mechanism and Machines by Ghosh and Mallik(EWP)
04. Theory of machines, by Dr. R.K.Bansal, Laxmi Publication
05. Theory of Machines by R.S. KhurmiS.Chandandco.

Reference Books:

01. Theory of Machines, by Thomas Bevan, (CBS Publishers, Delhi)
02. Theory of Machines &Mechanisms, John Uiker, Garden Pennock& Late. J. F.Shigley,
03. Theory of Machines, by W.Green,
04. Kinematics of Machines by R T Hinckle (Prentice HallInc.)
05. Kinematics by V.M. Fairs (McGraw-Hill)
06. Mechanism Design: Analysis and Synthesis Vol. I by A. Erdman and G.N. Sander (PrenticeHall)
07. Kinematics and Dynamics of Planer Mechanisms by Jeremy Hirsihham (McGraw-Hill)
08. “Machines and Mechanisms Applied Kinematic Analysis”, David H.Myszka,Pearson Education, Asia.
09. “Design of Machinery”, R. L. Norton, McGraw-Hill.

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: IV

ANALYSIS OF MACHINE ELEMENTS

COURSE CODE:PCC-PE211

Teaching Scheme	ExaminationScheme
Lectures: 3hours/week	ESE: 70 Marks
Practical:2hours/week	CIE: 30 Marks
Credits: 4	Term Work: 25 Marks

Pre-requisites: Engineering Mechanics

Course Objectives:

1) To study different type of stresses induced in structural parts due to loading conditions.
2) To study stress distribution diagram for various cross-sections.
3) To study different types of failures due to stresses induced and deflection.

Course Outcomes: **Student should able to**

1) Calculate direct and indirect stresses induced due to loading conditions.
2) Select best cross-section according to stress distribution diagram.
3) Optimize cross-section and length from design point of view.

Unit-1: Concept of stress, strain and strain energy (9)

Types of loads, Stress, Strain, Stress – Strain diagrams, factor of safety, failure stress, working stress, Modulus of Elasticity, Rigidity, Bulk Volume, relations, Hooke‘s law, Poisson‘s ratio. Strain energy: strain energy due to axial forces, strain energy in bending.

Unit-2: Shear Force and Bending Moment Diagram (7)

Shear force & Bending moments, Shear force and Bending moment computation and diagrams and diagram for statically determinate beams. Application for transverse point loads, UDL, UVL, Intermediate couples on simply supported and cantilever beams. Locating the place of contraflecture and maximum bending moments.

Unit-3: Stresses in beams (9)

Theory of Bending, Flexural formula for straight prismatic beams, Role of Moment of Inertia, for economic use of materials, Neural Axis, Section modulus, moment of resistance, stresses due to bending,

beams of uniform strength. Shear stresses in beams due to bending loads, Distribution of shear stresses across plane sections used for common structural purposes.

Unit-4: Direct and bending stresses (4)

Direct and Bending stresses: Axial loading combined with bending, eccentric loading on plane sections, core of section, middle third rule, applications to the problems of crane hooks, machine columns, brackets etc.

Unit-5 Deflection of beams (6)

Deflection of statically determinate beams due to bending loads, Macaulay‘s method. Application for simply supported and cantilever beams. Struts subjected to axial loading, end connections, Empirical design formulae, Euler‘s and Rankine‘s methods.

Unit-6: Principle stresses and principle planes (5)

Principal stresses and planes, general equations for direct stresses in mutually perpendicular directions along with shear stress, Mohr‘s circle, determination of maximum shear stress and their planes.

Term Work: The term work will consists of following assignments:
1. Calculation stresses and strain for given loading conditions
2. Computation of Shear force &Bending moment.
2. Computation of bending stresses and shearing stresses.
3. Problems on direct and Bending stresses
5. Problems on axially loaded struts and columns.
6. Problems on principal stresses

Instructions for oral examination:
1. Oral examination is based on simple concepts like stress, strain, plotting of stress distribution diagrams.
2. Oral examination is also based on practical implementation of Strength of Materials to Mechanical Engineering problems.

TEXTBOOKS:

1. “Strength of Materials”, S. Ramamruthum, DhanpatRai and Sons, New Delhi.
2. “Strength of Materials”, R. K. Bansal, Laxmi Publication, 4th Edition.

3. “Strength of Materials”, Khurmi Gupta, S. Chand Publication.
4. “Strength of Materials”, R.K. Rajput, S. Chad Publication.
5. “Mechanics of structure”, S.B Junnerkar,Charotar Publication House.
6. “Strength of Materials”, S. S. Bhavikatti, Vikas Publication House.
7. “Strength of Materials”, Timoshenko and Young, CBS Publication.
8. “Mechanics of Materials”, S. S. Ratan, Tata McGraw Hill Publication,
9. “Strength of Materials”, B. K. Sarkar, McGraw Hill Publication.
10. “Strength of Materials”, L. S. Negi, McGraw Hill Publication.

REFERENCE BOOKS:

1. “Strength of Materials”, Beer and Johnson, CBS Publication.
2. “Strength of Materials”, G.H. Rider,MacMillan India Ltd.
3. “Strength of Materials”, Nag and Chanda, Willey India Publication.
4. “Advanced Mechanics of Materials”, Boresi, Willey India Publication.
5. “Strength of Materials”, Den Hartong, McGraw Hill Publication.
6. “Mechanical analysis and design”, H. Burr and John Cheatam, PHI, New Delhi.

S.Y. B. Tech (PRODUCTION ENGINEERING) Semester: IV

COMPUTER AIDED SOLID MODELING

COURSE CODE:PCC-PE212

Examination scheme:

Teaching Scheme: **Term Work: 50Marks**

Lectures: 1 Hrs. per week Practical Oral Examination: 25 Marks

Practical: 2 Hrs. per week

Credits: 2

Pre-requisites: Machine Drawing, Engineering Graphics

Course Objectives:

1) To understand concepts of CAD, and its benefits and applications
2) To understand the concept of 3D modeling and its applications in the areas of CAM & CAE
3) To create solid models, Surface models, assemblies and drafting of a part by using suitable 3D modeling software.

Course Outcomes: Students shall be able to

1) Generate 3D solid models using suitable 3D modeling software.
2) Generate Surface models using suitable 3D modeling software.
3) Generate assemblies of simple industrial components using suitable 3D modeling software.

1. **Introduction to CAD:** **(2)**

Need for implementing CAD, Application of CAD and its benefits, Hardware Requirements, Different Software packages used for 3D Modeling. Concept of feature based and parametric modeling.

2. **Sketching:** **(5)**

2D sketching of elements likes line, circle, arc, spline etc. Dimensioning these elements, Geometrical constraints like parallel, perpendicular, co-incident, vertical, horizontal, tangent, symmetric etc.

3. **Generation of Solid models of any five components** **(7)**

(Preferably 03 industrial drawing with G; D and T annotations) using any suitable 3D modeling software package. Import and export of 3D solid models between two different software packages. Physical properties like volume, surface area, center of gravity etc of solid model.

4. **Introduction to Surfacing:** **(3)**

Generation of surface models of any three simple components using any suitable 3D modeling software

5. **Assembly Modeling:** **(4)**

Concept of Bottom up and top down approach, Building two composite assemblies of components (consisting at least five components) along with all relevant details, Exploded Views using assembly features in any suitable 3D modeling software.

6. **Generation of 2D Drawings:** **(3)**

Generation of Orthographic views of individual components required for shop floor [workingdrawings] from 3D model which will include all relevant views like front, side, top, bottom views,sectional views, dimensioning, dimensional and geometrical tolerances etc. Generation of title blocking sheet. Orthographic views of assembly drawings, generation of Bill of Materials (BOM). Plotting of drawings.

Term Work:

1. Development of at least 5 solid models using solid modeling features available in any suitable 3D modeling software package.

2. Developmentof at least 3 surface models using surface modeling features available in any suitable 3D modeling software package.

3. Development of 2 assembly models of at least 5 parts of different geometry.

4. Generation of 2D (Orthographic) drawings for shop floor using above solid models and surface models.

5. Generation of 2D (Orthographic) drawings of above assemblies along with exploded views

6. Retrieving physical properties for different component materials.

7. Plotting of above drawings on sheet.

Notes:

1. For term work no. 1 & 2 above A4 size sheets are to be used for printouts.

2. For term work no. 3 above A3 size sheets are to be used for printouts.

Practical Examination:

Development of solid model and generation of 2D views from the given part drawing followed by oral assessment based on above term work. (One computer terminal per candidate.)

Reference Books:

Various 3D modeling Software User Manuals.

1. CAD / CAM, Theory and Practice by Zeid, (TMH)

2. CAD / CAM, Principles & Applications by P. N. Rao (TMH)

S.Y. B. Tech (PRODUCTION ENGINEERING) SEM: IV

WELDING TECHNOLOGY

COURSE CODE: PCC-PE213

Teaching Scheme	**ExaminationScheme**
Lectures: 3hours/week	**ESE: 70 Marks**
Practical:2hours/week	**CIE: 30 Marks**
Credits: 4	**Term Work: 25 Marks**

Pre-requisites: Workshop Practice I & II

Course Objectives:

1. To gain knowledge of various types of conventional &non-conventional welding processes
2. To gain knowledge of various prerequisites; critical parameters of welding process
3. To gain knowledge of selection the appropriate welding process
4. To gain knowledge of selection of appropriate welding equipment, welding electrode, flux, type of flame, filler material
5. To gain knowledge of causes of defects generated during welding process; remedies to control defects.
6. To Gain Knowledge of welding automation.

Course Outcomes: Students should be able

1. To know the basics of various conventional &non-conventional Welding Processes
2. To understand advantages & limitations of welding processes and select the appropriate welding process based on application; customer requirement and specifications.
3. To demonstrate an ability to design of welding fixtures as per requirement and specifications.
4. To demonstrate an ability of inspection and testing of welded components.
5. To know the various aspects of estimation & costing of Welding jobs
6. To know the welding automation techniques.

Unit 1.Fundamentals and Classification of Welding Processes. (3)

Introduction, classification of Welding processes. Comparison with other joining processes, Advantages, disadvantages, practical applications. Welding Symbols. Basic & supplementary weld symbols, types of weld Joints, Selection of Weld Joint, and edge preparation.

Unit 2. Arc Welding Processes and Equipment's (6)

Definition, types of processes, Carbon Arc Welding, Flux Shielded Metal Arc Welding, Submerged Arc Welding, Tungsten Inert Gas Welding, Metal Inert Gas Welding, Electro slag Welding, Electro Gas Welding, Plasma Arc Welding , Arc Welding equipment's, Electrodes Types, classification and coding of electrodes.

Unit3. (3a) Gas Welding (3)

Principle of operation, types of flames, Gas welding Techniques, filler material and fluxes, Gas welding equipment's, advantages and applications

(3b) Resistances welding: (3)

Definition, Fundamentals, variables advantages and application, Spot Welding, Heat Shrinkage, Heat Balance Methods, Equipment, Electrodes, Seam, Projection Butt (up sets and flash), Percussion Welding – Definition, Principle of Operation, equipment, Metal Welded, advantagesand application.

(3c) Soldering and Brazing (3)

Definition, Comparison of Soldering, Brazing and Welding, principle, joint design, filler alloy,Fluxes, processes and application.

Unit 4.(4a)Introduction to Solid State Welding Processes (3)

Cold Welding, Diffusion Welding, Ultrasonic Welding, Explosive Welding, Friction Welding, Inertia and Forge Welding – Definition, principle of operation advantages, limitation andApplication.

(4b) Thermal Cutting of Metal (2)

Oxy-Fuel, Oxygen-Lance, Metal Powder, Chemicals Flux Cutting, Arc Cutting- Metallic, Air-Carbon, Tungsten Arc, Plasma Arc Cutting.

Unit 5. (5a) Weldability: - (2)

Definition, effect of alloying elements, Purpose and types of tests, Hot Cracking, Root Cracking and Cold Cracking Tests.

(5b) Weld Defects & Welding Distortion:-(2)

Common Weld defects, Causes and remedies. Concept of distortion, Types of distortion, Control of welding distortion

(5c) Inspection and Testing of Welds (4)

Destructive testing of weld – Tensile, Bend, Impact, Nick Break, Hardness, Etch Tests, Non Destructive Testing of Welds – Visual, Leak, X- ray and Gamma ray Radiography, Magnetic Particle Inspection, Dye, Fluorescent Penetrate Tests, Ultrasonic Inspection & Eddy Current testing.

Unit 6. (6a) Welding Fixtures (3)

Introduction, welding fixtures, their characteristics, classification and selection considerations, Principles governing design of good welding fixtures, various types of welding fixtures.

(6b) Welding Automation: - (3)

Introduction, Automation options, Simple Mechanization, Dedicated and Special Purpose Automation, Robotic welding, Modular Automation, Programmable control, Remote Control Slave and Automated Systems

Term Work

The Term Work shall consist of any 5 assignments out of first seven listed below. Assignment No.8 & 9 are compulsory.

1. One Job- Butt Joint or Lap Joint by Manual Metal Arc Welding
2. One Job- Edge or corner or T Joint by Manual Metal Arc Welding
3. One Job – by using TIG or MIG welding
4. One Job – by using Gas Welding
5. One Job by using Resistance Welding
6. One Job by using soldering Method
7. Study of selection of Welding Processes
8. Design of welding fixture.
9. Minimumone Industrial Visit to study advanced welding processes & submission its report

Text Books:

1. Welding Technology –O.P. Khanna (Khanna Publisher)
2. Welding & Welding Technology-by Richard Little (TMH)
3. Welding Technology –N.K.Srinivasan (Khanna Publisher)
4. Welding Processes and Technology by Dr. R.S.Parmar (Khanna Publisher)

Reference books:

1. Welding Science & Technology by Md. Ibrahim Khan (New Age International)
2. Welding Technology & Design by V.M.Radhakrishnan(New Age International Publisher)
3. Welding Guide and Handbook by- James E Brambaugh (Taraporwala Mumbai)
4. Welding by A.L. Davies – (Cambridge University Press.)
5. Welding Process Technology – P.T.Houltcroft (Cambridge University Press.)
6. Principles of Welding Technology- by L.M.Gourd (ELBS)
7. Advanced Welding systems- Vol..I ,II and III by JeamCornu (Jaico Publishing)
8. Arc and Gas welding- V. Rybakav (Mir Publication)
9. Practical Welding Technology- Rudy Molher (Industrial Press Inc.)
10. Manufacturing Technology: Foundry, Forming & Welding by P. N. Rao(TMH)

S.Y.B.TECH. (PRODUCTION ENGINEERING) – Part II,Sem. IV

WORKSHOP PRACTICE –IV

COURSE CODE: PE214

TeachingScheme:ExaminationScheme:
Practical:2Hrs./Week/Batch **Term Work: 50 Marks.**
Credit 1

Course Objective:
To practice basic metal cutting processes and enhance theskills.

One composite job consisting of three to four parts employing operations on lathe in addition to profile turning and eccentric turning and operations on Milling, Drilling Demonstration of Grinding operation on Grinding Machine.

Note:-
1) Students should prepare setup wise working drawing showing all the details in workdiary.
2) Dimensional accuracy is of primeimportance.
3) Student must maintain work diary showing regular progress in thesemester.

Assessment of the term work should be carried out considering the abovepoints.

Practical examination of 6 hours duration will be held and shall consist of preparation of job involving operations based on Workshop Practice-III and workshop practice-IV