METALLURGICAL ENGINEERING

DETAILED SYLLABUS FOR PART – 3 (3RD. YEAR) : SIXTH SEMESTER

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION											
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES											
DURATION OF COURSE: 6 SEMESTERS											
SEMESTER : SIXTH											
BRANCH : METALLURGICAL ENGINEERING											
SR. NO	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME					
			L	TU	PR	INTERNAL SCHEME			ESE	PR	Total Marks
						TA	CT	Total			
1	ADVANCE ENGINEERING MATERIALS & CORROSION METALLURGY	3	4	-	-	10	20	30	70	-	100
2	HEAT TREATMENT TECHNOLOGY	4	4	-	4	10	20	30	70	100	200
3	ELECTIVE – II : FERRO ALLOYS & DRI	3	4	-	-	10	20	30	70	-	100
4	NON - FERROUS METALLURGY	3	4	-	-	10	20	30	70	-	100
5	INDUSTRIAL MANAGEMENT	3	4	-	-	10	20	30	70	-	100
6	PROJECT WORK & SEMINAR	4	-	-	6	-	-	-	-	100	100
7	PROFESSIONAL PRACTICE - IV	2	-	-	3	-	-	-	-	50	50
8	GENERAL VIVA VOCE	3	-	-	-	-	-	-	-	100	100
T		25	20	-	13	50	100	150	350	350	850
STUDENT CONTACT HOURS PER WEEK : 33 hrs ; DURATION : 15 WEEKS / SEMESTER Theory and Practical Period of 60 Minutes each. L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.											

ADVANCE ENGINEERING MATERIALS & CORROSION METALLURGY

Subject Code	Course offered in	Course Duration	4 lecture contact periods	Full Marks
MET / S 6 / T 1 / AEMCM	Part III – 6TH. Semester	15 weeks	(@ 60 Minutes) per week	70

OBJECTIVE

1. Gather concept about applied engineering materials .
2. Understand about different developed engineering materials like , ceramic,glass , magnetic materials.
3. To be aware about Nano – materials.
4. To be aware about Corrosion & its prevention process.

MODULAR DIVISION OF THE SYLLABUS

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	Classification of Engineering materials	6
	2	Ceramic materials	10
	3	Glass materials	10
B	4	Electrical materials	8
	5	Magnetic materials	8
C	6	Nano-Materials	8
	7	Corrosion & its prevention	10
			TOTAL PERIODS: 60

Reference Books : -

1. Advances in Material Science --- R.K.Dogra , A.K.Sharma .
2. PROPERTIES AND APPLICATIONS OF ENGINEERING MATERIALS -METALS, ALLOYS, POLYMERS, CERAMICS, AND COMPOSITES -- -- NIIT
3. ENGINEERING MATERIALS: POLYMERS, CERAMICS AND COMPOSITES -- BHARGAVA, A . K .
4. Engineering Materials : Properties and Selection --- BUDINSKI, MICHAEL K., BUDINSKI, KENNETH G.
5. Corrosion Engineering, Fontana M.G. -- Tata Mcgraw Hill Education Private Limited

EXAMINATION SCHEME

Group	Chapter	Objective Question				Subjective Question			
		No of Questions to be set	No of Questions to be answered	Marks for each question	Total marks	No of Questions to be set	No of Questions to be answered	Marks for each question	Total marks
A	1,2,3	9	8	1	8	6	4	5	20
B	4,5	7	6	1	6	4	3	5	15
C	6,7	7	6	1	6	4	3	5	15
					20				50

DETAIL COURSE CONTENT

1.0 Classification of Engineering materials
1.1 Selection of Engineering materials
1.2 Properties of Engineering materials
1.3 Application of different Engineering materials

2.0 Ceramic materials
2.1 Introduction
2.2 Classification of ceramic materials
2.3 Advanced and application of ceramic materials
2.4 Structure and properties of ceramic material
2.5 Advanced ceramics , chararacteristics , uses

3.0 Glass materials
3.1 Introduction
3.2 Constituents of glass
3.3 Properties of glass
3.4 The furnace used for glass
3.5 Uses of glass

4.0 Electrical materials
4.1 Materials of Low resistivity and high conductivity
4.2 Materials of Semiconductor and insulator
4.3 Name commonly used conductor, Semiconductor and insulator materials .
4.4 State possible application of superconductivity materials.

5.0 Magnetic materials
5.1 Differentiate between the characteristics of soft and hard magnetic materials .
5.2 Example of different magnetic materials .
5.3 Properties of magnetic materials .

6.0 Nano – Materials
7.1 Definition
7.2 Different types of nano – materials used
7.3 Characteristics of nano – materials .
7.4 Actual application of nano – materials .

7.0 CORROSION & ITS PREVENTION
7.1 Corrosion of materials in natural environments .
7.2 Atmospheric corrosion – general characteristics, mechanism and prevention.
7.3 Localized corrosion damages and materials failure .
7.4 Passivity and trans passivity of metals. Breakdown of passivity and pitting corrosion.
7.5 Stress – corrosion cracking of materials. Intergranular corrosion failure.
7.6 Effects of metallurgical structure on corrosion.
7.7 Methods for protection of materials , Overview of corrosion prevention methods.
7.8 Chemical and electrochemical surface treatment of metals. Metallic, inorganic and organic protective coatings.
7.9 Application of inhibitors. Electrochemical methods for corrosion protection .

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HEAT TREATMENT TECHNOLOGY

Subject Code	Course offered in	Course Duration	4 lecture contact periods	Full Marks
MET / S 6 / T 2 / HTT	Part III – 6TH. Semester	15 weeks	(@ 60 Minutes) per week	70

O B J E C T I V E

1. Gather concept about principles & importance of heat treatment .
2. Understand about different processes of heat treatment of steel .
3. Gather knowledge about quenchants, furnaces & atmosphere .
4. State about different defects & remedial measures in heat treatment processes .

M O D U L A R D I V I S I O N O F T H E S Y L L A B U S

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	Introduction	2
	2	Principles of Heat Treatment	10
B	3	Heat Treatment processes for steel	12
	4	Surface hardening of steel	12
C	5	Heat Treatment furnaces & atmospheres	12
	6	Defects & remedies in heat treatment	12
			TOTAL PERIODS : 60

. **Reference Books : -**

1. Engineering Physical Metallurgy --- Y. Lakhtin .
2. Introduction to Physical Metallurgy --- S.H.Avner .
3. Elements of Physical Metallurgy --- A.G.Guy .
4. Metals Hand Book --- American Society of Metals .
5. Physical Metallurgy for Engineers --- Clark & Varney .
6. Metallurgy for Engineers --- E.C. Rollason .
7. Physical Metallurgy , Principles & Practice --- V. Raghavan .
8. Heat Treatment , Principles & Techniques --- T.V. Rajan , C.P.Sharma , A.Sharma

E X A M I N A T I O N S C H E M E

Group	Chapter	Objective Question				Subjective Question			
		No. of questions to be set	No of questions to be answered	Marks for each question	Total Marks	No. of questions To be set	No of questions to be answered	Marks for each questions	Total marks
A	1,2.	6	5	1	5	3	2	5	10
B	3,4.	8	7	1	7	5	4	5	20
C	5,6.	9	8	1	8	5	4	5	20
					20				50

DETAIL COURSE CONTENT

GROUP - A

1.0 Introduction

1.1 Phase changes of alloys with temperature – basis of heat treatment
1.2 Heat treatment process variables .

2.0 Principles of Heat Treatment .

2.1 Formation of austenite on heating , austenite grain size & its importance .
2.2 Annealing – types; Normalizing, hardening and tempering
2.3 Review of TTT. & CCT diagrams ; practical applications
2.4 Effect of alloying elements on hardenability and heat treatment of carbon steels
2.4 Bainite transformation & its mechanism.
2.5 Martensite transformation , mechanism , Ms – Mf temp., Hardness .

GROUP - B

3.0 Heat Treatment processes for steel .

3.1 Heat treatment cycle as time temperature plots – low and medium carbon steels.
3.2 Annealing and Normalizing – different methods , comparison .
3.3 Hardening , methods & factors .
3.4 Tempering , methods , structural change , temper brittleness & effect of alloying elements .
3.5 Austempering , Martempering , Patenting .
3.6 Heat treatment of weldments – structural changes precautions.
3.7 Properties of steels after tempering
3.8 **C**haracteristics of quenchants .
3.9 Different quenching media , like water, aquas solution, oil ,air , gases , salt baths , synthetic quenchants .

4.0 Surface hardening of steel

4.1 Basic principle involved in surface hardening –chemical and non-chemical methods
4.2 Brief description of Pack, Gas and Liquid carburising, parameters involved, heat treatment
4.3 Nitriding, Cynaniding & Carbonitriding – brief process description; factors involved,
4.4 Non-chemical methods of hardening - Induction hardening, flame hardening
4.5 Case depth measurement after hardening and Process control

GROUP - C

5.0 Heat Treatment furnaces & atmospheres .

5.1 Classification of heat treatment furnaces .
5.2 Batch furnaces ,continuous furnaces , salt bath furnaces .
5.3 Control of furnace atmosphere .
5.4 Chemistry of controlled atmosphere processes .
5.5 Commercially available atmosphere .

6.0 Defects & remedies in heat treatment .

6.1 Anomalies in hardness and structure after quenching and tempering
6.2 soft spot ,oxidation , decarburisation , overheating & burning .
6.3 Quench cracks , distortion & warping .
6.4 Remedial measures of above problems .

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Subject Code MET / S 6 / P 2 / HTT	Course offered in Part III – 6TH. Semester	Course Duration 15 weeks	4 Practical contact periods (@ 60 Minutes) per week	Full Marks 100

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1.0	**Study of TTT & CCT diagram .**
1.1	To draw TTT & CCT diagram for hypo , hyper & eutectoid steel .
1.2	Diagram showing effect of alloying elements on TTT & CCT diagram.
2.0	**Study about effects of heat treatment on mechanical properties & metallurgical microstructure.**
2.1	Annealing of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.
2.2	Normalising of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.
2.3	Hardening of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.
2.4	Tempering of Hypo, Hyper & Eutectoid steel & study of tensile strength, hardness values & microstructure.
3.0	**Surface hardening of steel**
3.1	To experiment on pack carburizing& study depth of carburization and hardness .

EXAMINATION SCHEME

1. Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the Sixth Semester.
2. Distribution of marks : Performance of Job – 35, Notebook – 15.
3. External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 25, Viva-voce – 25.

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FERRO ALLOYS & DIRECTLY REDUCED IRON

Subject Code	Course offered in	Course Duration	4 lecture contact periods	Full Marks
MET / S 6 / T 3 / FADRI	Part – III , 6TH. Semester	15 weeks	(@ 60 Minutes) per week	70

OBJECTIVE

1. Gather concept about application of ferro alloys & its importance .
2. Understand about principles & different processes of ferro alloy production .
3. Gather knowledge about sponge iron & production procedure .

MODULAR DIVISION OF THE SYLLABUS

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	Survey on ferro alloys .	10
	2	Principles & processes of ferro alloys.	15
B	3	Aluminothermic process .	15
C	4	Directly Reduced Iron (Sponge Iron) .	20
			TOTAL PERIODS : 60

Reference Books : -

1. Ferroalloys technology in India --- C.K.Gupta & A.K.Suri .
2. Production of Ferroalloys --- A.Riss & T. Khodorovsky .
3. Modern Iron Making --- R.H.Tupkary .
4. Metal News --- The Indian Institute of Metals .

EXAMINATION SCHEME

Group	Chapter	Objective Question				Subjective Question			
		No. of questions to be set	No of questions to be answered	Marks for each question	Total Marks	No. of questions to be set	No of questions to be answered	Marks for each questions	Total marks
A	1,2.	9	8	1	8	3	2	5	10
B	3	7	6	1	6	5	4	5	20
C	4	7	6	1	6	5	4	5	20
					20				50

DETAIL COURSE CONTENT

1.0 Survey on ferro alloys .

1.1 Definition , classification , applications .
1.2 Deoxidation & alloying .
1.3 Mode of addition .
1.4 Raw materials .

2.0 Principles & processes of ferro alloys.

2.1 Principles .
2.2 Mineral beneficiation & exploration .
2.3 Alluminothermic reduction process .
2.4 Thermit process & operation .

3.0 Aluminothermic process .

3.1 Physical chemistry & raw materials .
3.2 Smelting technology , commercial alloy composition .
3.3 Physical chemistry for production of high and low-carbon Ferrosilicon, Ferrochrome, ferromanganese .

4.0 Directly Reduced Iron (Sponge Iron) .

4.1 Defination & degree of metallisation .
4.2 Physical chemistry of sponge iron making .
4.3 Description of different Sponge iron making processes .
4.4 HyL process , Midrex process , Fludised Bed process , Rotary Kiln process ,SL / RN process .
4.5 Use of sponge iron .
4.6 Indian scenario of sponge iron making .

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PHYSICAL METALLURGY OF NON - FERROUS METALS & ALLOYS

Subject Code MET / S 6 / T 4 / PMNFMA	Course offered in Part – III , 6TH. Semester	Course Duration 15 weeks	4 lecture contact periods (@ 60 Minutes) per week	Full Marks 70

OBJECTIVE

1. Gather knowledge about Non ferrous metals & alloys and its importance.
2. Gather knowledge about Copper & its Alloys .
3. Gather knowledge about Aluminum & its Alloys .
4. Gather knowledge about Babbitt Metal .

MODULAR DIVISION OF THE SYLLABUS

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	Introduction	10
	2	Copper & its Alloys	20
B	3	Aluminum & its Alloys	20
C	4	Babbitt Metal	10
			TOTAL PERIODS : 60

Reference Books : -

1. Engineering Physical Metallurgy - Y. Lakhtin .
2. Metallurgy for Engineers -- E. C. Rollason
3. Metal News --- The Indian. Institute of Metals .
4. Introduction to physical metallurgy -- Avner

EXAMINATION SCHEME

Group	Chapter	Objective Question				Subjective Question			
		No. of questions to be set	No of questions to be answered	Marks for each question	Total Marks	No. of questions to be set	No of questions to be answered	Marks for each questions	Total marks
A	1,2.	9	8	1	8	5	4	5	20
B	3	8	7	1	7	5	4	5	20
C	4	6	5	1	5	3	2	5	10
					20				50

DETAIL COURSE CONTENT

1.0 Introduction

1.1 Review and listing of Important commercial applications of Non ferrous metals & alloys .
1.2 Review of industries associated with Non ferrous metals & alloys , their product and market .

2.0 Copper & its Alloys

2.1 Properties of pure Copper , pure Zinc , pure Tin .
2 2 Equilibrium diagrams of Cu – Zn binary system & discussion on its different phase .
2.3 Composition, properties, microstructure and uses of important industrial Cu – Zn alloys .
2.4 Equilibrium diagrams of Cu – Sn binary system & discussion on its different phase
2.5 Composition, properties, microstructure and uses of important industrial Cu – Sn alloys .
2.6 Heat treatment of important copper base alloys .
2.7 Effect of adding other alloying element with Cu – Zn & Cu – Sn alloys.

3.0 Aluminum & its Alloys

3.1 **Properties of pure Aluminum , pure Silicon .**
3.2 Equilibrium diagrams of Al – Cu binary system & discussion on its different phase
3.3 Composition, properties, microstructure and uses of important industrial Al – Cu alloys .
3.4 Heat treatment of important Al – Cu alloys .
3.5 Precipitation hardening phenomenon of Al - Cu alloys .
3.6 Equilibrium diagrams of Al – Si binary system & discussion on its different phase .
3.7 Composition, properties, microstructure and uses of important industrial Al – Si alloys .
3.8 Heat treatment & modification of important Al – Si alloys .

4.0 Babbitt Metal

4.1 Composition , microstructure and application of Tin base – Antimony – Copper Babbitt metal .
4.2 Composition , microstructure and application of Lead base – Antimony – Tin Babbitt metal .

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INDUSTRIAL MANAGEMENT

Subject Code	Course offered in	Course Duration	4 lecture contact periods	Full Marks
MET / S 6 / T 5 / IM	Part – III , Sixth Semester	15 Weeks	(@ 60 Minutes) per week	70

OBJECTIVE

This subject provides the students of polytechnics with an exposure to the art and science of management principles, functions, techniques and skills that are essential for maximising attainment of the organisational goals with the available manpower and resources. Upon successful completion of this subject, the students shall be equipped with the fundamental knowledge of management which should make them confident in facing the challenges of their responsibilities in the different organisational scenarios.

MODULAR DIVISION OF THE SYLLABUS

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	INTRODUCTION TO MANAGEMENT SCIENCE	5
	2	ORGANISATIONAL BEHAVIOUR	6
	3	HUMAN RESOURCES MANAGEMENT	8
B	4	PRODUCTION MANAGEMENT	9
	5	MATERIALS MANAGEMENT	3
	6	FINANCIAL MANAGEMENT	3
C	7	MARKETING & SALES MANAGEMENT	5
	8	QUANTITATIVE TECHNIQUES	6
			TOTAL PERIODS: 60

EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	14	ANY TWENTYFIVE	ONE	25 x 1 = 25	FOUR	ANY FIVE, TAKING AT LEAST ONE FROM EACH GROUP	10	5 X 10 = 50
B	4, 5, 6	11				THREE			
C	7, 8	8				TWO			

REFERENCE BOOKS

1. Essentials of Management / Kontz / McGraw-Hill of India
2. Organization & Behaviour / M. Banerjee / Allied Publishers
3. Human Behaviour at Work: Organizational Behaviour / Keith Davis & Newstrom / McGraw-Hill of India
4. Human Resources Management / Mirza Saiyatain / Tata McGraw-Hill
5. Production Management & Control / Nikhil Barat / U.N. Dhar & Co.
6. Production Management / Keith Lockyer / ELBS
7. Marketing Management / Philip Kolter / Prentice Hall of India
8. Lectures on Management Accounting / Dr. B.K. Basu / Basusri Bookstall, Kolkata

DETAIL COURSE CONTENT

GROUP - A **19 periods**

1.0 Introduction to Management Science **5**

1.1 Principles & functions of management .
1.2 Contributions of F.W. Taylor, Henry Fayol, Max Weber and Elton Mayo & Roethlisburger in development of the theories of management science.

2.0 Organisational Behaviour **6**

2.1 Objectives — Brief introduction to: Motivation & Morale – Perception .
2.2 Leadership & Leadership Styles .
2.3 Communication – Team Building –
2.4 Work Culture.

3.0 Human Resources Management **8**

3.1 Scope & Functions – Human Resources Planning .
3.2 Selection & Recruitment .
3.3 Training & Development .
3.4 Performance Appraisal .

GROUP - B **15 periods**

4.0 Production Management **9**

4.1 Production Planning**:** Routing – Loading – Scheduling — Production Control .
4.2 Expediting – Dispatching — Materials Handling — Work Study — Productivity .
4.3 Quality Management**:** Tools & Techniques – Quality Management System.

5.0 Materials Management **3**

5.1 Objectives & functions**:** Purchase function .
5.2 Stores function , Inventory Management .
5.3 ABC, VED analyses.

6.0 Financial Management **3**

6.1 Financial Ratios .
6.2 Elements of Costing .
6.3 Auditing

GROUP - C **11 periods**

8.0 Marketing & Sales Management **5**

8.1 Objectives & Functions — Marketing of products & Services .
8.2 Advertising & Sales Promotion .
8.3 Consumer Behaviour

9.0 Quantitative techniques **6**

9.1 Linear programming (graphical method only) .
9.2 Network Analysis **:** PERT – CPM

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PROJECT WORK & SEMINAR

Subject Code MET / S 6 / P 6 / PWS	Course offered in Part – III , Sixth Semester	Course Duration 15 Weeks	6 Practical contact periods (@ 60 Minutes) per week	Full Marks 100

OBJECTIVE

1. Project Work is intended to provide opportunity for students to develop understanding of the interrelationship between different courses
learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher
order skills.

2. The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something
which has social relevance, aging. It should provide a taste of real life problem that a diploma-holder may encounter as a professional.
It will be appreciated if the polytechnics develop interaction with local industry and local developmental agencies viz. different *Panchayet*
bodies, the municipalities etc. for choosing topics of projects and / or for case study.

3. The course further includes preparation of a Project Report which, among other things, consists of technical description of the project. The
Report should be submitted in two copies, one to be retained in the library of the institute. The Report needs to be prepared in computer
using Word and other software wherever necessary.

4. Seminar on Project Work is intended to provide opportunity for students to present the Project Work in front of a technical gathering with
the help of different oral & visual communication aids which they learnt through different courses in the Parts – I , II & III of the diploma
course. In the Seminar, students are not only expected to present their Project Work, but also to defend the same while answering
questions arising out of their presentation .

. GENERAL GUIDELINE

1. Project Work is conceived as a group work through which the spirit of team building is expected to be developed. Students will be required
to carry out their Project Works in groups under supervision of a lecturer of their core discipline who will work as a Project Guide.

2. It is expected that most of the lecturers of the core discipline will act as project guide and each should supervise the work of at least two
groups. Number of students per group will vary with the number of lecturers acting as Project Guide and student strength of that particular
class.

3. The subject of the project may be chosen by the faculties and students as per need and demand of the industry and future propects.

3. The practice of giving seminar on ' Project Work ' has to be performed every week on rotation basis. .

Some examples of the topics of project work are :

1. Hardenability of Steel .
2. Pack carburising of Steel .
3. Structure - property co-relation of carbon – steel .
4. Study on alloy cast iron .
5. Melting practices on Induction furnace .
6. Melting practices on Arc furnace .
7. Foundry sand properties .
8. Sponge iron preparation .
9. Ferroalloys .
10. Powder metallurgy .
11. Special alloy steel .
12. High strength low alloy steel .
13. Rolling & forging .
14. Metallurgical analysis .
15. Heat treatment practices .
16. Applications of different cast iron .
17. Survey on metallurgical industries .
18. Thermal analysis .

THE PROJECT REPORT SHOULD CONTAIN :

1. Brief synopsis of the Project.
2. Detail theoretical back – up .
3. Machinery and Instrument details .
4. Details of experiments carried .
5. Results
6. Inference .
7. Bibliography .

SEMINAR ON PROJECT WORK

1. Practice of giving seminar on Project project work .
2. Practice of using audio visual aids in seminar .
3. Practice of using charts , sketches , datas in support of seminar .
4. Practice of speech presentation in English .
5. Entertain Questioning - Answering as a part of seminar .

E X A M I N A T I O N S C H E M E

1. Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the Sixth Semester.
2. Distribution of marks : Performance of Job – 25, Project Report – 25.
3. External Assessment of 50 marks shall be held at the end of the Sixth Semester on the project Work .
4. Distribution of marks for External Assessment : Viva-voce – 50

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PROFESSIONAL PRACTICE - IV

Subject Code	Course offered in	Duration	3 Practical contact periods	Full Marks
MET / S 6 / P 7 / PPIV	Part – III , 6TH. Semester	15 weeks	(@ 60 Minutes) per week	50

Objective :- Student will be able to :

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture

PRACTICAL : LABORATORY EXPERIMENTS :

Full Marks = 50 ; CONTACT PERIODS = 3 Practical @ 60 Minutes contact periods per week for 15 weeks .

SL. NO.	TITLE
1.0	**Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work .**
1.1	TWO industrial visits may be arranged in the following areas / industries : i) Automobile manufacturing / auto component manufacturing units to observe the working of SPM . ii) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops . iii) Automobile service stations for four wheelers . iv) Co-ordinate measuring machine to observe its construction working specifications and applications. v) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc. vi) Wheel Balancing unit for light and/or heavy motor vehicles. vii) Food processing unit. viii) Textile industry machinery manufacturing / servicing units. ix) Hydro electric and Thermal power plants. x) Engine testing, exhaust gas analysis and vehicle testing xii) PWD workshop.
2.0	The Guest Lecture/s From field /industry experts, professionals .
2.1	To be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work . a) Electronic fuel injection systems b) Exhaust gas analysis. c) Vehicle testing. d) Transducer application in automobiles. e) Environmental pollution & control. f) Vehicle aerodynamics & design. g) Earth moving machines. h) Automobile pollution, norms of pollution control. i) Biotechnology j) Nanotechnology k) Rapid prototyping l) Programmable logic controllers m) TQM n) MPFI o) Hybrid motor vehicles p) Packaging technology q) Appropriate technology r) Six sigma systems s) LPG / CNG conversion kit.

3.0	**Group Discussion**
3.1	The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (**any one**) - Following topics are suggested : i) CNG versus LPG as a fuel. ii) Petrol versus Diesel as a fuel for cars. iii) Trends in automobile market. iv) Load shading and remedial measures. v) Rain water harvesting. vi) Trends in refrigeration Technology. vii) Disaster management. viii) Safety in day to day life. ix) Energy Saving in Institute. x) Nano technology.
4.0	**Seminar**
4.1	Seminar topic **(any 2 topics)** should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes for a group of 2 students).
5.0	**Mini Projects : (in a group of 4-5 students) : any one** 1) Design / drawing of simple jigs, fixtures 2) Thermocouple based temperature controller. 3) Pump on / off timer 4) Models of jigs / fixtures 5) Layout design of SSI units / factory / workshop of the institute 6) Models of material handling route systems

E X A M I N A T I O N S C H E M E

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Sixth Semester.
2. External Assessment of 25 marks shall be held at the end of the Sixth Semester on the entire syllabus.

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GENERAL VIVA - VOCE

Subject Code	Course offered in	Full Marks
MET / S 6 / P 8 / GV	Part – III , 6TH. Semester	100

COURSE CONTENT

The syllabi of all the theoretical and sessional subjects taught in the three years of diploma education.

EXAMINATION SCHEME

1. The Final Viva-Voce Examination shall take place at the end of the Part – III Second Semester. It is to be taken by one External and one
Internal Examiner.

2. The External Examiner is to be from Industry / Engineering College / University / Government Organisation and he / she should give credit
out of 50 marks; whereas, the Internal Examiner should normally be the Head of the Department and he / she should give credit of 50
marks. In the absence of the Head of the Department the senior most lecturer will act as the Internal Examiner.

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