

NEP-2020 Aligned Curriculum for
Three Year (Six Semester) Diploma Programme in
GLASS AND CERAMICS ENGINEERING
(FIFTH AND SIXTH SEMESTER)
For the State of Uttar Pradesh



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PREFACE

An important issue generally debated amongst the planners and educator's world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization have created an environment for free flow of information and technology through fast and efficient means. This has led to the shrinking of the world, bringing people from different culture and environments together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. To cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Technical Education, UP to revise the existing curricula of diploma programmes as per the needs of the industry and making them NEP-2020 compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much-needed dynamism in the system.

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1. SALIENT FEATURES OF DIPLOMA IN GLASS AND CERAMIC ENGINEERING

- 1) Name of the Programme : Diploma in Glass and Ceramics Engineering
- 2) Duration of the Programme : Three years (Six Semesters)
- 3) Entry Qualification : Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
- 4) Pattern of the Programme : Semester Pattern
- 5) NSQF Level : Level - 5
- 6) Ratio between theory and Practice : 40 : 60 (Approx.)

7) **Industrial Training**

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6th Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

8) **Ecology and Environment**

As per Govt. of India directives a subject on Environmental Science has been incorporated in the curriculum.

9) **Entrepreneurship and Start-ups**

A full subject Entrepreneurship & Start-ups has been incorporated in the curriculum.

A full subject on Construction Management, Accounts and Professional Practice has been incorporated in the curriculum.

10) **Student Centered Activities**

A provision of 2-4 hrs per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co-curricular activities such as expert lectures, self-study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS, library and other cultural activities.

11) **Project work**

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2- PROGRAM OUTCOMES (POs)

PO1: Basics and Discipline specific Knowledge

Assimilate knowledge of basic mathematics, science, engineering fundamentals.

PO2: Problem's Analysis and solution

Identify, analyse and solve problems using standard methods and established techniques.

PO3: Design and Development

Design solutions for technical problems.

Assist in designing components, systems, or processes to meet specific requirements.

PO4: Engineering Tools, Experimentation, and Testing

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

PO5: Socio/ Economic /Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

PO6: Project Management and Communication

Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

PO7: Lifelong Learning

Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

3-EMPLOYMENT OPPORTUNITIES OF DIPLOMA HOLDERS IN GLASS & CERAMICS ENGINEERING

Employment opportunities for diploma holder in Ceramics Engineering are visualized in following industries at various levels/positions.

- i) White Ware Industry
 - (a) Sanitary ware
 - (b) Tiles
 - (c) Crockery
 - (d) Pottery ware
 - (e) Handicraft
 - ii) Refractory industry
 - iii) Glass Industry
 - iv) Cement Industry
 - v) Modern Ceramic industries-metallurgical Cosmo ferrites, modern insulators, Special Ceramic as High alumina , Zirconium, etc.
 - vi) Iron and Steel Industry
 - vii) DRDO, ISRO, NNFL (National Nuclear Fuel Limited), NALCO (National Aluminum Cooperation Limited), BALCO (Bharat Aluminum Cooperation Limited)
 - viii) Lab Instructor in teaching institution
 - ix) Self-employed in setting up small units
- Ceramics Engineer/Ceramist/Glass Technologist in small and medium industries.
 - Quality Control (Inspection) Supervisors/quality assurance(QA) supervisor.
 - In plant Laboratory Supervisor/Production supervisor/R & D Supervisor.
 - Sales or Marketing Officer.
 - Conducts tests on raw materials and ascertain their suitability.
 - Supervises milling operations, glaze preparation, body preparation, shaping, drying and firing of ceramics goods.
 - Selects appropriate processes and machines for manufacture of ceramic goods and glassware.
 - Makes batch calculations.
 - Plans men, materials and machines for achieving target production.
 - Conducts quality control tests from raw materials and finished products.
 - Detects common faults in processes, equipment and furnaces and suggests remedial measures.

- Make cost calculations of ceramics goods.
- Keep record of production.
- Conducts market survey and promotes sales.
- Assist in testing laboratories.
- Assist in R & D laboratories.

4-LEARNING OUTCOMES OF THE PROGRAMME IN GLASS AND CERAMICS ENGINEERING

Sr. No.	Learning Outcomes
	After due completion of the course, a GLASS AND CERAMICS ENGINEERING will be able to:
1.	Read and interpret any engineering drawing.
2.	Plan, schedule, organize direct, control and coordinate men, materials and machines for the production of ceramics/glass products.
3.	Knowledge of physical, chemical and thermal properties of raw materials, additives and finished product.
4.	Select appropriate raw materials, processes, machines and make cost calculations for production of ceramics/glass products.
5.	Knowledge of work measurement and materials handling techniques.
6.	Detect faults in equipment's / processes / product and suggest remedial measures.
7.	Undertake quality control tests on raw materials, materials in the process and finished products.
8.	Assist in developmental activities at any label
9.	Knowledge of marketing and sales promotion of ceramics/glass products.
10.	Ability to manage stores and Ware house
11.	Knowledge of labour laws, factory safety rules, and handling of labour problems.
12.	Establish and run a small enterprise & Select material as per desired application
13.	Use electrical and electronic instruments to measure various engineering parameters
14.	Use various measuring and gauging instruments
15.	Understand the general Layout of Plant, process, equipments and testing
16.	Understand different renewable sources of energy and their applications.
17.	Understand different process in different plants and maintenance of their using equipments
18.	Understand the factory acts, laws and taxes
19.	Use various software tools for automation and process development.
20.	Communicate effectively in English and local language in oral and written form with others
21.	Prepare detailed project proposal and report.
22.	Plan and execute given task/project as a team member or leader
23.	Use computer and IT tools for creating documents, making spread sheet, DPR and making presentation
24.	Use various software tools for automation and process development.
25.	Handle the customers Effectively as Sales Person and Increase the Sales

26.	Prepare the Planning for Production and Maintenance schedule also
27.	Apply the Basic Knowledge of Electrical, Mechanical, and Civil Engg. Etc.
28.	Select the Refractory for the different types of Furnace / Kiln as Processed material
29.	Modify the Process / Furnace / Batch composition and take the corrective action
30.	Testing carryout of Ceramics raw materials as IS specification
31.	Understand and carryout the different Testing of Ceramics Finished Products as IS specification
32.	Determined the Physical & Mechanical Properties of Raw materials and Finished Product
33.	Carryout the Chemical Analysis of Ceramic Raw materials Finished Product
34.	Understand and execute the different techniques in Glass decoration
35.	Understand the manufacturing of Models / Statue, Working Mould & Master Mould of POP
36.	Understand the manufacturing process and Testing of Lime, Cement, High Alumina Product

5- ABSTRACT OF CURRICULUM AREAS

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

- Communication Skills in English
- Sports and Yoga
- Entrepreneurship and Start-ups

BASIC SCIENCES COURSE [BS]

- Mathematics
- Applied Physics
- Applied Chemistry

ENGINEERING SCIENCE COURSES [ES]

- Engineering Graphics
- Engineering Workshop Practice
- Introduction to IT Systems
- Fundamentals of Electrical & Electronics Engineering
- Engineering Mechanics

PROGRAM CORE COURSES [PC]

- Introduction To Glass and Ceramics
- Industrial Operation
- Industrial Calculation
- Pottery and Refractory
- Fuel furnace and Pyrometers
- Elementary Geology and Mineralogy
- Metallurgy and Material Chemistry
- Glass and Ceramic Engineering Drawing
- Glass, Enamel and Ceramics Coating
- Cement and Lime Technology
- Pottery and Porcelain - I
- Glass Technology -I
- Refractory Technology
- Modern Ceramics

PROGRAM ELECTIVE COURSES [PE]**Program Elective -1**

- Pottery and Porcelain - II
- Glass Technology - II

OPEN ELECTIVE COURSES [OE]**Open Elective -1**

- Energy Conservation & Audit
- Renewable Energy Technologies

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

- Summer Internship – I (3-4 weeks) after IIInd Sem
- Summer Internship – II (4-6 weeks) after IVth Sem
- Major Project(In-House) / Internship / Industrial Training

AUDIT COURSES [AU]

- Environmental Science
- Essence of Indian Knowledge and Tradition
- Indian Constitution

OR

OPEN ELECTIVE (ADVANCED SKILL CERTIFICATE COURSE)

SR.NO.	COURSE NAME
1.	Course Conducted By Infosys Pringboard
2.	Course Conducted By Tcs Ion
3.	Course Conducted By Nasscom - Futureskills
4.	Course Conducted By Nptel
5.	Moocs Through Swayam
6.	Conducted By Aicte-Elis And Centrally Funded Technical Institutes
7.	Conducted By C-Dac
8.	Conducted By Certifications Conducted B Y The Institute Of National Importance (Iit,Nit,Iiit Etc.)
9.	Conducted By Isro E-Learning
10.	Conducted By Other Relevant Government, International/National Platforms Of Repute
11.	Conducted By Neilit

Or

Proposed Courses from TATA Technologies Ltd.

1. Fundamentals of Innovation and Design Thinking
2. Product Design and Development
3. Product Verification and Analysis
4. Advanced Automobile
5. Electric Vehicle
6. Internet of Things
7. Advanced Manufacturing
8. Advanced Welding & Painting using Simulator
9. Process Control & Automation
10. Industrial Robotics
11. Artisan using advanced tool
12. Advanced Plumbing

Note: Students may opt for any of the above advanced skill development courses and may get certificate against 02 credits (as mentioned in open elective-01).

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GLASS AND CERAMICS ENGINEERING
FIFTH SEMESTER**

Sr. No .	SUBJECTS	STUDY SCHEME Periods/ Week			Credit	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External	Course/ Exam Type
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot			
5.1	Refractory Technology	2	1	-	3	40	-	40	60	3	-	-	60	100	Prog Core/Theory	
5.2	Glass Enamel & Ceramics Coating Lab	-	-	6	3	-	60	60	-	-	40	3	40	100	Prog Core/Practical	
5.3	Silicate Analysis Lab	-	-	6	3	-	60	60	-	-	40	3	40	100	Prog Core/Practical	
5.4	Physical Testing in Ceramics Lab	-	-	6	3	-	60	60	-	-	40	3	40	100	Prog Core/Practical	
5.5	(PE-1A) Pottery & Porcelain-II	2	1	-	3	40	-	40	60	3	-	-	60	100	Prog Elective/Theory	
	(PE-1B) Glass Technology-II															
5.6	Modern Ceramics	2	1	-	3	40	-	40	60	3	-	-	60	100	Prog Core/Theory	
5.7	(Q) Indian Constitution	2	-	-	-	-	50*	50*	-	-	-	-	-	-	Audit Course	
5.8	@Summer Internship – II (6 Weeks after 4 th Sem.)	-	-	-	2		100	100						100	Industrial Hands on Practice	
#Student Centered Activities (SCA)		0	0	7	-	-	50	50	-	-	-	-	-	50	-	
Total		8	3	25	20	120	330	450	180	-	120	-	300	750	-	

@ Industrial Training-II (Summer Internship-II After 4th Semester 6 Weeks)

Student Centered Activities will comprise of co-curricular activities like extension lectures, self-study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN GLASS AND CERAMICS ENGINEERING
SIXTH SEMESTER – (NORMAL PATHWAY)**

Sr. No.	SUBJECTS	STUDY SCHEME Periods/ Week			Credit	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External	Course/ Exam Type
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot			
6.1	Entrepreneurship & Startups **	2	-	-	2	20	20	40	60	3	-	-	60	100	Practicum/ Theory	
6.2	Ceramics Machinery & Furnace Design	3	1	-	4	40	-	40	60	3	-	-	60	100	Theory	
6.3	(OE-I A) Energy Conservation & Audit	2	-	-	2	-	-	-	100*	-	-	-	100*	-	Open Elective/ Theory	
	(OE-I B) Renewable Energy Technologies															
6.4	In – house Project Work	4	-	16	12	-	240	240	-	-	160	3	160	400	Practical	
#Student Centered Activities (SCA)		0	0	8	-	-	50	50	-	-	-	-	-	50	-	
Total		11	1	24	20	60	310	370	120	-	160	-	280	650	-	

** Common with other Engineering Branches

Student Centered Activities will comprise of co-curricular activities like extension lectures, self-study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

OR

SIXTH SEMESTER INDUSTRIAL PATHWAY

Sr. No.	SUBJECTS	Category & Course Type	STUDY SCHEME			Credits(C) (L+T)+P=C	MARKS IN EVALUATION SCHEME									Total Marks of Intern al & Extern al	Assessment
			Periods/W eek				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
			L	T	P		T h	Pr	To t	Th	Hrs	P r	Hrs	Tot			
6.1	Entrepreneurship and Start-ups (ONLINE Mode)	Humanities & Social Science (Theory)	-	-	-	2	-	-	-	100	03	-	-	100	100	Theory	
6.2	Industrial Hands On Practice	Industrial Training	-	-	-	12	150*			200**						350	
6.3	Industrial Project	Industrial Training	-	-	-	4	50*			50**						100	
6.4	# Seminar	In House	-	-	-	2	-	100	100	-	-	-	-	-	100		
Total			-	-	-	20	-							-	650		

NOTE:

1. The Industrial training tenure should not be less than 14 Weeks.
2. Industry must be registered with MSME / Directorate of industries/Limited Organization/ State/Central Government establishments.

3. Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the AICTE Internship Policy: Guidelines and procedures (Chapter -9 Procedures / format for organizing internship)
6. *“Entrepreneurship and Start-up”* course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.
7. ***Evaluation by faculty mentor**
The institute will depute one faculty member for mentoring at least 20-30 students undertaking apprenticeship training. Such mentors will monitor, guide and provide counselling to the students as and when required. Faculty mentor of the institute(s) may make a surprise visit to the internship/apprenticeship site to check the student's presence physically. (The Proforma of the evaluation is attached as the Annexure -1)
8. **** Evaluation by industry** : The industry shall assess the candidates based on the following parameters attendance, discipline and punctuality, familiarity of tools and material, engineering skills, application of knowledge and problem-solving skills, comprehension and observation, professional ethics, safety and environmental consciousness, communication skills, supervisory skills and general conduct during the period (The Proforma of the evaluation is attached as the Annexure -2)
9. **# Evaluation through seminar presentation/Viva-Voce at the institute** : The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

5.1	REFRACTORY TECHNOLOGY	L	T	P
THEORY		2	1	0

COURSE OBJECTIVE

In this specialised subject on refractory technology, a thorough knowledge of classification and testing of refractories is provided along with manufacturing techniques of important refractories. Phase diagrams are also dealt in this subject. This subject also provides them details of special refractories and their applications.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- CO1- Understand various types of refractories their classification and their manufacturing process
- CO2- Know testing of refractories as per BIS specification
- CO3- Understand refractory cement and monolithic and their application in metal extraction
- CO4- Know about insulating brick and fibrous refractory materials.
- CO5- Understand the use of refractory in Steel, Cement, Glass, Ceramic Industries

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	2	1	1	-	1
CO2	3	3	2	2	2	1	1
CO3	3	2	2	1	1	1	1
CO4	2	2	1	1	-	-	1
CO5	3	2	2	1	1	2	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

NOTE: Recapitulation of main topics from II year.

Unit No.	Content	Periods
1	ACID & BASIC REFRACTORY:- (Manufacturing, properties & uses):- Silica, Alumino silicate, Alumina, Magnesite, Dolomite, Kayanite, Sillimanite, chrome and chrome-magnesite, Magnesite-chrome refractories	3
2	NEUTRAL AND OTHER REFRACTORY:- 2.1 Describe the preparation, properties and uses of following refractory in brief:- Graphite Refractories, Silicon Carbide refractories, Fused Magnesia, Fused Silica, Mullite, 2.2 Fusion cast Refractories – type , Properties, application/Uses 2.3 Insulation refractories bricks – type of insulating brick, Properties, uses, Manufacturing 2.4 Carbon Containing refractories – (Manufacturing Properties, Uses) –Magnesia-Carbon ref, Alumina-Carbon	4

	ref, Alumina-Magnesia-Carbon ref 2.5 Super rectories, Synthetic raw materials, Cordierite refractory	
3	SPECIAL REFRACTORY:- Pure Alumina Ref, Zircon Ref, Zirconia Ref, Thoria Ref, , Boron Nitride	4
4	Refractory Hollow Ware:- Stopper, Nozzle, Pipes, Crucibles, Muffles, Saggars and Glass Pots furnace refractory.	3
5	Fibrous Refractory materials:- Refractory Tile, Refractory Blanket, Refractory Rope	5
6	Properties :- Testing and Quality control of refractory articles as per BIS specification a. Physical : Porosity, apparent porosity, bulk density, specific gravity, permeability, modulus of rupture(MOR), Abrasion, Resistance to weather and frost conductivity. b. Thermal : Pyrometric Cone Equivalent (PCE), Thermal expansion, thermal conductivity, Thermal Shock c. Mechanical : Cold crushing strength (CCS) d. Thermal Mechanical: Refractoriness under load (RUL). Hot modulus of rupture (MOR), Hot crushing strength. e. Thermochemical - corrosion.	5
7	Application of Ferrous Metal Refractories:- a. Describe with sketch the Refractories used in different areas of Blast Furnace b. Describe with sketch the Refractories used in different areas of Basic Oxygen Furnace c. Describe with sketch the Refractories used in different areas of Steel Ladles and hot metal ladle d. Describe with sketch the Refractories used in Continuous casting (Tundish) e. Describe with sketch the Refractories used in different areas of Coke Oven Furnace f. Describe with sketch the Refractories used in different areas of open hearth furnace and Bessemer converters, g. Describe with sketch electric furnace for steel melting	5
8	Refractories for cement Industry:- Describe with Sketch Refractory use in different area/zone in detail as –Rotary Kiln, Vertical Shaft Kiln	4
9	Refractories for Glass Industry:- Describe with Sketch refractory use in different zone in detail of – Glass tank Furnace, Regenerator/Recuperator, Glass Pot Furnace, Kiln use in Ceramic Industry	3
10	Monolithic Refractories - Castables/Mortar, Plastic masses, Ramming Masses, Gunning Masses, Spraying Masses, Patching Masses.	3
11	High Alumina Cement (HAC):- Introduction, Raw materials, Manufacturing process, Uses, and Hydration Chemistry & properties	3

INSTRUCTIONAL STRATEGY

Industrial visits of students may be organized for better understanding of various manufacturing process and products of refractories.

MEANS OF ASSESSMENT

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Actual Lab & Practical Work,
- Viva Voice

RECOMMENDED BOOKS

1. Refractories production and properties by J.H.Chester
2. Industrial Ceramic by Singer & Singer
3. Refractories their manufacturing properties & uses by M.L.Mishra
4. Technology of ceramics & refractories by P.P.Budnikov
5. Refractories by Chisti & Nandi 6.Refractories by F.H.Norton

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	3	8
2	4	15
3	4	8
4	3	6
5	5	7
6	5	15
7	5	15
8	4	7
9	3	7
10	3	6
11	3	6
Total	42	100

5.2	GLASS, ENAMEL AND CERAMICS COATING LAB	L	T	P
PRACTICAL		0	0	6

COURSE OBJECTIVE:

A thorough knowledge of different type of coatings done on ceramic & metallic materials in the ceramic industries enable the students to know different type of coatings and their application methods.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. Understand about the Raw materials of Glass, Enamel & Its Batch Calculation
2. Understand about the Melting of Glass, Enamel & Refining of Molten Glass
3. Understand about How to Quality control of Glass, Enamel & Coating
4. About different types of coatings applied over metals & other materials
5. We get an idea about metallurgy industries where maximum tonnage of ceramic materials are used
6. Students get a knowledge about Enameling on Different Metal & How to Melt the Enamel
7. Students get an idea about Stenciling on Enameling surface then Cover coat enamel applied and Firing in furnace
8. Students get an idea about Enamel's Defect & Its remedies.

DETAILED CONTENTS

LIST OF PRACTICALS

Unit No.	Content	Periods
1	GLASS PRACTICALS: 1. Purification & Sieve Analysis of Sand 2. Removal of iron from sand & Compounding of glass batches. 3. Weighing, Mixing & Melting of simple Glass Batch 4. Weighing, Mixing & Melting of color Glass Batch 5. Density of glass by float and sink method 6. Simple decoration processes e.g. etching, silvering staining, sand-blasting, lustering, cutting and polishing. 7. Examination the Common defects & strain in glass ware 8. Determination of the refractive index of glass 9. Determination of the thermal expansion of glass. 10. Determination of the low temperature viscosity. 11. Determination of the viscosity of molten glass	48
2	ENAMEL PRACTICALS: 1. Weighing, Mixing & Melting for Prepare the Enamel frit 2. Grinding the enamel frit in pot mill to prepare the enamel slip and its application 3. Determination the Fineness test of enamel slip. 4. Determination the Density of enamel slip using specific gravity bottle 5. Smelting, Cleaning and pickling of small mild steel plates for enameling	36

- | |
|---|
| 6. Application of Enamel slip on Iron sheet for making sign plates. |
| 7. Firing and fusion of applied enamel slip on M.S. Iron Sheet |

INSTRUCTIONAL STRATEGY

Students must visit different ceramic industries to know more about different coating techniques and defects in coating

MEANS OF ASSESSMENT

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Actual Lab & Practical Work,
- Viva Voice

RECOMMENDED BOOKS

1. Porcelain Enamels by Andrew
2. Industrial ceramics by Singer F and Singer SS
3. Modern pottery by HN Boss
4. Hand Book of ceramics
5. White ware by W. Rayan
6. Fine ceramics by FH Norton.

5.3	SILICATE ANALYSIS LAB	L	T	P
PRACTICAL		0	0	6

COURSE OBJECTIVE:

In this specialized Lab Silicate Analysis Students will analyze Ceramic materials as Loss on Ignition, they can check purity of Chemicals Determine the alkali in different types of Glass batches by using of Flame photo meter.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. Know the students how carryout loss on ignition of any Ceramic material
2. Understand the students to analyze ceramic raw material as Quartz, Feldspar, Glass etc.
3. Determined the Iron in China clay, Glass sand, Quartz etc
4. Determined the Alkali in ceramic material by Flame Photo meter.

DETAILED CONTENTS**LIST OF PRACTICALS**

Unit No.	Content	Periods
1	i. Determination of the Loss on Ignition of Given sample as silica sand, ii. Determination of purity of chemicals used in Ceramic industry. iii. Analysis of ceramic raw materials and glass raw materials such as lime, glass-sand, felspar, clay and quartz. iv. Colorimetric estimation of iron in China clay, glass sand and quartz. v. Analysis of Soda-lime glass. vi. Determination of alkali by conventional method and by flame photometer.	84

MEANS OF ASSESSMENT

- Actual Lab & Practical Work
- Laboratory Test
- Mid-term and end-term Lab tests

5.4	PHYSICAL TESTING IN CERAMICS LAB	L	T	P
PRACTICAL		0	0	6

DETAILED CONTENTS

LIST OF PRACTICALS

Unit No.	Content	Periods
1	POTTERY: - Particle size determination of ceramic raw materials by Anderson pipette, - Determine the Strength (M.O.R) of green and fired bodies. - pH-measurement of casting slip. - Determine the Viscosity of slurry by Torsion Viscometer - Thickness of weight, per unit area of glaze applied. - P.C.E. test for clays.	14
2	REFRACTORY: - Determination of the Pyrometric Cone Equivalent (P.C.E) of refractory - Determination of the Refractoriness under load (RUL) of refractory - Spolling test. (upto 1000⁰C) - Thermal expansion test (upto 1000⁰C) - Thermal conductivity (upto 1000⁰C) - Slag or glass resistance test (corrosion test) - Determination the Permanent linear change(P.L.C) of refractory - Determination the Permeability of refractory sample - Determination the Cold crushing strength (C.C.S) of refractory cubes - Determination the Packing Density of refractory materials - Study the Grading of Grog - Warpage of Refractory Slab	20
3	CEMENT: - Determination of the initial setting time of the cement - Determination of the final setting time of the cement - Determination of Tensile Strength of Cement Bracket - Determination of the Cold Crushing Strength of Cement sample	6
4	GLASS : - Softening point by littinton methods or by Softening point Apparatus - Low temperature viscosity. - Chemical durability of Glass ware by - I.S.I. method - ASTM Method - Determination the Thermal expansion of glass up to 1000⁰C. - Determination the Thermal Shock of glass ware - Annealing test by strain viewer. - Determination the Wall thickness of glass ware by varnier caliper / Dial gauge	16

	8. Light absorption of coloured glass at different wave length by spectro photometer.	
5	ENAMEL: 1. Study the enamel defect after Fusion / firing 2. Determine the Alkali Resistance Test 3. Determine the Acid Resistance Test 4. Determine the Impact Resistance Test 5. Determine the Water Resistance Test 6. Study the Gauge and Dimension of Metal sheet	10
6	FUEL AND PYROMETRY: 1. Determine the moisture content of a given fuel. 2. Proximate analysis of coal. 3. Determination the viscosity of oil fuel by Redwood viscometer or Torsion viscometer 4. Determine the Flash point of oil fuel. 5. Determination the sulphur content in the coal. 6. Uses & Study of different types of pyrometers and Thermocouples. 7. Determine the Calorific value of coal by Bomb calorimeter.	18

MEANS OF ASSESSMENT

- Assignments and quiz
- Laboratory Test
- Giving Lab tests,

5.5(A)	POTTERY AND PORCELAIN-II	L	T	P
P.E. – I / THEORY		2	1	0

COURSE OBJECTIVE:

This specialized subject enables the students to handle heavy clay wares and fine ceramics. Students are also made aware of health and safety guidelines and defects in ceramic body.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. Know the various raw materials used in white ware Industries
2. Know the Defects in various white ware
3. Understand various composition and formulation of various types of white ware bodies & their characteristic
4. Understand various qualities and process of testing of various ceramic products

DETAILED CONTENTS

Unit No.	Content	Periods
1	Raw material for white wares. Thermal effect, high temperature reactions in raw materials and their chemical change. Properties effect on ceramic whitewares, Texture and other physical properties. Influence of size and shape of particles. Particles size of ceramic materials and their determination. Changes in volume factors which influence the change.	4
2	Defects in white ware bodies caused by thermal expansion effects. Factors which influence changes in porosity and water absorption. Factors involved in the strength of whiteware bodies.	5
3	Define Calcination, sintering and vitrification. Development of the grain growth Microstructure of white wares.	5
4	Triaxial and other white wares and compositions with their Batch calculations.	3
5	Mechanism of firing and control: Modern trends in firing of whitewares.	3
6	Strength of porcelain insulators. Factors effecting breakdown of high and low voltage insulators.	5
7	White wares bodies : Earthen Ware, Stone ware, sanitary wares, bone china, chemical porcelain, electrical porcelain manufacturing method, properties and uses.	5
8	Describe the Ceramic Glaze, Raw material & their influence, Preparation, classification, application(Dipping, spraying, pouring, brushing, dusting) & decoration, Properties, Defects(Crawling, pinholes, peeling, crazing, spit-out dunting, blistering, sulphering, rolling, chipping) and their remedies	4
9	Ceramic colours and decoration, Factor affecting colour.	4

10	Recent development and control techniques applied to the whitewares processes- Kilns, Roller Head Jigger, Digital Printing.	4
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LIST OF PRACTICALS

1. Determination of porosity of a given sample.
2. Determination of density of a given sample.
3. Determination of thermal shock resistance of a given sample.
4. Determination of impact & chipping resistance of a given sample.
5. Determination of acid resistance of a given sample.
6. Steatite body preparation.
7. Preparation of lead and Borax frits.
8. Application and firing of transfer paper.
9. Study the milling of enamel & glaze in pot mill.
10. Application of glaze by dipping & spraying.

INSTRUCTIONAL STRATEGY

Students must get industrial exposure of various white ware industries to know more about process and products.

MEANS OF ASSESSMENT

- Assignments and quiz /class tests
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Industrial Ceramics by Singer & Singer, Khanna Publishers, New Delhi
2. Fine Ceramics by F.H. Norton.
3. A Handbook of Ceramics, Prentice Hall of India

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	4	12
2	5	12
3	5	12
4	3	7
5	3	7
6	5	12
7	5	12
8	4	12
9	4	7
10	4	7
Total	42	100

5.5 (B)	GLASS TECHNOLOGY-II	L	T	P
P.E. –I / THEORY		2	1	0

COURSE OBJECTIVE:

In this specialized subject, melting and refining of glass, colorants of glass, manufacturing of glass bottles and defects in glass are in detail. Elementary knowledge about glass ceramics and fibre optics is also provided along with quality procedures.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. Know various raw materials for glass ceramic
2. Understand general ideas about Ornamental glass, melting furnace & glass melting process
3. Knowledge about colourants in glass
4. Understand idea about the various process/technique of glass decoration
5. Understand Float glass making process & other glass products
6. Know the various process/technique decoration of glass and Special glass making
7. Know idea on layout of modern glass plant

DETAILED CONTENTS

Unit No.	Content	Periods
1	GLASS CERAMICS:- Introduction on Nucleation and crystallization in glasses, Controlled heat treatment for crystallization, Ultra low thermal expansion glass ceramics, Machinable glass ceramics.	5
2	ORNAMENTAL GLASS:- History of glass beads making, Tools and apparatus for glass beads making. Raw materials of ornamental glass i.e. Soda Lime, Types of ornamental products i.e. Glass beads, Glass Pendants, Different techniques of glass beads making	5
3	COLOURANTS OF GLASS- Titanium, oxides, Chromium oxide, manganese oxide, Iron oxide, Cobalt oxide, Nickel oxide, Copper oxide, Selenium oxides and others	6
4	DIFFERENT TECHNIQUES OF DECORATION i.e. Silvering, Fuming, Lustering, Feathering, Dating, Banding, Dichroic, Millefiori,.	6
5	FLOAT GLASS:- Theory of float process, construction of float tank, Control of glass ribbon thickness, application/uses of Float glass	5
6	OPTHELMIC GLASSES:- Refractive and dispersion in glass, Design of glass lens.	4
7	GLASS AND REFECTORY TECHNOLOGY:- Different types of refractories used in glass industry, Properties, Behaviour, Conditions in the different zones of glass. Melting	5

	furnace and selection of refractory accordingly	
8	ASTM methods for determination of strain point, annealing point, softening point, density, co-efficient of thermal expansion, viscosity	4
9	Manufacturing of glass bottles, hollow and pressed ware, sheet and plate glass, safety glass, optical glass, toughened glass, fiber glass, heat resistance glass, window glass	2

INSTRUCTIONAL STRATEGY

Different glass industries like sheet glass industry, hollow ware glass industry, float glass industry must be shown to students for better understanding of raw materials, processes and products etc.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Handbook of Glass Manufacturing by F.V. Tooley, Prentice Hall of India Publication
2. Modern Glass Practice by S.G. Scholse, McGraw Hill Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	5	12
2	5	12
3	6	12
4	6	12
5	5	12
6	4	8
7	5	12
8	4	12
9	2	8
Total	42	100

5.6	MODERN CERAMICS	L	T	P
THEORY		2	1	0

COURSE OBJECTIVE:

Development of new materials which have better performance & reliability in service are in demand in the industry. This course has been designed to give the diploma holders of ceramic engineering a thorough knowledge of the new ceramics, their properties and applications in the specialized areas like nuclear ceramics, electronic devices, bio ceramics etc.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- CO1- Understand about the Low & High tension Insulator Body
- CO2- Understand High temperature Ceramic & Abrasive
- CO3- Understand about Fibers & Whiskers
- CO4- Understand about the Special ceramic & Bio-Ceramics
- CO5- Know about the Capacitor & Condenser.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	2	1	1	-	1
CO2	3	2	2	1	1	1	1
CO3	2	2	2	1	1	-	1
CO4	3	3	2	2	2	1	1
CO5	2	2	1	1	1	-	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit No.	Content	Periods
1	Introduction To Low loss ceramics: The importance of low dielectric losses in high frequency work, steatite and cordierite bodies and their composition, manufacturing methods, properties and uses.	5
2	Introduction To High permittivity ceramics: Electrical condensers, advantage of ceramic condensers, rutile bodies, Titanates ceramics. Ferro electric and Piezo electric ceramics	5
3	Introduction To Magnetic ceramics: Soft spinel ferrites and hard hexagonal ferrites.	5
4	Special Ceramics: High temperature ceramics, Berillia, Magnesia, alumina and zirconia	4

5	Recent developments in the field of ceramics (lectures to be delivered by eminent ceramic engineers) in kilns, materials, energy efficiency. Elementary idea of non-oxide ceramic and fuel cells.	5
6	Ceramics raw materials, Chemical analysis and Physical Testing, Investigations of Clay firing properties, Glaze and Process control.	4
7	Abrasive :- Definition, Classification, properties, Manufacturing process of abrasive grains & product, Bonded & Coated Abrasive, Ceramic Cutting tools	5
8	Fibers & Whiskers:- Definition, types, Properties, application	4
9	Bio-Ceramics: - Ceramic materials for artificial tooth and bone joints, Elementary idea about preparation, properties and manufacture of bio-ceramics and their applications.	5

INSTRUCTIONAL STRATEGY

Students must get exposure of various industries like ferrite industry, semi conductor industry, capacitor industry to know more about products and processes.

MEANS OF ASSESSMENT

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Viva Voice

RECOMMENDED BOOKS

1. Ceramic materials for electronics by R.C. Buchahan, McGraw Hill
2. Introduction to Ceramics by W.D. Kingery, Prentice Hall of India
3. Industrial Ceramics by Singer & Singer
4. Ceramic Material For electronic by Heneb & West
5. Special Ceramic by Popper
6. Magnetic Ceramics by Richerson
7. Abressive by Coes L. Jr.
8. Cutting Tools by R.Edwards
9. Non Oxide Technical & engg. Ceramics by S.Hampshire
10. Ceramics Matrix Composites by R. Warren
11. Ceramics Material for Electronics by Marcel Dekker

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	5	12
2	5	12
3	5	12
4	4	10
5	5	10
6	4	12
7	5	10
8	4	12
9	5	10
Total	42	100

5.7	INDIAN CONSTITUTION	L	T	P
AUDIT COURSE		2	0	0

COURSE LEARNING OBJECTIVES:

1. Understand the history, principles, and key interpretations of the Indian Constitution.
2. Understand the structure and key roles of the Indian Union Government, including the President, Prime Minister, and Council of Ministers.
3. Understand the composition, powers, and functions of the Lok Sabha, Rajya Sabha, and the Supreme Court.
4. Understand the roles and powers of the Governor, Chief Minister, Council of Ministers, and the State Secretariat.
5. Understand the structure and functions of local administration, including District, Municipal, and Zila Panchayat levels.
6. Understand the structure, role, and functions of the Election Commission of India.

COURSE OUTCOMES: (COs)

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

- CO1:** Understand the historical background, philosophy, and process involved in the making of the Indian Constitution.
- CO2:** Analyze the structure and functioning of the Union Government, including the roles, powers, and relationships of the President, Prime Minister, Council of Ministers, Lok Sabha, and Rajya Sabha.
- CO3:** Explain the organization and working of the State Government.
- CO4:** Evaluate the system of Local Administration in India by understanding the structure and functions of District Administration, Municipal Corporations, and Zila Panchayats.
- CO5:** Understand the role, powers, and significance of the Election Commission of India in ensuring free and fair elections in a democratic system.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	2	-	2	*	*
CO2	3	3	2	-	2	1	2	*	*
CO3	3	2	1	-	2	1	2	*	*
CO4	3	3	2	-	3	2	2	*	*
CO5	3	2	-	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENT

Unit 1 – The Constitution – Introduction

(06 Periods)

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation

Unit 2 – Union Government

(06 Periods)

- Structure of the Indian Union Government

- President – Election, Role and Power
- Prime Minister and Council of Ministers

Unit 3- Indian Legislature & Judiciary

(06 Periods)

- Composition of Lok Sabha and Rajya Sabha
- Powers & Functions of Lok Sabha and Rajya Sabha
- Structure of Supreme Court including Appointment of Judges
- Powers & Functions of Supreme Court

Unit 4 – State Government

(03 Periods)

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

Unit 5 – Local Administration

(04 Periods)

- District Administration
- Municipal Corporation
- Zila Panchayat

Unit 6 – Election Commission

(03 Periods)

- Structure of Election Commission of India
- Role and Function of Election Commission

Suggested Distribution of Books

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
4. Our Constitution Subhash Chand Kashyap NBT New Delhi.

Suggested Software/Learning Websites:

- a. <https://www.constitution.org/cons/india/const.html>
- b. <http://www.legislative.gov.in/constitution-of-india>
- c. <https://www.sci.gov.in/constitution>
- d. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>
- e. <https://ncert.nic.in/textbook.php>

SUGGESTED DISTRIBUTION OF MARKS

SR No	Topic Time Allotted (periods)	Marks Allotted
1	6	20
2	6	20
3	6	20
4	3	12
5	4	16
6	3	12
TOTAL	28	100

5.8	SUMMER INTERNSHIP – II (6 Weeks after 4th Sem.)	L	T	P
PRACTICAL		0	0	0

6 weeks structured & supervised branch specific task oriented industrial training to be organized during after exam of IV semester. Students will submit a report.

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 3 weeks duration to be organized during the semester break starting after third year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 30 and external assessment of 40 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behavior, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

6.1	ENTREPRENEURSHIP AND START-UPS	L	T	P
HUMANITIES / THEORY		2	0	0

COURSE LEARNING OBJECTIVES:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

COURSE OUTCOMES

CO 1- Understand the basic of Entrepreneurship and Business Structures

CO 2- Planning and implementation of Business ideas

CO 3- Understanding Strategical Market Analysis

CO 4- Manage Organizational roles

CO 5- Understanding various Financial schemes

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	-	-	2	*	*
CO2	2	3	3	2	1	3	2	*	*
CO3	2	2	2	2	1	-	2	*	*
CO4	2	1	2	-	2	3	2	*	*
CO5	3	2	2	2	2	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENT:

Unit 1 - Introduction to Entrepreneurship and Start – Ups (09 Periods)

- Definitions, Classification of Entrepreneur
- Traits of an Entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures- On the Basis of size and On the basis of ownership
- Similarities/differences between entrepreneurs and managers

Unit 2 – Business Ideas and their implementation (08 Periods)

- Discovering ideas and visualizing the business
- Activity map
- Business Plan (Case Study)

Unit 3 – Ideas to Start-up (12 Periods)

- Marketing and Accounting- Definition and Importance.

- Market Analysis – STP (Segmentation, Targeting, Positioning)
- Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives.
- Risk analysis- SWOT Analysis.

Unit 4 – Management

(09 Periods)

- Definition Concept and Functions of Management
- Company's Organization Structure- Concept and Classification
- Recruitment and Selection- Definition,
- Training and Development- Importance.

Unit 5 - Financing and Protection of Ideas

(12 Periods)

- Financing methods available for Entrepreneurship/ Startups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing).
- Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses
- Communication of Ideas to potential investors – Investor Pitch.

Unit 6: Succession, Dissolution and Harvesting strategy

(6 Periods)

- Ways of succession
- Types of Dissolution

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	Entrepreneurship Development (A new Venture creation)	Vasant Desai	Himalya Publication
3.	Entrepreneurship Development	Khanka S.S.	S Chand & Company Limited New Delhi
4.	Entrepreneurship Development	Gupta and Srinivsan	S Chand & Company Limited New Delhi
5	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974
6	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
7	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business ISBN: 978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate->

structure/

- c. <https://www.finder.com/small-business-finance-tips>
- d. <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>
- e. NPTEL Course on Entrepreneurship https://onlinecourses.nptel.ac.in/noc23_mg74/preview
- f. National Geographic Channel you tube Video on “GI Tag Crafts of Bharat”

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	09	17
2	08	14
3	12	20
4	09	17
5	12	21
6	6	11
Total	56	100

6.2	CERAMICS MACHINERY & FURNACE DESIGN	L	T	P
THEORY		3	1	0

COURSE OBJECTIVE:

A thorough knowledge of the important machineries used in the ceramics industries enable the students to carry out various processes efficiently; hence this subject is very essential.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- CO1- Understand about the Plant layout and its setup machinery
- CO2- Understand details about different type of Shaping machines and Size Reduction & size Separation Machine
- CO3- Understand manufacturing of various type of cement, their qualities
- CO4- Know about Mixing & Body making Machine as per Requirement
- CO5- Know various types furnace / Kiln used in Ceramic Industries

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	2	1	1	1	1
CO2	3	3	2	2	2	1	1
CO3	3	2	2	1	1	1	1
CO4	2	2	2	1	2	1	1
CO5	3	2	2	1	1	1	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit No.	Content	Periods
1	Plant Layout: plant location, layout of the factory building, selection, operation and maintenance of ceramic machinery and equipment (for Pottery, Refractory, Glass, Enamel and Cement).	6
2	Size Reduction: Selection of crushing & grinding equipments. Definition of closed and open circuit operations.	6
3	Size Separation: wet classifiers, Air, Electromagnetic / magnet separators, vibrating sieve, slip lifting & Diaphragm pump, Filter press, Vacuum filter, Centrifugal Dewatering	6
4	Mixing and Body Making: Simple & De-airing pug mills and pugging equipments. Extruders, kneading equipments, wet pan mill, mixers, blunger,	6

	agitator etc	
5	Shaping Machine: Potters wheel, Jigger & Jolly, Batting machine, Semi & fully automatic jiggers, Roller machines, Extrusion wire cutting machines,	6
6	Pressing Machines: Important parameters of pressing (Die, Powder & Pressure) Toggle press, Screw press, friction press, Hydraulic press, vibratory compaction machine Isostatic press, Hot isostatic press(HIP), Injection moulding, Tape casting, Tile press and their parts.	6
7	Furnace Design: study of common types of furnaces in use in ceramic industries i.e. glass melting tank furnaces including unit melters, tunnel kiln, chamber kiln and down draft kiln, rotary cement kiln, muffle kiln and annealing lehrs. Environment friendly gas fired Kiln for glass beads making	5
8	Chimney and chimney calculation. Furnace capacity, Fuel efficiency and firing efficiency, Essential operations of a furnace i.e. Preheating of air, gas, fuel and oil, Flame-system, preheating of batch, firing, charging, melting and reversal etc	5
9	Furnace life and selection of refractories, Heating and cooling down of a furnace combustion, calculation, Solid and Liquid Fuel, gaseous Mixture	5
10	Elementary idea of design, construction and thermal calculation of at least one of the above mentioned furnaces	5

INSTRUCTIONAL STRATEGY

First Teacher should be Demonstrate by Making the figure in Class Board. Students must visit the different types of Ceramic plants to be familiar with Different types of Furnace / Kiln and manufacturing process of Ceramic industries. And another way is to showing the slide & video

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Actual Lab & Practical Work
- Model Making,

RECOMMENDED BOOKS

1. Industrial Ceramic by Singer & Singer, IBH Publisher.
2. A Concise Introduction to Ceramics by George C. Phillips, Amazon Publication
3. Ceramics, Mastering the Craft by Richard Zakin, American Ceramic Society Publication,

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	6	10
2	6	10
3	6	10
4	6	10
5	6	10
6	6	10
7	5	10
8	5	10
9	5	10
10	5	10
Total	56	100

6.3 A	ENERGY CONSERVATION AND AUDIT	L	T	P
OPEN ELECTIVE -I/ THEORY		2	0	0

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. To identify demand supply gaps in present scenario.
2. To understand conservations approaches to an industry.
3. To draw the energy flow diagram of an industry.
4. To identify energy wastage and suggest alternative methods.
5. To understand the concepts energy audit.

DETAILED CONTENTS

Unit No.	Content	Periods
1	Introduction: General energy problem, Sector wise Energy consumption, demand supply gap, Scope for energy conservation and its benefits; Energy Efficiency Principle – Maximum energy efficiency, Maximum cost effectiveness; Mandatory provisions of EC act; Features of EC act-Standards and labeling, designated consumers, Energy Conservation Building Codes (ECBC);	6
2	Energy Conservation Approaches In Industries: Methods and techniques of energy conservation in ventilation and air conditioners- compressors pumps, fans and blowers - Area Sealing, Insulating the Heating / cooling fluid pipes, automatic door closing- Air curtain, Thermostat / Control; Energy conservation in electric furnaces, ovens and boilers.	6
3	Energy Conservation Option: New equipment, technology, staffs training; Calculation and costing of energy conservation project; Depreciation cost, sinking fund method. Cost evaluation by Return On Investment(ROI) and pay back method etc.	6
4	Performance improvement of existing power plant: cogeneration, small hydro, DG Set; Demand side management; Load response programmes; Types of tariff and restructuring of electric tariff Technical measures to optimize T and D losses.	5
5	Energy Audit: Energy audit and its benefits; Energy flow diagram; Preliminary, Detailed energy audit; Methodology of - preliminary energy audit and Detailed energy audit – Phase I, Pre audit, Phase II- Audit and Phase III- Post audit; Energy audit report; Electrical Measuring Instruments - Power Analyzer.	5

RECOMMENDED BOOKS

1. Electric Energy Generation, Utilisation and Conservation Sivaganaraju, S Pearson, New Delhi, 2012
2. Project Management, Prasanna Chandra, Tata Mcgraw Hill, New Delhi
3. O.P. Jakhar, Energy Conservations in Buildings, Khanna Publishing House, New Delhi
4. Financial Management, Prasanna Chandra Tata Mcgraw Hill, New Delhi.
5. Energy management Handbook, Prasanna Chandra, Tata Mcgraw Hill, New Delhi.
6. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ed. 2018)

6.3 B	RENEWABLE ENERGY TECHNOLOGIES	L	T	P
OPEN ELECTIVE -I / THEORY		2	0	0

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. To understand present and future scenario of world energy use.
2. To understand fundamentals of solar energy systems.
3. To understand basics of wind energy.
4. To understand bio energy and its usage in different ways
5. To identify different available non-conventional energy sources

DETAILED CONTENTS

Unit No.	Content	Periods
1	Introduction: World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems	6
2	Solar energy: Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.	6
3	Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.	6
4	Bio-Energy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.	5
5	Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems	5

RECOMMENDED BOOKS

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, BNatarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

6.4	IN-HOUSE PROJECT	L	T	P
PRACTICAL		4	0	16

COURSE OBJECTIVE:

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

1. Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.
2. Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
3. Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
4. Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
5. Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
6. Setup a small scale unit & run smoothly.

GENERAL GUIDELINES

In the final year of the course, student can be divided in groups of 3 to 5 to take up a project for setting up a small scale industry to produce glass wares, white wares, electrical insulating items, refractory bricks etc.

The project report will include selection of site, market survey, list of equipments & machinery, raw materials, power, human resources, and investment involved. These things be rationally determined by the basis of actual data collected during survey. They are expected to visit existing industry for the purpose.

The project will also clearly mention amount of raw material wanted for 3 months working and yearly turn over and expected profit.

Prepare at least a few samples of the product, intended for manufacture, at institute level for producing before the examiner.

The project should have a table of the results of test and quality control of the product.

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no Supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10 %	10	8	6	4	2
2.	Planning and execution of considerations	10 %	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self-expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared “not eligible to receive diploma”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

S.No.	Range of maximum marks	Overall Grade
i	More than 80	Excellent
ii	79 < > 65	Very Good
lii	64 < > 50	Good
Iv	49 < > 40	Fair
v	Less than 40	Poor

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.
2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.
3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students’ performance as per the above criteria.
4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.
The teachers are free to evolve other criteria of assessment, depending upon the type of project work. It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition.

8 RESOURCE REQUIREMENT

PHYSICAL RESOURCES

(A) **Space requirement**

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) **Equipment requirement:**

Following Laboratories are required for Diploma Programme in Glass & Ceramic Engg.

- Communication Laboratory
- Applied Physics Laboratory
- Applied Chemistry Laboratory
- Applied Mechanics Laboratory
- Engineering Drawing
- Basics of Electrical, Mechanical, Civil Engg.
- Basics of IT/Computer Applications Laboratory
- Carpentry Shop
- Painting and Polishing Shop
- Plumbing Shop
- Welding Shop
- Fitting and Plumbing Shop
- Sheet Metal Shop
- Black smithy / Mason Shop
- Machine Shop
- Pottery & Refractory Lab and Modeling & Mould Lab
- Glass, Enamel & Ceramic Coating Lab
- Elementary Geology & Mineralogy Lab
- Energy Conservation Lab
- G.C. Workshop Practice Lab
- Silicate Analysis Lab
- Physical testing in Ceramic Lab

EQUIPMENT REQUIRED FOR

COMMUNICATION SKILLS LABORATORY			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500

APPLIED PHYSICS LABORATORY			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800
17.	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4,000
23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000
25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	500

30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000

APPLIED CHEMISTRY LABORATORY			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Digital Balance	1	80,000
2.	Burette 50ml	30	3,000
3.	Pipette 25ml	60	4,000
4.	Beakers 100ml	60	4,000
5.	Burette stand	30	30,000
6.	Glazed tile	30	1,000
7.	Conical flask 50ml (Titration flask)	60	4,000
8.	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
9.	Able's Flash Point apparatus	2	10,000
10.	(1/10)°C thermometer	06	6,000
11.	Candles	20	100
12.	Crucible with lid	06	2,000
13.	Muffle furnace	1	18,000
14.	Decicators	06	8,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	2,000
16.	Chemicals EDTA-1 kg Eriochrome Black-T(solochrome black T)-200g Buffer solution (NH ₃ - 2.5 ltr, NH ₄ Cl – 1 kg) Zinc sulphate- 500g H ₂ SO ₄ - 2.5 ltr Phenolphthalein indicator (as per requirement) Methyl orange indicator (as per requirement) Charcoal (as per requirement) Kerosene- 1 ltr	LS	20,000
17.	Miscellaneous	LS	2,000

APPLIED MECHANICS LAB				
Sr. No.	Description	Qty	Rs	Total Price
1	Polygon of Forces Apparatus	4	1500	6000
2	Universal Force Table	2	2500	5000
3	Principle of Moment Apparatus Bell Crank lever	4	1500	6000
4	Combined Inclined plane & Friction apparatus	4	1500	6000
5	Simple wheel and axle	2	2500	5000
6	Differential wheel and axle	2	3500	7000
7	Double sleeve Pulley Block	1	800	800
8	Simple Screw Jack	4	3000	12000
9	System of pulleys (Any I,II,III)	2 set	4000	8000
10	Worm & Worm wheel	2 set	5000	10000
11	Simply Support Beam with different weights (2 Sets)	2	3000	6000
12	Jib Crane	2	2500	5000
13	Jointed Roof Truss Apparatus	2	2500	5000
14	Miscellaneous	LS		5000

ENGINEERING DRAWING LAB			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Drawing Boards (700 x 500mm)	60	25,000
2.	Draughtsman Tables	60	1,80,000
3.	Draughtsman Stools	60	40,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooder joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000

BASICS OF IT LABORATORY/COMPUTER LABORATORY			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Computer System with latest configuration	30	8,00,000
2.	Printer (MFP)	1	25,000
3.	Printer (Laser)	1	35,000
4.	Plotter	1	75,000
5.	Digitiser	1	50,000
6.	Antivirus Software	LS	10,000
7.	Internet Facility on Computers	LS	2,00,000
8.	LCD Projector	1	35,000
9.	UPS	60	1,20,000
10.	Software (latest windows, latest MS Office)	1	1,00,000
11.	Scanner	1	10,000
12.	Miscellaneous	LS	5,000
CARPENTRY SHOP			
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000
7.	Wood Planner	1	20,000
8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500
PAINTING AND POLISHING SHOP			
1.	Spray gun with hose pipe	1	1,000
2.	Paint brushes	20	2,000
3.	Paint/Varnish	LS	2,000

4.	Air Compressor with 2 hp motor	1 set	10,000
5.	Miscellaneous	LS	2,000
ELECTRICAL SHOP			
1.	Tool kit (Plier, Screw driver, Knife, Steel rule, hammer, scriber, pincer steel tape etc.)	20	20,000
2.	Fuses, Switches, Plugs, Sockets, Ceiling rose, Wires, cleats, Clamps, Test lamp, Tester.(as per requirement)		8,000
3.	Electric Iron	1	1,500
4.	Electric kettle	1	1,500
5.	Ceiling fan/table fan	1	2,500
6.	Desert cooler	1	5,000
7.	Lead acid battery	2	8,000
8.	Battery Charger	1	6,000
9.	Miscellaneous	LS	3,000

SMITHY SHOP			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Black smithy forge (with open hearths, accessories to match the forge)	20	40,000
2.	Wrought iron anvils	20	20,000
3.	Swage blocks	4	8,000
4.	Blower with accessories, motor switch etc	1	6,000
5.	Work benches with vices	2	6,000
6.	Power hammer	1	20,000
7.	Tools and accessories – hammers, swages, tongs, poker, pullers etc	20	10,000
8.	Miscellaneous	LS	1,500
FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribes	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribes	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chisels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2”	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500

SHEET METAL SHOP			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00
4.	Shearing Machine	1	20,000
5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminum)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Miscellaneous	LS	1,500
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas Cutting Unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Welding generator set	1	10,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000
11.	Pedestal grinder	1	10,000
12.	Metal spraying gun	1	10,000
13.	Spot welder	1	25,000
14.	TIG welding set	1	1,00,000
15.	MIG welding set	1	1,00,000
16.	Welding Partition Screen	5	2,500
17.	Miscellaneous	LS	3,000

FOUNDRY SHOP			
Sr. No.	Description	Qty	Total Price (Rs)
1.	Moulding boxes	40	8,000
2.	Ladles	5	2,000
3.	Tool Kits	10 set	5,000
4.	Quenching tanks	2	5,000
5.	Portable grinder	1	3,000

6.	Pit furnace with blower	1	10,000
7.	Miscellaneous	LS	1,000
MACHINE SHOP			
1.	Centre lathes	10	6,00,000
2.	Grinder	1	10,000
3.	Universal milling machine	1	1,25,000
4.	Shaper	2	1,20,000
5.	Plainer	2	1,20,000
6.	Work bench	3	10,000
7.	Precision instruments	1	10,000
8.	Hand tools and accessories	2	8,000
9.	CNC trainer lathe	1	4,00,000
10.	Miscellaneous	LS	5,000

ENVIRONMENT ENGINEERING LABORATORY			
Sr. No	Particulars	Qty	Estimated Cost (Rs)
1	pH Meter	01	500
2	Turbidity Meter	01	5000
3	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
4	B.O.D. Incubator	01	25000
5	Water Analysis Kit	01	5000
6	High Volume Sampler	01	40000
7	Electrical Balance for weighing upto 1/10 of milligram (capacity)	01	1000

ENERGY CONSERVATION LABORATORY			
Sr. No	Particulars	Qty	Total Price (Rs)
1	Clamp meter	02	5000
2	Multimeter	02	2000
3	Power Analyzer	01	20000
4	Different types of lamps (LS) 60 W lamp, 230 V , 100 V 200 W lamp 500 W lamp 100 W lamp, 110 V, 150 V	10	500
5	Lux meter	02	5000
6	Centrifugal pump, 1 Kw	1	15,000
7	Standard window A.C.	01	20000
8	Anemometer	02	5000
9	Thermometer	03	2000
10	Flow meter	02	10000
11	Pumping set with at least two pumps of different capacity.	1 set	10000
12	Pressure gauge fitted on discharge lines	1 set	2000
13	Variable Frequency Drive	02	50000
14	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1	3000

15	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1	10000
16.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25000
17	Pressure Gauge	1	2,000
18.	Experimental Set up for Valve Throttling vs VFD	1	50,000
19.	Compressor, 20 cfm, single-stage	1	50,000
20.	Air leakage meter	1	18,000
21.	Blower (2 HP)	1	8,000

1	POTTERY & REFRACTORY LAB			
S. No	Name of Equipment	Qty	Rs.	T. Rs.
1	Ball Mill(Porcelain line inside with pebbles)Capacity-2 Cubicfeet	1	20000	20000
2	Pot Mill Rotatary with pot & grinding media	1	8000	8000
3	Screw Blunger Lab Size	1	5000	5000
4	Wooden Plunger Lab Size	1	5000	5000
5	Vibrating Screen with complete Accessories	1	3000	3000
6	Filter Press Lab Size with Diaphram Pump	1	30000	30000
7	Universal Jigger Jolleys	2	5000	10000
8	Toygle Press Lab Size	1	10000	10000
9	Jaw Crusher Capacity small Lab size	1	10000	10000
10	Semi Automatic Colour Printing Heat Press for Ceramic Cup	1	10000	10000
11	Hand Screw Press (No.-1or 2) as per need	1	10000	10000
12	Hot air oven (Heavy Duty) inner size-14"x14"x14"	1	8000	8000
13	Kanthal Furnace upto 1200 ⁰ C	1	25000	25000
14	High temperature furnace horizontal type up to 1450 ⁰ C	1	200000	200000
15	Ph meter digital	2	1500	3000
16	Test Sieves set (No of sieves-10 of different micron size)	2	2500	5000
17	Diamond Cutter Tile cutter with dia of blade (8"/10")	1	5000	5000
18	Vernier Calipers (Branded) Plane & Dial type	2	1500	3000
19	Permanent Magnet for casting slip	1	500	500
20	De-airing pug mill Lab Size	1	25000	25000
21	Painters Wheel (H x Dia)-18"x10"	2	1000	2000
22	Cyclone Dryer / Separator Small / Lab Size	1	10000	10000
23	Travelling Microscope	1	10000	10000
24	Permeability App.	1	6000	6000
25	Hydraulic press (25 MT Capacity) Lab Size	1	250000	250000

2	GLASS, ENAMEL & CERAMIC COATING LAB			
S. No	Name of Equipment	Qty	Rs.	T. Rs.
1	Physical Balance (Branded -max capacity-250 gm)	1	5000	5000
2	Silica Crucible (50 ml, 100 ml) =(Lump sum)		2500	2500
3	Platinum Crucible 50 ml & weight >50 gm	2	20000	40000
4	Strain Viewer	1	1000	1000
5	Thermal baths for thermal shock	1	15000	15000
6	High Temp. Furnace, bottom moveable, vertical type upto1450 ⁰ C	1	200000	200000
7	Lens Grinding & Polishing m/c. Small Size	1	25000	25000
8	Sand blasting m/c. Small Size with Compressor	1	15000	15000
9	Electric Muffle Furnace Small size 1200 ⁰ C	1	20000	20000

10	Electric furnace 30x30x30cm.Temp.1000°C	1	25000	25000
11	Enamel slip Spray gun	2	1500	3000
12	Softening Point testing app. for Glass.	1	80000	80000
13	Thermal Expansion Testing App. for Glass	1	100000	100000
14	Ultrasonic Drilling Machine	1	25000	25000
15	Thickness Viewer for non-metal coating on metal	1	10000	10000
16	Ultra Violet Glass Viewer	1	25000	25000
17	Graphite Paddles For Glass Beeds Making	1	50000	50000
18	Optic Moulds for millefiori Glass rods	10	10000	100000
19	Optical Microscope of high magnify power with light	2	20000	40000
20	Optical Microscope (Ordinary)	2	800	1600
21	UV Laser Machine for glass marking	1	150000	150000

3 SILICATE ANALYSIS LAB.				
S. No	Name of Equipment	Qty	Rs.	T. Rs.
1	Chemical Balance(Branded -max capacity 250 gm)	2	5000	10000
2	Digital Electronic Balance (Branded-max 200gm, min least count 0.001 gm)	1	15000	15000
3	Hot Plate 2KW	1	3000	3000
4	Hot air oven (Heavy Duty)inner size-14"x14"x14"	1	8000	8000
5	Platinum Crucible with lid 25 ml.& Weight >25gm	3	10000	30000
6	Platinum Disc with lid 5 cm dia, weight 20 gm approx	2	8000	16000
7	Platinum dish with lid 10 cm dia, weight 35 gm approx	1	14000	14000
8	Hydro Flourication Chamber	1	10000	10000
9	Calorimeter for determination of Iron titanium content in clay	1	6000	6000
10	Lovibond comporotor with test tube.	1	1500	1500
11	Flame Photometer	1	4000	4000
12	Water Bath	3	4500	4500
13	Water De-ioniser Plant Glass Made	1	5000	5000
14	Glass Ware (Lump sum)		2500	2500
15	Silica Crucible (25 ml, 50 ml) (Lump sum)		2000	2000
16	Tongs (Stainless Steel) size 10” & 12”	5	100	500

4 PHYSICAL TESTING IN CERAMIC LAB				
S. No	Name of Equipment	Qty	Rs.	T. Rs.
1	Physical Balance (Branded -max capacity-250 gm)	1	5000	5000
2	Electronic Digital Physical Balance-max capacity-250gm	1	8000	8000
3	Auto clave Testing for Crazing deffect	1	15000	15000
4	Vicats Needle apparatus	2	500	1000
5	Le Chatteliers apparatus.	2	500	1000
6	Density Comparator Testing App.	1	3000	3000
7	Infra Red Moisture Balance	1	12000	24000
8	Speedy moisture test for direct reading	1	12500	12500
9	Electric Muffle Furnace Small size 1000 ⁰ C	1	25000	25000
10	Refractometer & Glossy Meter	1	3500	3500
11	Optical pyrometer Range 400 to 1600 ⁰ C	1	25000	25000
12	Radiation Pyrometer up to 1600 ⁰ C	1	80000	80000

13	Thermo couples upto 1500°C With Digital Indicator	1	10000	10000
14	Red Wood Viscometer	1	11500	23000
15	Orset / Digital apparatus for Gas Analysis	1	5000	5000
16	Bomb calorimeter with complete accessories	1	50000	50000
17	Flash point Apparatus for liquid fuel	1	5000	5000
18	Thermal Expansion Apparatus up to 1000°C.	1	100000	100000
19	Planetary Ball Mill PM 100 with complete accessories	1	500000	500000
20	Ultimate Tensile strength testing machine	1	40000	40000
21	Apparatus for testing c.c.s. of refractory/Concrete cube	1	40000	40000
22	Rotary Viscosity meter/ Torsion viscosity meter	1	5000	5000

5 GEOLOGY & MINERALOGY LAB.				
S. No	Name of Equipment	Qty	Rs.	T. Rs.
1	Mineralogical Microscope	6	10000	60000
2	Steel Books Shelves	2	6000	12000
3	Electronic Digital balance Max capacity-25kg/100 kg	2	1500	3000
4	Moh's Scale for hardness	10	500	5000
5	Rockwell Hardness Tester with computer Programming	1	120000	120000
6	Grinding & Polishing Machines for sample preparation	1	30000	30000

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

9 EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems.

The formative evaluation for theory subjects may be caused through sessional /class- tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-I should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can

be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals /field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

10 RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.
2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.
3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.
4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.
2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.
3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in

advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.
5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.
6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.
7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feed back to every student
8. The student centred activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.
9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.
10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.
11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.
12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.
13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

11- GUIDELINES FOR ASSESSMENT OF STUDENT-CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows-

15 Marks for general behaviour and discipline

(by HODs in consultation with all the teachers of the department)

10 Marks for attendance as per following:

(by HODs in consultation with all the teachers of the department)

a) 75 - 80% 06 Marks

b) 80 - 85% 08 Marks

c) Above 85% 10 Marks

25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a) 25 - State/National Level participation

b) 20 - Participation in two of above activities

c) 15 - Inter-Polytechnic level participation

12 LIST OF PARTICIPANTS

The following experts have participated /contributed in workshop for Developing the Curriculum scheme/competency profile according to AICTE and NEP-2020 of Three Year Diploma Course in Glass & Ceramic Engineering at Central For Development of Glass Industry (C.D.G.I), Firozabad.

1. Shri Sachin Rajpal, Principal Director, C.D.G.I, Firozabad
2. Shri Rohit Kumar Singh, Glass Technologist, C.D.G.I, Firozabad
3. Shri Ajay Singh, Glass Technologist, C.D.G.I, Firozabad
4. Shri Parsa, MD, Akashwani Glass Works, Firozabad
5. Shri Karan Pal, H.O.D, Glass & Ceramic Engg., S.G.S.J. Polytechnic Khurja
6. Shri Mool Chand, H.O.D, Glass & Ceramic Engg., Govt. Polytechnic Firozabad
7. Dr. Pawan Kumar Mulani, Lecturer Chemistry, Govt. Polytechnic Firozabad
8. Shri Vikas Kulshreshtha, Assistant Professor/Coordinator, IRDT Kanpur

(ANNEXURE-I)

PROCEDURES / FORMATS FOR ORGANIZING INTERNSHIPS.

STUDENT INTERNSHIP PROGRAM APPLICATION

Complete and submit to the TPO/ Internship Program Coordinator.

1. Student Name:		Enroll. No.:	
2. Campus Address:		Phone:	
3. Home Address:		Phone:	
4. Student email address:			
5. Branch:		6. Internship Semester: _____	
7. Internship Preferences			
	Company/Industry	Core Area	Location
Preference-1			
Preference-2			
Preference-3			
Faculty mentor Signature: _____ Date _____.			
Student Signature: _____ Date _____.			
Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program			

Signature with seal
HOD/Principal

(ANNEXURE-I)

**REQUEST LETTER FROM INSTITUTE TO INTERNSHIP/INDUSTRIAL TRAINING
PROVIDER**

Ref. No.: _____

Date: _____

To,
The HR Manager/Training Coordinator

.....
.....

Subject: Request for Internship/Industrial Training for Diploma Students

Sir/Madam,

We are pleased to introduce....., a premier institution affiliated with Board of Technical Education, Uttar Pradesh, offering diploma programs in various diploma disciplines.

As a part of the curriculum, our students are required to undergo Internship/Industrial Training to gain practical exposure and enhance their technical competencies. Therefore, we kindly request your esteemed organization to provide Internship/Training opportunities to our students during the period from to

S. No.	Name	Enroll. No.	Semester/Year	Discipline

Yours sincerely,

(Head of Department/Principal)

PROFORMA FOR EVALUATION OF INTERNSHIP BY INDUSTRY

Student Name:Evaluation Date:

Industry Supervisor Name:

Company/Organization:

Title of the Project:.....

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Max. Marks	Marks Given
Attendance and Punctuality	20	
Discipline and Professional Behavior	20	
Technical Knowledge and Understanding of Processes	30	
Practical Skills and Quality of Work	20	
Ability to Apply Theoretical Knowledge	20	
Problem Solving and Analytical Ability	10	
Communication and Interpersonal Skills	20	
Teamwork and Collaboration	10	
Internship Report/Documentation	20	
Presentation and Viva-Voce	30	
Total Marks	200	

Additional comments, if any:

Signature with seal of Industry supervisor

HR Manager

INTERNSHIP REPORT

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

MONITORING & EVALUATION OF INTERNSHIP

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation by faculty supervisor of Industry.
3. Evaluation through seminar presentation/viva-voce at the Institute.

1. EVALUATION BY INDUSTRY

The industry will evaluate the students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary and skill test in addition to any remarks.

2. MONITORING/ SURPRISE VISIT BY TPO/ STAFF/ FACULTY MENTOR

TPO/Staff/ Faculty Mentor of the institutes will make a surprise visit to the internship site, to check the student's presence physically, if the student is found absent without prior intimation to the T & P Cell, entire training will be cancelled. Students should inform the TPO, faculty mentor as well as the industry supervisor at least one day prior to availing leave by email. Students are eligible to avail 1-day leave in 4 weeks and 2 days leave in 6 weeks of the internship period apart from holidays and weekly offs.

3. EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOCE AT THE INSTITUTE

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Seminar presentation will enable sharing knowledge & experience amongst students & teachers and build communication skills and confidence in students.