

5.1 EMPLOYABILITY SKILLS – I

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- - 2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Writing skills (08 hrs)
 - i) Official and business correspondence
 - ii) Job application - covering letter and resume
 - iii) Report writing - key features and kinds

2. Oral Communication Skills (20 hrs)
 - i) Giving advice
 - ii) Making comparisons
 - iii) Agreeing and disagreeing
 - iv) Taking turns in conversation
 - v) Fixing and cancelling appointments

3. Generic Skills (04 hrs)
 - i) Stress management
 - ii) Time management
 - iii) Negotiations and conflict resolution
 - iv) Team work and leadership qualities

5.2 ENVIRONMENTAL EDUCATION

L T P
3 - -

RATIONALE

Education about environment protection is a must for all the citizens. In addition, a diploma holder must have knowledge of different types of pollution caused by industries and construction activities so that he may help in balancing the eco system and controlling pollution by adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Definition, Scope and Importance of Environmental Education (02 hrs)
2. Basics of ecology, biodiversity, eco system and sustainable development (03 hrs)
3. Sources of pollution - natural and manmade, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement (12 hrs)
4. Solid waste management – Causes, effects and control measures of urban and industrial waste (06 hrs)
5. Mining and deforestation – Causes, effects and control measures (04 hrs)
6. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (10 hrs)
7. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) (04 hrs)
8. Current Issues in Environmental Pollution – Global Warming, Green House Effect, Depletion of Ozone Layer, Recycling of Material, Environmental Ethics, Rain Water Harvesting, Maintenance of Groundwater, Acid Rain, Carbon Credits. (07 hrs)

INSTRUCTIONAL STRATEGY

The contents will be covered through lecture cum discussion sessions. In addition, in order to have more appreciation of need for protection of environment, it is suggested that different activities pertaining to Environmental Education like video films, seminars, environmental awareness camps and expert lectures may also be organized.

RECOMMENDED BOOKS

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.

3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
Total	48	100

5.3 CERAMIC WHITEWARE TECHNOLOGY –II

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3 - 6

RATIONALE

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.

DETAILED CONTENTS

1. Heavy Clay Wares:- Brickware, salt glazed pipes, sanitary ware, earthen ware body, terracotta body, stoneware body. (10 hrs)
2. Fine Ceramics:- Manufacturing, properties & their applications: floor tiles, wall tiles, dental porcelain, insulators: Low tension and High tension, electrical porcelain, chemical stoneware, bone china ware, Hotel ware. (10 hrs)
3. Study of the following properties of ceramic body:- Loss on ignition, plasticity, thermal shock resistance, corrosion resistance, abrasion resistance, lead solubility test, porosity, impact and chipping resistance, acid resistance. (10 hrs)
4. Health & safety with glazes & ceramic materials-labeling of hazardous material, ceramic material hazards, recommended health & safety procedures, disposal of materials. (10 hrs)
5. Defects of Ceramic Body: - Crawling, pinholes, peeling, crazing, spit-out dunting, blistering, sulphering, rolling, chipping and their records. (08 hrs)

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 corrosion resistance of a given sample.
5. Determination of abrasion resistance of a given sample.
6. Determination of impact & chipping resistance of a given sample.
7. Determination of acid resistance of a given sample.
8. Steatite body preparation.
9. Preparation of lead and Borax frits.
10. Application and firing of transfer prints.
11. Study the milling of enamel & glaze in pot mill.
12. Application of glaze frit by dipping & spraying.
13. Study the defects like pinholes, chipping and dunting of fired product.
14. Preparation of clay models like statue, pen stands, paper weights.

INSTRUCIONAL STRATEGY

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

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

Sr. No	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2.	10	22
3.	10	22
4.	10	20
5.	08	16
Total	48	100

5.4 CERAMIC REFRACTORY TECHNOLOGY-II

L T P
3 - 6

RATIONALE

This specialized subject enables the diploma holders to perform sintering process efficiently. This subject also provides them details of special refractories and their applications.

DETAILED CONTENTS

1. Sintering- Sintering process with oxide system, Manufacturing, properties and uses of: Magnesia, Zirconia, Thoria, Insulating bricks, Insulating castables, Ceramic fibre, glass wool. Preparation of crucibles, muffels, saggars, fused alumina & used magnesia. (18 hrs)
2. Special Refractories- Manufacturing, Properties and uses of : Refractory- Borides, Carbides, Nitrides (for example SiC, Silicon nitride etc.) Cermets and composite materials, Titania, Beryllia, Abrasives, Monolithics- Castables, Ramming and Patching mixes, Refractory mortars and cements. (14 hrs)
3. Application of refractories:-Glass Tank furnace, Blast furnace, Basic and open hearth furnace, Soaking pits, Reheating furnace, Hot metal mixer, Laddles, Steel melting furnace by electricity. Refractories used in nuclear power plant-Coke-ovens, Cement and lime industries. (16 hrs)

LIST OF PRACTICALS

1. Refractoriness under load determination.
2. Spalling resistance for the refractoreis.
3. Conductivity determination for the compacted bricks.
4. Conductivity determination for the composite walls.
5. Permeability determination of bricks.
6. Shrinkage effect determination on bricks.
7. Instrumental analysis: X - Ray diffractrometry, Flame Photometry & spectroscopy.
8. Determination of thermal shock resistance.
9. Determination of volume shrinkage by direct & indirect method.
10. Determination of coefficient of thermal expansion.
11. Refractoriness determination of various materials.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Refractories by Nandi, New Age Publication.
2. Refractories by ML Mishra, Tata McGraw Hill Publishers, New Delhi.
3. Refractories by Chester, Prentice Hall of India Publication.
4. Refractories by Chesty, PHI Publication.

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (Hrs)	Marks Allotted (%)
1	18	40
2.	14	26
3.	16	34
Total	48	100

5.5 GLASS TECHNOLOGY - II

L T P
3 - 6

RATIONALE

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

DETAILED CONTENTS

1. Fundamental concept of glassy state, chemistry of glass in light of atomic structure, viscosity, thermal expansion and density measurement, origin of thermal stresses, tempering and annealing of glass, detection and measurement of strain, chemical durability, effect of composition on glass manufacturing. (06 hrs)
2. Melting and refining of glass, annealing and decolourisation, strain, temporary and permanent strain, durability, attack of water on glass, acid attack, alkali attack (06 hrs)
3. Colourants of glass-Titanium, oxides, Chromium oxide, manganese oxide, Iron oxide, Cobalt oxide, Nickel oxide, Copper oxide, Selenium oxides and others. (04 hrs)
4. Manufacturing of glass bottles, hollow and pressed ware, sheet and plate glass, safety glass, optical glass, toughned glass, fibre glass, heat resistance glass, window glass (08 hrs)
5. Defects in glass, their detection and prevention: - stones, cords, blisters and seeds bad colour, bad workmanship etc. (06 hrs)
6. ASTM methods for determination of strain point, annealing point, softening point, density, co-efficient of thermal expansion, viscosity. (06 hrs)
7. Elementary knowledge of Glass Ceramics and Fibre Optics. (02 hrs)
8. Introduction to- (i) Statistical quality control (ii) Basis of ISO-9000 and TQM. Pollution Control Systems in Glass Industry. (04 hrs)
9. Principles and methods of glass working- fourcaults machine, pitsburg process, blowing, gobfeeder, ribbon machine, spinning glass. (06 hrs)

LIST OF PRACTICALS

1. Determination of thermal expansion of glass.
2. Determination of refractive index of glass.
3. Determination of low temperature viscosity.
4. Examination of Common defects in glass.
5. Examination of strain in glass.

6. Determination of hardness and durability of glass.
7. Determination of viscosity of molten glass.
8. Determination of glass, cutting, sandblasting, silvering and enameling.
9. Preparation of container glass, mixing, melting, tests during melting.
10. Preparation of special glasses such as crystal, semi crystal and signal glasses.

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.

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

Sr. No	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2.	06	12
3.	04	10
4.	08	18
5.	06	10
6.	06	10
7.	02	04
8.	04	10
9.	06	14
Total	48	100

5.6 MODERN CERAMICS

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3 - -

RATIONALE

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.

DETAILED CONTENTS

1. Introduction to new ceramics, scope & classification. (04 hrs)
2. Superconductivity:- Phenomenon & properties of superconductors, Meissner effect. Development of high temperature ceramic super conductors, their crystal structure, application of super conductors. (06 hrs)
3. Nuclear Ceramics:- Nuclear energy, types of reactors, fuel elements, containers, moderators, control rods, structural parts, irradiation effect, ceramic materials used in technology, their classification & applications. (06 hrs)
4. Dielectric & magnetic ceramics:- Barium titanate, manufacture of barium titanate, property, hexagonal & polycrystalline ferrites, rare earth garnets, orthoferrites, ilmenites, classification of ferrites, types of ferrite, hard & soft ferrites, manufacturing of soft ferrites, hard ferrite, applications. (08 hrs)
5. Ceramic capacitors: - Thin film capacitor, thick film capacitor, multilayer capacitors. (04 hrs)
6. Ceramic sensors: Resistors, Varistors and Thermistors. Ceramic materials: Properties, manufacturing, piezoelectricity phenomenon. Ceramic materials: their shaping, sintering and finishing, and applications. (06 hrs)
7. Bio-Ceramics: - Ceramic materials for artificial tooth and bone joints, Elementary idea about preparation, properties and manufacture of bio-ceramics and their applications. (06 hrs)
8. Piezoelectric, ferroelectric, pyroelectric and electro-optic ceramics. Basic theory of development of piezoelectricity, ferroelectricity in ceramic materials. PZT and PLZT based materials. (08 hrs)

INSTRUCTIONAL STRATEGY

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

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

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (Hrs)	Marks Allotted (%)
1	04	10
2.	06	12
3.	06	12
4.	08	14
5.	04	10
6.	06	12
7.	06	14
8.	08	16
Total	48	100

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview; Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene

6.1 PROJECT ORIENTED PROFESSIONAL TRAINING

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- - 40

Industrial training project work aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students during last semester of the course, are required to be sent for a period of 4 weeks at different work sites. Some of the good industries are suggested by the expert group as follows:

- Design of process equipment
- Development of prototypes
- Study of the process of manufacturing of whitewares, refractories and glasses
- Fabrication of components/equipments
- Fault diagnosis and rectification experiences
- Bringing improvements in the existing system/equipment
- Calibration and testing of equipment or any other innovative project which can develop creative skills in the students

Some of the good industries are suggested by the expert group as follows:

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| 1. | Hindustan Sanitaryware Industries Ltd. | Bahadurgarh (Haryana), Bibinagar (AP) |
| 2. | Hindustan National Glass Ltd. | Bahadurgarh (Haryana), Neemrana(Rajsthan) |
| 3. | Somany Ceramics Ltd. | Bahadurgarh (Haryana), Kodi (Gujrat) |
| 4. | Diamond Pottery | Bahadurgarh (Haryana) |
| 5. | Gulati Glass | Bahadurgarh (Haryana) |
| 6. | Yash Ceramics | Bahadurgarh (Haryana) |
| 7. | Anant Raj Industries | Rewari (Haryana) |
| 8. | R.K. Stonewares | Bhiwadi (Rajsthan) |
| 9. | Kajaria Ceramics | Bhiwadi (Rajsthan), Sikandrabad (UP) |
| 10. | Orient Tiles | Sikandrabad (UP) |
| 11. | Haryana Sheet Glass | Sonepat (Haryana) |
| 12. | OSRAM Industries | Sonepat (Haryana) |
| 13. | Asani Glass Industries | Bhiwadi (Rajsthan) |
| 14. | Bosch and Lamb Industries | Bhiwadi (Rajsthan) |
| 15. | Glass Equipments Ltd. | Bahadurgarh (Haryana) |
| 16. | Cosmo Ferrites Ltd. | Jabli, Distt. Solan (HP) |
| 17. | Rocca Parryware Ltd. | Alwar (Rajsthan) |
| 18. | CentralGlass & Ceramic Research Instt. | Khujra (UP) |
| 19. | Naresh Potteries | Khujra (UP) |
| 20. | Silico-Chemico (P) Ltd. | Khujra (UP) |
| 21. | Grasim Cements Ltd. | Panipat (Haryana) |
| 22. | Modern Insulators | Abu Road (Rajsthan) |
| 23. | Saint Gobara Glass | Bhiwadi (Rajsthan) |
| 24. | Saint Gobara Glass | Sriperumbudeer TN) |

25.	Nitco Tiles Ltd.	Alibang (Maharashtra)
26.	Bell Granito Ceramica Ltd.	Baroda (Gujrat)
27.	Crompton Greeves (I) Ltd.	Baroda (Gujrat)

In industrial training, each student is supposed to study the material and technology used at site and prepare a detailed project report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students.

The teacher along with field supervisors will conduct performance assessment of students. This minor project work will carry 200 marks. 100 marks will be given by Industrial/field supervisors and 100 marks by the teacher supervising this training. The components of evaluation will include the following:

a)	Punctuality and regularity	15%
b)	Initiative in learning new things	15%
c)	Relationship with workers	15%
d)	Industrial training report	55%

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various 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. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. 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 for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

- Design of process equipment
Development of prototypes
- Study of the process of manufacturing of whitewares, refractories and glasses
Fabrication of components/equipments
- Fault diagnosis and rectification experiences
- Bringing improvements in the existing system/equipment
- Calibration and testing of equipment or any other innovative project which can develop creative skills in the students

A suggestive criteria for assessing student performance by the external (personnel 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

* For the internal and external examinations all the marks can be proportional for study scheme.

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

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 > 65	Very good
iii)	64 > 50	Good
iv)	49 > 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated 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.

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 100 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 another 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 organisations in such an exhibition. 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 industries are approached for instituting such awards.

