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UTTARAKHAND BOARD OF TECHNICAL EDUCATION JOINT ENTRANCE EXAMINATION AND TRAINING, RESEARCH DEVELOPMENT CELL, DEHRADUN STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME

BRANCH NAME – CHEMICAL ENGINEERING

SEMESTER – VI

			T	Р	T		EVALUATION SCHEME						
Subject	Subject			Internal External			Total	Credit					
Code						Theory	Practical	The	ory	Prac	tical	Marks	Point
			Period/Weeks		ks	Max Max Marks Marks	Max Marks	Hrs.	Max Marks	Hrs.			
136001	Entrepreneurship Development and Management**	5	-	-	5	20	-	80	2.5	-	-	100	5
016003	Fertilizer Technology	5	-	-	5	50	() 	50	2.5	-	-	100	5
016004	Petroleum and Petrochemicals	5	-	4	9	50	50	50	2.5	75	3.0	225	5
016002	Process Equipment Design **	5	-	-	5	50	-	50	2.5	-	-	100	6
016001	Pollution Control and Industrial Safety**	5	-	4	9	50	50	50	2.5	75	3.0	225	6
016005	Major Project Work	-	- \	7	7	-	50	1.	8-1	75	3.0	125	5
016052	Industrial exposure (assessment at Institute level)	-	-			-	25	19	/ /	-	-	25	1
016054	General proficiency #	-	-	4	4	-	25		/-	-	-	25	1
016055	Employability skills **	4	-	-	4	25	/ .	50	2.5	-	-	75	1
	Total	29	-	19	48	245	200	330	-	225	-	1000	35

** Common with diploma programme in Chemical Technology (Paint) and Chemical Technology (Rubber & Plastic).
General Proficiency will comprise of various Co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities, G.K., general study, elementary math and discipline.

++ Industrial visit compulsory at minimum two industries or departments.

Note- 1- Each period will be of 50 minutes. 2- Session will be of 16 weeks. 3- Effective teaching will be of at least 12.5 weeks.

Branch Code - 01



ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

Subject Code : 136001



RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION-A ENTREPRENEURSHIP

1. Introduction

- 1. Concept/Meaning and its need
- 2. Qualities and functions of entrepreneur and barriers in entrepreneurship
- 3. Sole proprietorship and partnership forms of business organisations
- 4. Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)

2. Market Survey and Opportunity Identification

- 5. Scanning of business environment
- 6. Salient features of National and State industrial policies and resultant business opportunities
- 7. Types and conduct of market survey
- 8. Assessment of demand and supply in potential areas of growth
- 9. Identifying business opportunity
- 10. Considerations in product selection

3. Project report Preparation

- 6. Preliminary project report
- 7. Detailed project report including technical, economic and market feasibility

(14 periods)

(17 periods)

(23 periods)

- 8. Common errors in project report preparations
- 9. Exercises on preparation of project report

SECTION-B MANAGEMENT

4. Introduction to Management

Definitions and importance of management Functions of management: Importance and Process of planning, organising, staffing, directing and controlling Principles of management (Henri Fayol, F.W. Taylor) Concept and structure of an organisation Types of industrial organisations: Line organisation, Line and staff organisation Functional Organisation

5. Leadership and Motivation

(05 periods)

(06 periods)

a) Leadership:

Definition and Need, Qualities and functions of a leader Manager Vs leader Types of leadership

b) Motivation:

Definitions and characteristics, Factors affecting motivation Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas

(10 periods)

a) Human Resource Management

Introduction and objective

Introduction to Man power planning, recruitment and selection Introduction to performance appraisal methods

b) Material and Store Management

Introduction functions, and objectives, ABC Analysis and EOQ

c) Marketing and sales

Introduction, importance, and its functions, Physical distribution Introduction to promotion mix, Sales promotion

d) Financial Management

Introductions, importance and its functions Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics

(05 periods)

a) Customer Relation Management (CRM): Definition and need, Types of CRM

b) Total Quality Management (TQM):

Statistical process control, Total employees Involvement Just in time (JIT)

c) Intellectual Property Right (IPR):

Introductions, definition and its importance Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

- 1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
- 2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
- 3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
- 4. Entrepreneurship Development Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
- 5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
- 6. Handbook of Small Scale Industry by PM Bhandari

- 7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.
- 8. Entrepreneurship Development & management By V.K. Joshi, Jagdamba Publication, New Delhi

Topic No.	Time Allotted (Pds)	Marks Allotted (%)
1	23	30
2	17	20
3	14 219 9,	15
4	6	10
5 9	5	05
6 5	10	15
7	5	05
Total	80	100

FERTILIZER TECHNOLOGY

Subject Code: 016003

RATIONALE

Fertilizer plants have large employment potential, therefore, this subject is being offered as an elective subject. Students will be imparted detailed knowledge of nitrogenous, Phosphatic and mixed fertilizers.

DETAILED CONTENTS

1. Introduction

Demand and Supply in India. Overview of fertilizer industry in India. Important fertilizer plants in India. General introduction of NPK fertilizers

2. Nitrogenous Fertilizers:

- Importance of ammonia, Properties, uses & method of manufacture of Ammonia with flow-sheet .its manufacture from different processes and brief description of important fertilizers made from ammonia.
- Detailed manufacturing processes of urea and major engineering problems
- Detailed manufacturing processes of Ammonium Nitrate.
- Major Engineering problems like corrosion, safety, crystallization, conditioned air requirements

3. Phosphatic Fertilizers:

- Detailed manufacturing process of superphosphate and triple super phosphate with the help of flow sheet.
- Ammonium phosphates: Detailed process description with the help of flow sheet

4. Potassic Fertilizers

Brief description of manufacturing of various Potassic fertilizers like KCl and K2SO4

5. Mixed Fertilizers:

• Chemical Fertilizer; (A mixture of ammonium phosphate, ammonium sulfate and potash); Flow sheet and description of process.

(08 periods)

(10 periods)

(16 periods)

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(20 periods)

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6.	Micronutrients:	Different micronutrients,	their effects.	(12 periods)
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(06 periods)

7. Bio-fertilizers

Brief description of various types of bio-fertilizers

INSTRUCTIONAL STRATEGY

The fertilizer plants have large employment potential for chemical engineers so the students maybe imparted knowledge about the fertilizers in detail with their detailed flow sheets.

RECOMMENDED BOOKS

- 1. Agriculture in India, Vol. I by Kumar, Aggarwala and Others, Asia Publishing House, Mumbai
- 2. Handbook on Fertilizer Technology, published by Fertilizer Association of India
- 3. Fertilizer Quality Guide for Major and Micro Nutrients by HLS Tandon published by Fertilizer Association of India
- 4. Fertilizer Industry in India, Part I and II by Pritam Singh and VS Awasthi, 1992

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
P	08	15
2	20	20
3	16	15
4	08	10
5	10	15
6	12	15
7	06	10
Total	80	100

PETROLEUM AND PETROCHEMICALS

Subject Code : 016004

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RATIONALE

Petroleum industry being one of the fast growing industries has large employment potential. Students will be imparted detailed knowledge of petroleum and petrochemical products along with the processes involved in their production.

DETAILED CONTENTS

THE CONTENTS ARE NOT LEGIBLE

- 1. History and development of petroleum refining, composition constituents of petroleum. (08 periods)
- 2. Important petrochemical feed stocks and precursors. (10 periods)
- Definition, properties and uses of flash point, fire point, cloud and pour point viscosity index, octane number, cetane number, diesel index, smoke point, aniline point, penetration number. (12periods)
- 4. Technology of cracking, reforming, alkylation, isomerization, hydrogenation, oxidation, nitration, polymerization. (12 periods)
- 5. Manufacturing processes of synthesis gas, acetaldehyde, vinyl acetate, ethyl chloride, styrene, acrylonitrite, propylene oxide, butadiene, and isoprene.

(14 periods)

- 6. Cracking, different cracking processes like thermal cracking, visbreaking, catalytic cracking (fluidized bed and fixed bed). (08 periods)
- 7. Lube oil production processes. (08 periods)
- 8. Coking, different coking processes like delayed coking and fluidized bed coking.

(08 periods)

LIST OF PRACTICALS

- 1. Flash point and fire point of oil by pensky-martan method.
- 2. Flash point and fire point of oil by clear and open cup method.
- 3. Viscosity of petroleum products by Redwood viscometer.
- 4. Viscosity of petroleum products by saybolt's viscometer.
- 5. Viscosity of petroleum products by Angular viscometer.
- 6. Smoke point of kerosene and other volatile liquids.

- 7. Aniline point of petroleum products.
- 8. Penetration numbers of greases, bitumen and asphalt.
- 9. Cloud and pour point of oils.
- 10. Colorific value by Bomb calorimeter.
- 11. Colour comparison by photoelectric colorimeter or by Lovibond Tintometer.

INSTRUCTIONAL STRATEGY

Theoretical knowledge of this subject should be properly imparted to the students with the help of practical examples. Each topic should be supplemented with assignments. Extension lectures by experts from petroleum industry can enrich the students with better inputs regarding the various processes involved for improving the quality of petroleum products. Also a visit of the students to a refinery will further help them to understand the different processes and equipment involved in the petroleum industry.

RECOMMENDED BOOKS

- 1. Petroleum Refinery Engineering by WL Nelson
- 2. Petroleum Processing by RJ Hengsbeck

SUGGESTED DISTRIBUTION OF MARKS					
Topic No.	Time Allotted (Periods)	Marks Allotted (%)			
I	08	10			
2	10	15			
3	12	15			
4	12	15			
5	14	15			
6	08	10			
7	08	10			
8	08	10			
Total	80	100			

PROCESS EQUIPMENT DESIGN

Subject Code : 016002

RATIONALE

The topic included in the subject process equipment design are design of machine elements, storage, vessels, pressure vessels with the consideration of stress involved in materials and their protective coating. The students are expected to solve the elementary problems of different equipment used in process industry.

DETAILED CONTENTS

1. Basic Considerations in Process Equipment Design

Introduction, general design procedures, fabrication techniques, equipment Classification, power for rotational motion.

2. Design Considerations

Introduction, materials selections, corrosion prevention, stresses created due to static & dynamic loads, elastic instability, combined stresses and theories of failure, fatigue, brittle, fracture, creep, temperature effect, radiation effects, effects of fabrication methods, economic consideration.

3. Power Requirement of Pumps

Definition of pumps, types of pumps (centrifugal and reciprocating pumps), manometric head of centrifugal pump, efficiency of the centrifugal pumps (manometric efficiency, mechanical efficiency and overall efficiency), problems relating calculations of horse power (H.P.), N.P.S.H., for flow of incompressible fluid, characteristics curves for pumps, specification sheet for pumps.

4. Pressure Vessels

Selection of type of vessels, causes of failure of vessels, methods of fabrication, types of formed heads, stress in thin shells subjected to internal pressure, longitudinal and circumferential stress, joint efficiency and corrosion allowance, crown and knuckle radius, Problems relating calculation of shell thickness of cylindrical and spherical shells under internal and external pressure, thickness of torispherical heads subjected to internal pressure as per I.S. code.

5. Distillation Column

Preparation of equilibrium diagram, problems relating calculation of theoretical

(17 periods)

(17 periods)

(08 periods)

(10 periods)

(08 periods)

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plates at a given reflux ratio and total reflux, minimum reflux ratio, feed plate location, by McCabe-thiele methods for separation of ideal binary mixtures, shell diameter calculations.

6. Heat Exchanger and Condensers (12 periods)

Problems relating calculation of L.M.T.D., individual and overall heat-transfer coefficients, number of tubes, number of passes, Heat-transfer coefficient for condensing vapors by Wilson's plot.

7. Evaporators

(08 periods)

Problems relating calculation of heating area, steam requirement, steam economy for single and double effect evaporators. Methods of feeding evaporators and effect of Boiling Point Rise (B.P.R) and Hydrostatic Head.

INSTRUCTIONAL STRATEGY

The emphasis should be laid on numerical aspects for the design of distillation columns and process vessels. Field visits may help the students to know more about latest types of trays and packings used in distillation absorption columns. Emphasis should also be laid on material selection aspects for the equipment.

RECOMMENDED BOOKS

- 1. Process Equipment Design by Hessy & Ruston
- 2. Process Equipment Design by Bronwnell and Young, John Wiley
- 3. Process Equipment Design by MV Joshi, V.V. Mahajam, Macmillan Publichers India

SUGGESTED DI	STRIBUTION OF MARKS
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Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	08	10
3	10 10 10 10 10 10 10 10 10 10 10 10 10 1	20
4	17	20
5	17	20
6	12	10
7	08	10
Total	80	100

POLLUTION CONTROL & INDUSTRIAL SAFETY

Subject Code : 016001

RATIONALE

This course is related with the cleaning of environment. This subject provides the knowledge of how to keep our environment free from any type of pollution, what are laws related to environment. In this subject, study of industrial safety and fire are also included.

DETAILED CONTENTS

1. Introduction:

What is environment? Environment keeps changing, component of the environment, factors affecting environment & types of environment. What is pollution? Classification of pollution & types of pollution, classification of pollutants.

2. Air Pollution

Definition of air pollution, types of air pollutants, properties of air pollutants, various sources of air pollution like SPM, SOX, NH3, F, CL, CFC, CO2, and their effects, Acid rain, Green house effects, Ozone layer.

Air pollution control equipment's:-

- (I) Settling chambers
- (II) Cyclones
- (III) Scrubber (dry & wet)
- (IV) Cyclones & multiclones
- (V) Electrostatic precipitator
- (VI) Bag filters.
 - Ambient air quality measurement & their standards.

3. Water pollution

(12Periods)

Origin of waste water, different types of water pollutants, their sources & effects. Water pollution, standards for drinking water, domestic waste water & industrial waste water. Methods of measurement of various parameters like BOD, SS, PH, COD, TDS etc. methods of treatment of industrial waste water like.

I) Chemical treatment

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(12 Periods)

(07Periods)

- II) Physio chemical treatment
- III) Bio-chemical treatment
- IV) Any other advanced treatment

4. Pollution and factory acts

Water pollution control act 1974, air pollution act 1981, environment protection act 1986, hazardous chemical manufacturing, storage and impact rule 1989 and hazardous waste management and handling rule 1989, elementary knowledge of factory act 1948 and payment of wage act 1936.

5. Fire & prevention

Fire triangle, classification of fires, flammable and

Inflammable liquids, various types of fire extinguishers and their applications.

Fire hazards and their prevention.

6. Industrial safety

Receiving, storing, transportation of flammable liquids, gases and toxic Materials and wastes, Safety in chemical reaction, pipelines in chemical factories, Precautions in the case of processes in operations involving explosives and inflammable Dusts, gases, vapours etc. codes of practice and specification for safety equipment/ Alarms/signals (reference should be made from I.S. Codes).

7. Elements of safety

Safety aspects related to site, plant layout, process development And design stages, identification of hazards and its estimation risk, risk analysis and Assessment methods, fault free method, event free method, scope of risk assessment, Controlling toxic chemicals and flammable materials

8. Toxic substances and degree of toxicity

Its estimation, their entry routes into human System, their doses and responses, control techniques for toxic substances exposure, Use of respirators, ventilation systems.

LIST OF PRACTICALS

- 1. Estimation of TS, TDS
- 2. Estimation of BOD
- 3. Estimation of COD by titration methods
- 4. Estimation of PH valve, carbonate, bicarbonate and hydroxide alkalinity of waste water sample

(8 Periods)

(12 Periods)

(12 Periods)

(09Periods)

(08 Periods)

- 5. To determine the turbidity of waste water sample
- 6. To determine the hardness of water
- 7. Demonstration of various types of fire extinguishers

INSTRUCTIONAL STRATEGY

In this subject, it is essential to instruct to students about the environment and pollution due to industry and how it may be minimized It must be essential to students to visit industry for pollution related problems.

RECOMMENDED BOOKS

1. Safety and Accident Prevention in Chemical Operation byFawelt and w'ood, Inter

Science Publication

- 2. Chemical Engineering, Vol. 1, II, III and IV by Coulson and Richardson, Pergammon Press Publication
- 3. Air Pollution by Perkins, McGraw Hill Publication
- 4. Fundamentals of Air Pollution by Williamson, Addison Wesley Publication
- 5. Liquid Wastes of Industries by Nemerow, Addison Wesley Publication
- 6. Waste Water Engineering by Metcalf and Eddy, McGraw Hill Publication

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
'IF	07	10
2	12	15
3	12	15
4	12	15
5	08	10
6	12	15
7	09	10
8	08	10
Total	80	100

MAJOR PROJECT WORK

Subject Code : 016005

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RATIONALE

Every diploma holder has to do a project work before going to the world of work so that he may have sufficient knowledge to face the various problems involved in solving the project. Chemical engineering technician must be well aware of these too. So the projection the design of pressure vessel, storage tanks, heat exchanger, distillation column and evaporator are included in the subject.

Project work aims at developing skills in the students whereby they apply the knowledge and skills gained through the course in totality to solve a 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. The project assignments may consist of:

- Design of pressure vessel
- Design of heat exchanger
- Design of distillation column
- Design of evaporator
- Development of prototypes
- Study of the process of manufacturing of paints, detergents etc.
- · 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

G .			Rating Scale					
Sr. No.	Performance criteria	marks	Excellent	Very Good	Good	Satis- factory	Poor	
1.	Selection of project assignment	10	10	8	6	4	2	
2.	Planning and execution of	10	10	8	6	4	2	
	considerations							
3.	Quality of performance	20	20	16	12	8	4	
4.	Providing solution of the problems or	20	20	16	12	8	4	
	production of final product	181	T					
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	

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

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)	65-80	Very good
iii)	50-64	Good
iv)	41-49	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.



EMPLOYABILITY SKILLS

Subject Code: 016055

RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

DETAILED CONTENTS

Unit I:

- Technical Education & Industrial scenario. •
- Competency required of an engineer. •

Unit II:

- Professional Engineer desirable values and ethics and their development. •
- Relation between engineering profession, society and environment

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Unit III:

Effective Communication

- Reading & Active Listening Skills .
- Speaking
- Writing
- Presentation Technique/Seminar
- Group discussion

Unit IV:

Managing project

- Leadership •
- Motivation •
- Time management
- Resource management
- Interpersonal relationship •

Unit V:

Preparing for Employment

Searching for job/job hunting •

(06 periods)

(06 periods)

(12 periods)

(12 periods)

(10 periods)

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- Resume & CV Writing
- Interview technique in personal interview telephonic interview, panel
- · Interview, group interview, video conferencing

Unit VI:

Self Management

- Selfawareness
- Stress Management
- Conflict resolution

Unit VII:

- Creativity, Innovation and Intellectual property right
- · Concept and need in present time for an engineer

Unit VIII:

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Rules & Ethics

Basic rules, laws and norms to be adhered by engineers during their working

LIST OF PRACTICAS

- Steps how to effectively write different types of Letters.
- Steps to make a Presentation in Power Point.
- Steps to make a Resume more effective.
- Steps to conduct Telephonic/On-line Interview (Through skype/Google Hangout).
- Study of Different Techniques of Stress Management.
- Study of Rules & Ethical practices to be followed at Workplace.

RECOMMENDED BOOKS

- Employability skills by Kapil Dev, Vishnu P. Singh Asian Pub. New Delhi
- Employability skills for Diploma students by Dr. S.K. Singh, Vayu Education, New Delhi

(06 periods)

(08 periods)

(04 periods)

Unit No.	Time Allotted (Periods)	Marks Allotted(%)
1	06	10
2	06	10
3	12	18
4	12	18
5	10	16
6	08	12
7	06	10
8	04	6
Total	64	100





LEARNING OUT COMES AND MEANS OF ASSESSMENT

BRANCH NAME – CHEMICAL ENGINEERING

SEMESTER – VI

	S.N0.	Title of Subject/Unit	Learning Outcomes	Means of Assessment
	1	Entrepreneurship Development and Management	The students will be able to develop themselves how to work in chemical industries and how they can systematically apply an entrepreneurial way of thinking identify and create business opportunities that may be commercialized successfully.	Assignments, Quizzes, Seminars, Class Test, Mid Term Examination & Semester examination.
121	2	Fertilizer Technology	It will provide the use of reactions and unit operations steps in manufacturing of various fertilizers. Characterize fertilizers on the basis of different properties. Identify engineering problems in fertilizer manufacturing. Handle the fertilizers.	Assignments, Quizzes, Class Test, Mid Term Examination & Semester examination.
	3	Petroleum and Petrochemicals	It will give the information regarding History and Development of Petroleum Refining, Composition and properties of petroleum, Manufacturing Processes of petrochemicals	Assignments, Quizzes, Class Test, Mid Term Examination & Semester examination. Practical assessment is done through practical, practical files and Viva voce.
	4	Process Equipment Design	It gives the knowledge of design of process equipments, storage vessels, Pressure Vessels with consideration of stress involved in materials and their protective coating. Numerical Problems	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination.
	5	Pollution Control and Industrial Safety	It provides the knowledge about types of pollution. This subject provides the knowledge of how to keep our environment free from any type of pollution. Laws related to environment and industrial safety.	Assignments, Quizzes, Class Test, Mid Term Examination & Semester examination. Practical assessment is done through practical, practical files and Viva voce.