



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 6.1 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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### 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 (23 periods)  
Concept /Meaning and its need  
Qualities and functions of entrepreneur and barriers in entrepreneurship  
Sole proprietorship and partnership forms of business organisations  
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 (17 periods)  
Scanning of business environment  
Salient features of National and State industrial policies and resultant business opportunities  
Types and conduct of market survey  
Assessment of demand and supply in potential areas of growth  
Identifying business opportunity  
Considerations in product selection



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3. Project report Preparation (14 periods)  
Preliminary project report  
Detailed project report including technical, economic and market feasibility  
Common errors in project report preparations  
Exercises on preparation of project report

### MANAGEMENT

#### SECTION –B

4. Introduction to Management (06 periods)  
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  
a) Line organisation  
b) Line and staff organisation  
c) Functional Organisation



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5. Leadership and Motivation (05 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, 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
- Just in time (JIT)



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- c) Intellectual Property Right (IPR)  
Introductions, definition and its importance  
Infringement related to patents, copy right, trade mark
- d) GST
  - Introduction, Its importance

**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.

SUGGESTION



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### 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.

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted(Periods) | Marks Allotted(%) |
|--------------|------------------------|-------------------|
| 1            | 23                     | 30                |
| 2            | 17                     | 20                |
| 3            | 14                     | 15                |
| 4            | 6                      | 10                |
| 5            | 5                      | 05                |
| 6            | 10                     | 15                |
| 7            | 5                      | 05                |
| <b>Total</b> | <b>80</b>              | <b>100</b>        |



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### 6.2. COMPUTER APPLICATIONS IN MECHANICAL DRAFTING, DESIGN AND ANALYSIS

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#### RATIONALE

Today age is computer age. Most of our daily activities are being influenced by the use of computers. It has become necessary for diploma students to have a basic knowledge of computer applications related to their branch. This subject is being offered to provide further practice to students on MS Power Point and MS Access and acquaint them to Computer Aided Design software for modelling, assembling and drafting.

#### DETAILED CONTENTS

##### 1. MS Word:

Introduction to MS word for preparing technical report. Use of different fonts, size, tables, and equations should be considered.

##### 2. MS Excel

Creation of graphs such as bar chart, PI chart, line diagram using technical data, Examples: Load deformation data of any material may be given to the students and ask to convert these data to stress strain form and plot of stress strain curve. Determination of modulus of elasticity, yield strength, percentage elongation, ultimate strength, etc from the above curve. With given x-y data, plotting of the data and fitting various regression equations using Excel program.

##### 3. MS Power Point:

Templates, wizard, views, colour schemes, Introduction to various Power Point toolbars, Presentations using Power Point:-

- Slide Views
- Slide Formatting
- Animation
- Graphs

#### Computer Aided Design using any software such as AUTO CAD/ IDEAS/ etc

- 4.1 Concept of Auto CAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode
- 4.2 Drawing commands – point, line, arc, circle, ellipse,
- 4.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.
- 4.4 Dimensioning and placing text in drawing area
- 4.5 Sectioning and hatching



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### 4.6 Inquiry for different parameters of drawing entity

#### **Assembly and detail drawings of the following using**

**AUTOCAD 5.1** Tool post

5.2 Tail stock

5.3 Screw jack

5.4 Safety valve

5.5 Stuffing Box

5.6 Bench vice

#### **Isometric Drawings by**

**CAD Drawings of**

following on computer:

Cone

Cylinder

Isometric view of objects

#### **b) 3D Modelling**

3D modelling, Transformations, scaling, rotation, translation

#### **c) Project work**

Technical report writing where all such chapters are to be used.

**NOTE :- Practical work must be performed on the related contents as described above. Strategy should be made in such a way that at first student should be taught the contents theoretically than related practical works must be performed.**

### **INSTRUCTIONAL STRATEGY**

1. Teachers should show model of the component/part whose drawing is to be made.

### **RECOMMENDED BOOKS**

e) AutoCAD 2000 for you by Umesh Shettigar and Abdul Khader; Janatha Publishers, Udupi.

f) Machine Drawing by P.S. Gill; Kataria and Sons, Ludhiana.

g) A Text book of Machine Drawing by R.K. Dhawan, S.Chand and Company Ltd., New Delhi.

h) Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.

i) Auto CAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.





### 6.3 Advance Production Processes.

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**RATIONALE:** The importance of modern production processes lies in the fact that conventional processes are though applied in most of the time, modern processes are more accurate , more applicable and user friendly for industries. So students should also have a basic knowledge of these processes.

1. UNCONVENTIONAL MACHINING PROCESSES-Introduction, principle, process and application of Ultrasonic machining (USM) ,Electro chemical machining (ECM) ,Electro chemical Grinding (ECG), Electrical Discharge Machining (EDM), Laser beam machining (LBM), Electro beam machining (EBM),Plasma arc machining (PAM). (20 periods)
2. Modern welding Process (Modern Welding Methods, Principle of operation, advantages, disadvantages and applications of: Tungsten inert gas (TIG) welding, Metal inert gas (MIG) welding, Thermit welding, Electro slag welding, PUG welding). (20 periods)
3. Powder Metallurgy-Introduction to powder metallurgy. Steps in powder metallurgy, making of powder, compaction, secondary operations, sintering, advantages and limitations of powder metallurgy (20 periods)
4. Newer Moulding Processes -Introduction to different moulding methods with their advantages and applications -plastic Injection moulding, moulding, fibre glass moulding, and calendering. (20 periods)
5. Modern Casting processes -Introduction , advantages and applications of modern casting processes such as vacuum die casting, evaporative pattern casting, hybrid casting and investment casting. (16 periods)





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| TOPIC NO.    | TIME ALLOTTED (Periods) | MARKS ALLOTTED (%) |
|--------------|-------------------------|--------------------|
| 1            | 20                      | 25                 |
| 2            | 20                      | 20                 |
| 3            | 20                      | 25                 |
| 4            | 20                      | 10                 |
| 5            | 16                      | 20                 |
| <b>TOTAL</b> | <b>96</b>               | <b>100</b>         |

SUGGESTION



## 6.4 Refrigeration and Air Conditioning

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### 1. Fundamentals of Refrigeration

20 Period

Introduction to refrigeration and air conditioning, units of refrigeration, meaning of refrigerating effect, compressor work, condenser work and COP, difference between COP and efficiency, methods of refrigeration, natural system and artificial system of refrigeration (Simple numerical problems)

### 2. Vapour Compression System

15 Period

Principle, function, parts and necessity of vapour compression system, T- $\phi$  and p-H charts, dry, wet and superheated compression. Sub cooling, super heating (No numerical problems)

### 3. Refrigerants

15 Period

Functions, various classification of refrigerants, properties of R - 717, R - 22, R-134 (a), CO<sub>2</sub>, R - 11, R - 12, R - 502, Properties of ideal refrigerant, selection of refrigerant

### 4. Vapour Absorption System

20 Period

Introduction, principle, NH<sub>3</sub> absorption system, lithium bromide absorption system, advantages and disadvantages of Vapour absorption system over vapour compression refrigeration system (No numerical problems)

### 5. Refrigeration Equipment

10 Period

5.1 Compressors: Function, various types of compressors

5.2 Condensers: Function, various types of condensers, essential requirements of a condenser

5.3 Evaporators: Function, DX and flooded evaporator, advantages and disadvantages, other types of evaporators

### 6. Psychrometry

16 periods

Definition, importance, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT, humid heat, latent heat, relationship amongst them.



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Psychrometric chart, various lines, psychrometric process, by pass factor, room sensible heat factor, effective room sensible heat factor, ADP, room DPT, supply air condition. (Simple numerical problems)

### LIST OF PRACTICALS

- To plot ph diagram for vapour compression refrigeration system using refrigeration test rig
- To plot ph diagram for vapour compression refrigeration system using air conditioner test rig
- Study of vapour absorption refrigeration
- To study rotary compressor
- To find relative humidity using psychrometer

### INSTRUCTIONAL STRATEGY

- a) Models of various components/ parts should be demonstrated to develop comprehension amongst students
- b) Industrial visit to thermal power plant and roadways/ private automobile workshop should be arranged
- a) Video films for demonstration of working of IC engines, jet propulsion and gas turbine should be shown.

### RECOMMENDED BOOKS

- a) Elements of heat engines by Pandey and Shah; Charotar Publishing house, Anand
- b) Thermal Engineering by PL.Ballaney; Khanna Publishers, New Delhi.
- c) Engineering Thermodynamics by Francis F Huang; McMillan Publishing company, Delhi.
- d) Engineering Thermodynamics by CP Arora; Tata Mc Graw Hill Publishers, New Delhi.
- e) Thermal engineering by RK Purohit; Standard publishers Distributors, New Delhi.
- f) Refrigeration and air conditioning by Domkundwar; Dhanpat Rai & sons, Delhi.
- g) Refrigeration and air conditioning by CP Arora , Tata McGraw Hill , New Delhi.
- h) Refrigeration and air conditioning by R.S Khurmi and J.K Gupta; S Chand and Company Limited, New Delhi



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**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No.    | Time Allotted (Period) | Marks Allotted (%) |
|--------------|------------------------|--------------------|
| 1.           | 20                     | 20                 |
| 2.           | 15                     | 10                 |
| 3.           | 15                     | 15                 |
| 4.           | 20                     | 15                 |
| 5.           | 10                     | 15                 |
| 6.           | 16                     | 25                 |
| <b>Total</b> | <b>96</b>              | <b>100</b>         |

SUGGESTION



## 6.5 POWER PLANT ENGINEERING

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### RATIONALE

A diploma holder in mechanical engineering is supposed to manage the power generating plant. In Uttaranchal state, hydropower potential is supposed to be very large. Therefore, he must have relevant knowledge and skills about various power plants e.g. steam power plant, nuclear power plant, hydro power plant, diesel engine power plant and gas turbine power plant. Hence this subject is offered.

### DETAILED CONTENTS

#### 1. Introduction

(12 Periods)

Sources of energy fuels, flowing stream of water, solar rays, wind, terrestrial heat, ocean tides and waves Concept of power station, central and industrial power station, captive power station, classification of power station with respect to prime mover steam, IC engine, gas turbine and hydro power station, scope in Uttaranchal state

#### 2. Steam Power Plant

(20 Periods)

2.1 Parameters of power cycle- thermal efficiency, work ratio, specific steam Consumption Rankine cycle flow diagram, representation on thermodynamic planes, thermal efficiency, effect on change of condenser pressure, boiler pressure, degree of super heat on thermal efficiency Reheat cycle, simple regenerative cycle, STEAM GENERATOR – FUNCTIONS, CLASSIFICATION & SELECTION (No numerical)

#### 2.2 Steam prime movers

Concept of a prime mover, steam turbine- advantages as a prime mover, principle elements of a steam turbine .Governing of steam turbines- classification of steam turbines Starting and stopping procedures for turbines, precautions during running Performance of steam turbine, Thermal efficiency, efficiency ratio, mechanical efficiency, steam rate (No numerical)



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### 2.3 Steam Condensing Equipment

Functions of condensers, classification, surface condenser components and their functions Condenser auxiliaries- hot well, condensate pump, vacuum pump, air ejector, circulating pump, atmospheric relief valve Requirement of a good condensing system Cooling towers-purpose and types

### 3. Nuclear Power Plant

(20 Periods)

Atomic structure of matter, nomenclature, atomic nuclear reactions- fission, fusion, mass defect, binding energy, chain reaction, types of nuclear materials, fissile and fertile materials Nuclear reactors-elements and functions of different reactors, (DIFFERENT TYPES OF REACTORS VIZ. BWR, PWR, FBR), advantages and disadvantages and Comparison of nuclear power station with a steam power station Health hazards, safety precautions

### 4. Diesel Engine Power Plant

(12 Periods)

Advantages and disadvantages of diesel engine. Essential elements of diesel power plant. Fuel injection system performance, testing of diesel engine power plant

### 5. Gas Turbine Power Plant

(12 Periods)

Brayton cycle- schematic diagram, thermal efficiency. Advantages of gas turbines over diesel engines. Classification of gas turbines, advantages and disadvantages methods of improving thermal efficiency, Important parts and their functions, Essential auxiliaries and controls for gas turbine power plant. Fuel for gas turbines

### 6. Hydro Power

(20 Periods)

Advantages, basic elements, dams, head works, water turbines, classification of water turbines, speed and pressure control, plant auxiliaries, plant operation, potential in Uttarakhand state, detailed working



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### RECOMMENDED BOOKS

1. A course in Power Plant Engineering by S. Domkundwar & Arora; Dhanpat Rai and sons
2. Power Plant Engineering by G.B.S Narang
3. Power plant engineering by G.R. Nagpal; S.K. Khanna Publishers, Delhi

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time allotted (Period) | Marks Allotted (%) |
|--------------|------------------------|--------------------|
| 1            | 12                     | 10                 |
| 2            | 20                     | 30                 |
| 3            | 20                     | 20                 |
| 4            | 12                     | 10                 |
| 5            | 12                     | 10                 |
| 6            | 20                     | 20                 |
| <b>Total</b> | <b>96</b>              | <b>100</b>         |





## 6.6 PROJECT WORK

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Periods per week - - 6

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.

Projects related to repair and maintenance of automobiles

Projects related to increasing productivity

Projects related to quality assurance

Projects related to estimation and economics of production

Projects connected with repair and maintenance of plant and equipment

Projects related to identification of raw material thereby reducing the wastage

Any other related problems of interest of host industry



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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      | Satis-<br>factory | 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/<br>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         |
| <b>Total marks</b> |   | <b>100</b> | <b>100</b>   | <b>80</b> | <b>60</b> | <b>40</b>         | <b>20</b> |

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

|      | Range of maximum marks | Overall grade    |
|------|------------------------|------------------|
| i)   | More than 80           | <i>Excellent</i> |
| 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/project work 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.



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### 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 organizations 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.



## 6.7 EMPLOYABLE SKILLS

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Periods per week - - 6

### 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 workshop. This subject is included to develop employability skills amongst the students

### DETAILED CONTENTS

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer  
(04 period)
2. Personality types, characteristic and features for a successful engineer  
(04 period)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment  
(04 periods)
4. Managing project (16 period)  
Leadership  
Motivation  
Time management  
Resource management  
Computer Software  
Interpersonal relationship  
Engineer economics and fundamentals
5. Effective Communication (08 period)  
Listening  
Speaking  
Writing  
Presentation Technique/Seminar  
Group discussion
6. Preparing for Employment (08 period)



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Searching for job/job hunting

Resume Writing

Interview technique in personal interview telephonic interview, panel interview, group interview, video conference

7. Managing Self (06 period)  
Managers body, mind, emotion and spirit  
  
Stress Management  
Conflict resolution
8. Continuing professional development (04 period)  
Organising learning and knowledge  
Use of computer for organising knowledge resource
9. Creativity, Innovation and Intellectual property right (06 period)  
Concept and need in present time for an engineer
10. Basic rules, laws and norms to be adhered by engineers (04period)  
during their working