

# **Management Studies Course Book-1**

## **PART-1**

- **Management Process and Organizational Behaviour**
- **Business Mathematics**
- **Financial Accounting and Analysis**
- **Business Economics**
- **Computer Applications**

*Editors*

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*Part-1*

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**Dr. Ravi Kant Swami**  
**Dr. Poorva Ranjan**

## Preface

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The aim of the book is to enlighten the readers with various management aspects. This book includes number of management topics such as Management Process and Organizational Behaviour, Business Mathematics, Financial Accounting and Analysis, Business Economics, and Computer Applications.

This book is segregated into two parts part I and part II that includes five units in total. Each unit presents a number of chapters that will be a comprehensive study material for the students to serve student learning and improvement in basic understanding of the management concepts.

In Part I there are two-and-a-half units that includes Management Process and Organizational Behaviour, Business Mathematics, Financial Accounting and Analysis whereas, Part II covers other half of the Financial Accounting and Analysis. It also includes Business Economics, and Computer Applications. Unit such as Management Process and Organizational Behaviour will help students understand both individual and group behaviour in workplaces. The book covers Math utilized by business undertakings to record and oversee business tasks and the basic understanding of computer applications as well.

*(viii)*

The subject matter experts of this book are the experienced and well qualified faculty members of the DME management school. These subject matter experts are the authors of this book. They draw on their extensive experience in the field of the academics and shared the same in this book. The chapters have been planned meticulously as we try to provide a comprehensive handbook to the students of BBA.

**Dr. Ravikant Swami**  
**Dr. Poorva Ranjan**

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**PART-1**  
**Unit-1**  
**Management Process and**  
**Organizational Behaviour**  
**1**

**Introduction to Management–**  
**Concept and Need**

*Mr. Bhupender Singh*

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**Introduction**

Management is the process of creating and sustaining an environment in which individuals working in groups efficiently achieve specific goals (Koontz & Weihrich, 2015). Further, it is noted that:

- Management is applicable to any type of organisation.
- Management is applicable to managers at all levels of the organisation.
- Goal of all managers is to generate a profit/surplus, i.e., achieving the business targets by using minimum resources available.
- Productivity (implying effectiveness and efficiency) is fundamental to management.
- Managers are responsible for planning, organising, staffing, leading, and controlling.

**Concept of Management**

***a. Objectives of Management***

## 2

# Overview of Managerial Functions

*Ms. Navya Jain*

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### **Introduction**

Different scholars and management thinkers have identified different functions of management. For example, they may be classified as planning, organising, staffing, leading, and controlling (Koontz & Weihrich, 2015) or planning, organizing, leading and controlling (Robbins et al., 2012). For the purpose of our discussion, we shall follow the classification of Koontz and Weihrich (2015).

### **Functions of Management**

#### ***a. Planning***

The planning function entails following aspects (Koontz & Weihrich, 2015):

- Deciding on missions and objectives, and the corresponding activities to attain them
- Involves decision making–picking future courses of action from available choices. Understanding of the decision-making process and decision-making techniques is also critical for managers.

# 3

## Classical Approaches to Management–Fayol

*Ms. Parul Grover*

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### Introduction

Henri Fayol was a French industrialist who is regarded as the father of modern management theory (Koontz & Weihrich, 2015). He outlined 14 management principles, examining management taking a total organizational approach (Durai, 2015) and deemed these principles to be flexible and universal in nature.

### Figure 3.1 Fayol's 14 Principles of Management

- Division of Labour
- Authority
- Discipline
- Unity of Command
- Unity of Direction
- Subordination of Individual Interests to the General Interest
- Remuneration
- Centralization
- Scalar Chain or Chain of Command
- Order
- Equity
- Stability of Tenure of Personnel
- Initiative
- Esprit de Corps

**Source:** Author's own, based (Robbins et al., 2012)

## Classical Approaches to Management–Taylor

*Dr. Pooja Sharma*

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### **Introduction**

Frederick Winslow Taylor was an American engineer and propounded the highly influential principles of scientific management in 1911, he is known as the father of scientific management (Koontz & Weihrich, 2015).

Factories utilizing Taylor's concepts found significant increases in productivity, quality, and performance. However, Taylor's work was also seen to promote an unfavourable management style, leading to worker exploitation, chance of conflicts with trade unions, decline in individual initiatives, and excess focus on measurement of work (Durai, 2015).

### **Key Principles of Scientific Management**

There are 5 main principles of scientific management (i) Replacement of rules of thumb with science (ii) Generating harmony in group action instead of discord (iii) Generating cooperation instead of disorderly individualism (iv) Working towards maximum output (v) Developing all employees for individual and organizational growth (Koontz & Weihrich, 2015). These are briefly explained as given below:

# 5

## Classical Approaches to Management–Neo Classical

*Ms. Pooja Tripathi*

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### **Introduction**

Neo classical approach to management is considered to be the transitional phase in management thought and largely focuses on human relations, considering the person, group relationships, social aspects and also encompassed behavioural sciences (Bhattacharya, 2012).

The behavioural method places more emphasis on enhancing management through consideration of the psychological makeup of organisational members than the traditional approach, which concentrates on the technical components of management (Durai, 2015).

Thus, as part of the Neo-Classical approach to management, the text shall focus on the following key managerial aspects:

- a. Theory X and Theory Y
- b. Maslow's Hierarchy of Needs
- c. Hawthorne Studies

This chapter shall focus on McGregor's Theory X and Theory Y.

# 6

## **Human Relations Approaches to Management**

*Dr. Poorva Ranjan*

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### **Introduction**

Abraham Maslow, an American psychologist, proposed the influential theory of motivation—Hierarchy of Needs which can be used for managing employees in the workplace. This theory is among the most recognized theories of motivation. Over the years, there has been widespread application of this theory and scholars have also critically evaluated it with arguments for and against it. We will examine these aspects in the given text.

### **Hierarchy of Needs by Abraham Maslow**

Maslow proposed that each individual has five levels of needs:

- (i) Physiological
- (ii) Safety
- (iii) Social
- (iv) Esteem and
- (v) Self-actualization; each of these level of needs must be significantly satisfied before the subsequent need takes

## Neo Classical and Human Relations Approaches to Management

*Dr. Ravi Kant Swami*

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### **Introduction**

The Hawthorne Studies form a critical part of the human relations approach to management. Elton Mayo is regarded as the father of human relations approach (Bhattacharya, 2012). This chapter outlines the Hawthorne studies in the following manner:

- a. Background
- b. Phases/Series of Studies
- c. Contribution to the Human Relations Approach

#### ***a. Background***

A study was done by the engineers at the Western Electric Hawthorne Works in Chicago to determine how illumination affects worker productivity. Comparing employee performances and examining how lighting affects productivity with a control group and an experimental group revealed that both groups' productivity rose irrespective of the changes in lighting (including under poor light) which confused the engineers and at this stage, Professor Elton Mayo of Harvard Business School joined the studies to

# 8

## **Modern Approaches–Behavioural, Contingency and System Approach**

*Ms. Roli Wadhwa*

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### **Introduction**

Some of the recent approaches to management shall be discussed in this chapter. Among the modern approaches, it is important to understand the quantitative school of thought, the systems theory approach and the contingency approach to management. Each of these has provided a unique managerial perspective that has been adopted over several years now.

### **Quantitative Approach to Management**

- The core of the quantitative approach is the application of mathematical and statistical models, information models, and computer simulations for managerial problem solving and decision making (Robbins et al., 2012)
- It originates from World War II days and builds upon several previous management theories and approaches such as that of Taylor and his principles of scientific management and has branches such as It has various branches, such management science, operations management, and management information systems (Durai, 2015)

## **Modern Approaches–MBO, Business Process Re-engineering**

*Dr. Seema Mam*

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### **Introduction**

Having traced the earlier approaches to management, this chapter will focus on some of the most influential management approaches that also widely adopted in organizations today. This chapter shall clarify recent management approaches as follows:

- a. Management by Objectives (MBO)
- b. Business Process Re-engineering (BPR)

### **Concept of Management by Objectives (MBO)**

- Setting mutually acceptable goals and using those goals to assess employee performance is the MBO method (Robbins et al., 2012)
- It has also been viewed as a complete managerial system that incorporates many important managerial operations in a systematic way and is purposefully targeted towards the effective and efficient attainment of organisational and personal goals (Koontz & Weihrich, 2015)

# 10

## Types of Plans, Environmental Analysis

*Ms. Shanu Jain*

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### **Introduction**

“Planning is a method or technique of looking ahead. It is a deliberate conscious search used to formulate the design and orderly sequence of actions through which it is expected to reach the objective.”

*–G.R. Terry*

Making decisions about what to do, how to do it, when to do it, and who will do it in advance. Managers create a future map, establish the objectives to be met, and choose the actions necessary to reach those objectives while planning.

### ***Planning may be of Various Types such as***

**Informal:** Not written down, short-term focus; specific to an organizational unit.

**Formal:** Written, specific, and long-term focus, involves shared goals for the organization.

Koontz & Weihrich (2015) have classified plans as:

- (1) Missions or purposes,
- (2) Objectives or goals,

# 11

## Decision Making– Process and Techniques

*Ms. Shruti Auplish*

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### **Introduction**

“Whatever a manager does, he does through decision-making.”

*–Peter Drucker*

Decision-making is a key component of a manager’s job at all levels and in all kinds of organizations. This chapter will focus on the process (steps) involved in the decision-making process and the various techniques used by managers for taking decisions in organizations.

Managerial decision-making usually encompasses three components – input (organizational problems), process (management) and output (solutions to problems) (Durai, 2015). The general calibre of managerial decision-making has a significant impact on whether an organization succeeds or fails (Robbins et al., 2012).

### **Process/Steps of Decision-making**

The process or steps of decision-making as outlined by Robbins et al (2012) are given below:

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## Concept and Process of Organizing–Overview

*Mr. Swaraj Manchanda*

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### **Introduction**

“Organizing involves the grouping of activities necessary to accomplish goals and plans, the assignment of these activities to appropriate departments and the provision for authority delegation and coordination.”  
–*Harold Koontz and O'Donnell*

Koontz and Weihrich (2015) have explained organizing as:

- The identification and categorization of necessary activities
- The grouping of activities required to achieve goals
- The assignment of each group to a manager with the requisite authority (delegation) to supervise it
- The provision in the organisational structure for horizontal (on the same or similar organisational level) and vertical (e.g., between corporate headquarters, division, and department) coordination

### **Purposes of Organizing**

- Divides work to be done into specific jobs and departments.

## Formal and Informal Organization Structure

*Mr. Bhupender Singh*

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### **Introduction**

We can understand organising as a process that entails the arrangement and grouping of organisational resources and activities as well as the development of relationships between them with a view to achieving the objectives of the organisation. It is important for managers in all organizations to be well versed with the basics of organizing as a management function. This chapter focuses on the concept of formal and informal organization. It is pertinent for managers to be aware of the pros and cons of each for effective management.

### **Formal Organization**

Koontz and Wehrich (2015) have outlined the following aspects of formal organizations:

- Formal organization refers to the intentional structure of roles in a formally organized enterprise.
- This doesnot mean that a formal organization is inflexible.

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## Principles of Organizing

*Ms. Navya Jain*

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### **Introduction**

Organizing is defined as the process of development of an organization's structure and when this structure undergoes further changes, it is seen as organization design (Robbins et al., 2012). Even though any organisation may have a varied size, stature, aims, and environment, the fundamental organising principles remain the same throughout all organisations (Durai, 2015). Thus, managers must understand the fundamental aspects and principles of management so that are adopted and applied effectively for the achievement of organizational goals.

The fundamental presumptions or beliefs that underlie the organising function are referred to as organising principles. Different scholars have outlined these principles in slightly different forms but they are similar and highlight core aspects of organizing as a management function.

One set of organizing principles drawn from Henri Fayol's 14 management principles, (Durai, 2015), namely, (i) principle of chain of command, (ii) principle of unity of command, (iii) principle of unity of direction, (iv) principle of span of control, (v) principle of

## Types of Organization Structure

*Ms. Parul Grover*

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### **Introduction**

Organizations may be mechanistic or organic in terms of two generic organization structures noted by Robbins et al. (2012) wherein a mechanistic organization leans towards bureaucracy whereas an organic design accords flexibility to the organization. Further, the choice of organization structure is impacted by four situational factors-organization's strategy, size, technology, and degree of environmental uncertainty (Robbins et al., 2012). In this chapter, specific kinds of organization structures as identified by scholars, are briefly discussed for understanding the options available to senior management in designing the organization structure.

### **Types of Organization Structure**

Robbins et al (2012) has identified three traditional types of organizational structures and highlighted the following features of each of these structures as given below:

#### **Simple Structure**

- An organisational structure with limited formalization, little departmentalization, broad spheres of influence, and authority concentrated in one person.

## Emerging Organization Structure

*Dr. Pooja Sharma*

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### **Introduction**

This chapter outlines some of the contemporary forms of organization structures adopted in organizations. These are in addition to the traditional organizational structures, such as, simple, functional, divisional, etc., that were previously discussed. Largely, the chapter highlights the matrix organization, use of strategic business unit, virtual organization and boundaryless organization as identified by management scholars. The key features of these types of contemporary organization structures are also outlined.

### **Modern or Emerging Organization Structures**

#### ***1. Matrix Organization Structure***

Koontz and Weihrich (2015) lay down the following characteristics, merits and demerits of matrix organization:

#### *Key Characteristics*

- The combination of functional and project or product patterns of departmentalization in the same organisational structure is typically the essence of matrix organisation.

## Personality–Meaning and Types

*Ms. Pooja Tripathi*

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### **Introduction**

Personality can be understood as the sum of ways in which an individual reacts to and interacts with others, it is often described in terms of the measurable traits a person exhibits (Robbins & Judge, 2017). Understanding personality is not easy, after all, it has several aspects to it and is considered to be a complex concept.

Personality is the whole person and is concerned with external appearance and traits, self, and situational interactions. People affect each other depending on these factors. The role of heredity and the brain is more important than appearances when studying personality (Luthans, 2010). There is after all, the nature and nurture idea, i.e., nature pertains to heredity, physiological/biological dimensions and nurture pertains to environmental, developmental dimensions.

### **Personality Types**

#### ***1. The Myers–Briggs Type Indicator (MBTI)***

- Developed by mother-daughter duo Katharine Briggs and Isabel Briggs-Myers

## Different Learning Styles–Basics

*Dr. Poorva Ranjan*

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### **Introduction**

It is relevant to first understand what is learning. Any relatively permanent change in behaviour that occurs as a result of experience is termed as learning. All of OB is either directly or indirectly affected by learning, e.g, worker's skill, a manager's attitude, a salesperson's optimism and confidence, etc., are all learned. Application of learning processes and principles enables analysis of employee behaviour which helps in managing human resources for better performance.

It is relevant for managers and business students to understand the basics of learning as:

- If we don't keep learning new skills and knowledge, we run the risk of stagnating and going out of date in the long run.
- Knowing what is expected of a person in high-quality work is a crucial step in the continual learning process.
- The foundation of continuous learning is what is frequently referred to as "reflective practise." Reflective practise entails the learner taking into account significant occurrences from prior experiences that serve as the foundation for future

## Perception–Concept, Perceptual Process

*Dr. Ravi Kant Swami*

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### **Introduction**

“Perception is a process by which we organize and interpret sensory impressions in order to give meaning to our environment” (Robbins & Judge, 2017)

“Perception is a very complex cognitive process that yields a unique picture of the world, a picture that may be quite different from reality.” (Luthans, 2010)

What we perceive and what is actually true can differ significantly. The concept of perception is crucial to OB research because:

- People’s actions are determined by their interpretation of reality rather than reality itself.
- The world that influences behaviour is the world as it is perceived. In other words, we act from the world that we perceive.
- People may have diverse perspectives on things, and their perspectives are influenced by their needs.

## Perception–Importance, Factors Influencing Perception

*Ms. Roli Wadhwa*

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### **Introduction**

Perception can be understood as a method by which people organise and interpret their sensory impressions to offer context to their surroundings (Robbins & Judge, 2017). Employee perception is a unique filter, resulting in different reactions and behaviors (Luthans, 2010). This is what makes perception an extremely crucial concept for managers. Each individual in the workplace may operate from different perceptions and may have different reactions to the same actions and events in their immediate environment, e.g., how employees respond to organizational policies, organizational change initiatives, communication from the superior, etc. These stimuli in the individuals' environment may lead to different reactions as different employees may perceive these stimuli differently. This chapter focuses on the importance of perception and the factors influencing perception, particularly, in the organizational context.

### **Importance of Perception**

Singh (2015) has outlined several reasons for understanding perception. Decisions must be made frequently by managers Data

## Values and Attitudes– A Conceptual Background

*Dr. Seema Mam*

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### **Introduction**

Values can be understood as fundamental convictions that a particular way of acting or end-state of affairs is individually or socially preferable to an alternative or converse way of acting or end-state of affairs (Robbins & Judge, 2017). Because they comprise a person's opinions about what is morally correct, admirable, or desirable, values have a judging component. Both content and intensity are present. A value system represents a hierarchy based on a ranking of an individual's values in terms of their intensity (Robbins & Judge, 2017).

Attitudes are positive or negative judgements about things, people, or events (Robbins & Judge, 2017). There are several job related attitudes that are relevant for people management perspective and affect individual behaviour, for example:

- Job Satisfaction
- Job Involvement
- Employee Engagement

## Concept and Types of Values: Components of Attitude

*Ms. Shanu Jain*

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### **Introduction**

The previous chapter has introduced the basics of values and attitudes. In this chapter we shall focus on further understanding of some important types of values (value frameworks) and also the components of attitudes.

The chapter shall outline the following key concepts:

#### **Values:**

- (i) Generational Values
- (ii) Hofstede's Framework

#### **Attitudes:**

- (i) Components of Attitudes
- (ii) Attitude Formation

### **Values**

#### ***(i) Generational Values Framework***

Developed by researchers, mapping the work values of US employees into groups by generations (Robbins & Judge, 2017):

## Job Related Attitudes of Individuals

*Ms. Shruti Auplish*

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### **Introduction**

Previously, it has been discussed that organizational attitudes of job related attitudes are relevant to understand for managers and they include attitudes such as Job Satisfaction, Job Involvement, Employee Engagement, Organizational Commitment and Perceived Organizational Support. In this chapter, we specifically focus on understanding the relationship between attitudes and behaviours, elaboration of job satisfaction and organizational commitment.

### **Relationship between Attitudes and Behaviours**

The relationship between attitudes and behaviours can be understood by considering:

#### **Cognitive Dissonance Theory**

- Proposed by Leon Festinger.
- Any incompatibility between 2 or more attitudes or between behaviour and attitudes (e.g. texting while walking; an employee using company property for personal use, etc).

## Motivation–Concept and Importance

*Mr. Swaraj Manchanda*

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### Introduction

“Motivation refers to the forces within a person that affect his direction, intensity, and persistence of voluntary behaviour.”

–*Singh (2015)*

“The processes that account for an individual’s intensity, direction, and persistence of effort toward attaining a goal.”

– *Robbins & Judge (2017)*

Motivation as a concept holds immense value for managers. The reason is that all managers, in all kinds of organizations, across the globe, must manage employees and encourage them to perform to the best of their abilities. Now, this is easier said than done. Managers have to deal with persons with different personalities, values, attitudes, education, skills and abilities, all these individuals may have very different forces driving them towards their organizational journey. Hence motivation becomes a critical aspect of the manager’s day to day job.

In this chapter, we focus on:

- Concept of motivation
- Importance of motivation

## Types of Motivation

*Mr. Bhupender Singh*

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### **Introduction**

“The processes that account for an individual’s intensity, direction, and persistence of effort toward attaining a goal.”

*–Robbins and Judge (2017)*

This definition outlines the meaning of motivation. How a person attempts to do something is indicated by their intensity. When we discuss motivation, most of us tend to concentrate on one aspect. However, unless the effort is directed in a way that is advantageous to the organisation, high intensity is unlikely to result in favourable job-performance outcomes. As a result, we take both the effort’s quality and intensity into account. We should be looking for activity that is aligned with and geared towards the organization’s goals. Finally, persistence is a characteristic of motivation. This gauges a person’s capacity for sustained work. Motivated people persevere through a task long enough to reach their objectives.

Having done a recap of motivation basics, let us turn to the different kinds of motivational techniques.

Organizations commonly use money, monetary rewards, non-monetary rewards, provide opportunities for employee participation,

## Leadership– Theories of Leadership

*Ms. Navya Jain*

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### **Introduction**

“The art or process of influencing people so that they will strive willingly and enthusiastically toward the achievement of group goals.”  
– *Koontz and Weihrich (2015)*

“The ability to influence a group toward the achievement of a vision or set of goals.”  
– *Robbins and Judge (2017)*

Considering these definitions of leadership, it can be understood that leadership is tied to influence and helping organizational members channel their efforts towards the attainment of certain pre-determined goals. It is also important to understand that not all leaders are managers and not all managers are leaders (Robbins & Judge, 2017). This points to the fact that leaders can emerge without being formally appointed. For best interests of the organization, both effective leaders and effective managers are required. Thus, understanding of the foundational concepts of leadership is relevant for managers.

## **Discussing Famous Leaders and their Leadership Styles**

*Ms. Parul Grover*

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### **Introduction**

Having discussed the basics of leadership and the theories of leadership, this chapter examines some of the theories in relation to the leadership styles displayed by some famous leaders over the years. The purpose is to guide the reader towards building a practical understanding of some of the most influential leadership styles followed by eminent personalities across the globe.

### **Famous Leaders and their Leadership Styles**

#### ***1. Charismatic Leadership***

This may be observed on the basis of interpersonal attraction between leader-follower, in which a follower grows to respect and depend on the leader he/she admires and the leader holds influence through their personal traits. This is also seen as a leadership theory that claims that when followers see specific behaviours, they attribute heroic or exceptional leadership skills (Robbins & Judge, 2017). Further, charismatic leadership has the following key features:

## Power and Conflict

*Dr. Pooja Sharma*

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### **Introduction**

Power and conflict are two universal aspects of managing people in organizations. Wherever there are people, there will be dynamics of power and inevitable conflict that surfaces time to time. Awareness of the foundational knowledge of power and conflict will help managers address day to day business situations and managing people in an effective manner. In this chapter, we shall focus on the basic understanding of power and conflict in an organizational behaviour context.

### **Power**

Despite being a universal phenomenon for organizations, scholars have different ways of interpreting power (Luthans, 2010). It is understood as the potential of an individual to influence another individual in accordance with their wants (Robbins & Judge, 2017).

Power may be derived by a person in the organization on the basis of formal personal bases which may be further classified, and are outlined as given below (Robbins & Judge, 2017):

#### ***1. Formal Power***

Based on an individual's formal position in the organization. Formal power may be classified further into:

## Extrinsic and Intrinsic Motivation

*Ms. Pooja Tripathi*

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### **Introduction**

Motivation pertains to individuals' drives, desires, needs, wishes and other similar attributes (Koontz & Wehrich, 2015). It has been observed as the process accounting for the intensity, direction and tenacity of action towards goal attainment as displayed by an individual (Robbins & Judge, 2017).

Herzberg's two factor theory outlines extrinsic and intrinsic motivators (Koontz & Wehrich, 2015), this chapter provides a brief background into this first and then delves into further discussions about extrinsic and intrinsic motivators.

### **Background–Herzberg's Two Factor Theory of Motivation**

Frederick Herzberg conducted a widely reported motivational study on about 200 accountants & engineers employed by firms in Pennsylvania, US. The professional subjects in the study were essentially asked two questions:

- (1) When did you feel particularly good about your job?
- (2) When did you feel exceptionally bad about your job?

## **Conflict and Culture: Power and Conflict**

*Dr. Poorva Ranjan*

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### **Introduction**

Foundational concepts on power and conflict have been discussed previously. This chapter shall outline a very critical component of the workplace, i.e., organization culture. All activities and managerial actions are to be performed within the organizational context and the organizational culture provides a major backdrop for efficient and effective management. In this respect, first organization culture is discussed, and then the ideas of conflict management and power dynamics are further elaborated for building essential managerial knowledge.

### **Organization Culture**

Organization culture is a complex phenomenon, pertaining to the presence of shared norms and values that direct members' behaviours in an organization (Luthans, 2010). The concept of shared meaning among organizational members and seven key characteristics of organizational culture (on a continuum of high to low) are highlighted (Robbins & Judge, 2017):

## Power Tactics– Concept and Role

*Dr. Ravi Kant Swami*

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### **Introduction**

Power can be understood as the ability or the capacity to influence others to act according to one's wants (Robbins & Judge, 2017). It is defined as the deliberate influence over people's beliefs, emotions, and behaviours (Singh, 2015). Power tactics allow individuals to translate their power bases into actual behaviours or acts (Robbins & Judge, 2017).

This chapter outlines the key concept of power tactics and its application in the organizational context.

### **Power Tactics for Influencing others**

There are mainly 9 kinds of power tactics that people adopt (Robbins & Judge, 2017):

1. **Legitimacy:** Reasoning that a request complies with organisational policies or guidelines or relying on your position of authority.
2. **Rational persuasion:** Demonstrating that the request is reasonable by offering logical justifications and verifiable proof.

## Organization Culture– Meaning and Types

*Ms. Roli Wadhwa*

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### **Introduction**

On a scale from high to low, seven fundamental aspects of organisational culture are underlined, as well as the idea of shared meaning among organisational members (Robbins & Judge, 2017), i.e., innovation and risk taking, attention to detail, outcome orientation, people orientation, team orientation, aggressiveness and stability. These aspects of the meaning of organizational culture and its features, have been discussed in the previous chapters. The current chapter focuses on the various ways organizational culture can be observed and common classifications of organization culture.

### **Meaning of Organization Culture**

Organisational culture refers to the presence of shared norms and values that guide individuals' behaviour within an organisation (Luthans, 2010). It is a representation of the individual members' commonly held perceptions members (Robbins & Judge, 2017).

### ***Singh (2015) Summarizes that Organizational Culture***

- Is visible via how things are done in an organization.

## Determinants of Organizational Culture

*Dr. Seema Mam*

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### **Introduction**

Organization culture can be seen in the way organizations approach problems, the way work is done in the organization, in the ethos, shared values and team spirit in an organization (Singh, 2015). It is understood as the perception of employees on the characteristics of an organization, outlining a descriptive lens to the idea of organizational culture (Robbins & Judge, 2017). The previous chapters have discussed the key features of organizational culture and the common classifications of organizational culture. The current chapter focuses on the key determinants of organizational culture.

### **Determinants of Organizational Culture**

Seven factors affecting employees' perception of organizational characteristics (meaning organizational culture, as described above) are highlighted by Robbins and Judge (2017):

1. **Innovation and risk taking:** How much the organization offers opportunities for innovation and risk taking to employees.

## Concept and Determinants of Organizational Culture

*Ms. Shanu Jain*

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### **Introduction**

Organization culture has been used to explain the descriptive aspects of the organization's characteristics, as perceived by employees (Robbins & Judge, 2017). Several scholars have termed it as a complex phenomenon, examining it from different frameworks and thus, outlining its key features and determinants. Bhattacharya (2012) suggests that it is either something that an organisation possesses or something that an organisation is. In the previous chapter, some of these determinants were discussed, and this chapter further elaborates the determinants of organizational culture. The focus on this chapter would be to examine Schein's model showcasing the determinants of organizational culture.

### **Schein's Model of Organizational Culture**

Singh (2017) highlights the Schein's model of organizational culture as another way of understanding the elements of organizational culture. The model includes the following as part of organizational culture:

## Cases on Organizational Culture and Climate

*Ms. Shruti Auplish*

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### **Introduction**

The previous chapters have outlined the concept of organizational culture, its features, key determinants and various classifications. The current chapter shall outline how to sustain organizational culture and the key functions of organizational culture. It shall also direct the reader to valuable cases and questions for practical understanding of organizational culture.

### **How to Sustain Organizational Culture**

Robbins and Judge (2017) outline 3 steps for sustaining organization culture:

#### ***1. Selection***

Finding and hiring people with the knowledge, skills, and ability to perform well must be ensured in selection. The person-organization fit is crucial in this process. Candidates that have the same values as the organisation would therefore be more likely to fit in. Candidates also have the option to decline if they believe their principles and those of the organisation conflict. In order to maintain

**Unit-2**  
**Business Mathematics**

**36**

**Concept of Factorial**

*Mr. Bhupender Singh*

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**Introduction**

Business Mathematics is a subject which finds its applications in several areas, may it be Operations Management, Research, Statistics, Social Sciences, etc. One of the areas of Business Mathematics which finds its usage in several commercial and economic spheres is factorial. Let us understand the concept and application of Factorial.

**Concept of Factorial**

The factorial concept is defined as follows:

Consider a positive integer “n.” The factorial of “n,” denoted as “n!”, is the product of all the natural numbers from 1 to “n.”

We can express “n!” as follows:

$$n! = 1 \times 2 \times 3 \times 4 \dots (n-2) \times (n-1) \times n$$

Alternatively, some books present “n!” in reverse order:

$$n! = [n \times (n - 1) \times (n - 2) \times (n - 3) \dots (3) \times (2) \times (1)]$$

Additionally, we can rewrite “n!” in the form:

$$n! = [1 \times 2 \times 3 \times 4 \times 5 \dots (n - 1)] \times n = [(n - 1)!] \times n = n(n - 1)!$$

## Principles of Counting

*Ms. Navya Jain*

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### **Introduction**

After the concept of Factorial, next important area of Business Mathematics which makes it multi-disciplinary is the principle of Counting. This principle plays a wide role in understanding other concepts like permutations, combinations, arrangement of objects, counting of objects in a particular situation, deciding the possible pairs of pants and shirts which can be made from a given number of the same. Lets understand Fundamental principle of Counting and its types.

### **Fundamental Counting Principle**

The fundamental principle of counting says that if we have a series of tasks to be performed simultaneously and say the first task can be performed in a no. of ways, second task in b no. of ways, third task in c no. of ways and so on then all the tasks can be done in

$a \times b \times c \times d \times \dots$  So on ways.

The formula mentioned above represents the multiplication principle, which is the main type of principle of fundamental principle of counting. This principle applies when we have a finite number of tasks that need to be performed together. In

## Mathematical Induction: The Principle

*Ms. Parul Grover*

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### **Introduction**

Mathematical induction is a proof technique commonly used in mathematics. The principle of mathematical induction is often credited to the French mathematician Blaise Pascal (1623-1662). The English mathematician John Wallis (1616-1703) is known for being the first to use the term “induction” in relation to this mathematical principle.

James Bernoulli (1655-1705), a Swiss mathematician, utilized the principle of mathematical induction to provide a proof of the binomial theorem in probability. The term “mathematical induction” gained immediate acceptance within the mathematical community, and over the following 50 years or so, it became universally recognized and adopted.

Let’s understand the meaning and procedure of the principle first. Then we shall take certain examples to understand it better.

### **Meaning and Procedure of Principle of Induction**

If we denote the given statement as  $P(n)$ , where  $n$  represents a positive integral value (a natural number starting from 1), then the

## Arithmetic Progression: Concept and Numerical Application

*Dr. Pooja Sharma*

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### Introduction

Arithmetic progression, also known as an arithmetic sequence, refers to a sequence of numbers where the difference between any two consecutive numbers remains constant. This constant difference is referred to as the common difference. Arithmetic progressions find relevance in various aspects of daily life, such as:

**Estimating Stadium Capacity:** When determining the seating capacity of a stadium or venue, an arithmetic progression can be used. By establishing the common difference as the distance between seats, the progression helps calculate the number of audience members the stadium can accommodate within the given space.

**Taxi Fare Calculation:** In the context of taxi fares, an arithmetic progression is often utilized. The initial cost serves as a starting point, while the subsequent per mile or kilometer charge accounts for the constant difference. This allows for the calculation of the total fare based on the distance traveled.

## Geometric Progression: Concept and Numerical Application

*Ms. Pooja Tripathi*

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### Introduction

After Understanding Arithmetic progression, lets dive into the concept of another progression or sequence of numbers called as Geometric Progression.

### Meaning of Geometric Progression

If in any sequence, consecutive ratio between any two terms is same, it is said to be a Geometric Progression (G.P.). The constant ratio is called as “r”, first term is symbolised as “a”.

Here unlike AP, there is a constant ratio between any two consecutive terms. The formulas for sum upto n terms and the last term of a GP are as follows:

(a) Sum of first n terms of GP:

$$S_n = a(r^n - 1)/(r - 1) \text{ in case } r > 1 \text{ and if } r < 1 \text{ then } S_n = a(1 - r^n)/(1 - r).$$

(b) Nth term of GP is:

$$A_n = ar^{(n - 1)}$$

## Concept of Functions: Numerical Application

*Dr. Poorva Ranjan*

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### Introduction

Apart from Arithmetic and Geometric Progression, concept of Sets, Relation and Functions also play a crucial role in Business Mathematics. Let's explore the concepts and then understand numerical applications of the same.

### Meaning of Sets, Relation and Functions

A set is a group of well-defined objects. The objects within a set are considered distinct based on simplicity.

A collection of sets is often referred to as a family or collection of sets. For instance, let's consider a family of sets consisting of  $A_1, A_2, A_3, \dots$  up to  $A_n$ . This family can be represented as  $\{A_1, A_2, A_3, \dots, A_n\}$  and can be denoted as  $S = \{A_i \mid i \text{ belongs to } N \text{ and } 1 \leq i \leq n\}$ . In notation, a set is represented by a capital letter and its elements are listed within curly brackets, for example,  $\{ \}$ .

Various types of sets exist in set theory, and a few of them are explained below.

## Introduction of Matrices: Definition of Matrices, Types of Matrices, Equality of Matrices

*Dr. Ravi Kant Swami*

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### Introduction

Matrices means an ordered arrangement of numbers or items in certain rows and columns. **It is a rectangular arrangement of  $m \times n$  numbers into  $m$  horizontal rows and  $n$  vertical columns**, enclosed by a pair of rectangular brackets []. Matrices have a lot of commercial and industrial applications. Matrices help in deciding about creating various combinations of products and sales territories, solving transportation problems, and other commercial applications. Lets understand the meaning, types and equality of matrices.

### Definition and Meaning of Matrices

It is a rectangular arrangement of  $m \times n$  numbers into  $m$  horizontal rows and  $n$  vertical columns, enclosed by a pair of rectangular brackets []. **See the example below:**

$$a_{11} \ a_{12} \ a_{13}$$

$$a_{21} \ a_{22} \ a_{23}$$

$$a_{31} \ a_{32} \ a_{33}$$

$$a_{41} \ a_{42} \ a_{43}$$

## Matrix Operations in Algebra

*Ms. Roli Wadhwa*

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### Introduction

After understanding different types of matrices and their criteria for equality, next step is to apply various operations on Matrices say addition, subtraction, multiplication and others. Lets see how we can do that.

### Matrix Operations

#### *1. Addition of Matrices*

Let A and B be two matrices of the same order ( $m \times n$ ). Then the addition of A and B, denoted by  $A + B$ , is the matrix obtained by adding corresponding entries of A and B. Order of  $A + B$  is also  $m \times n$ .

#### *Properties of Addition of Matrices*

- a. *Matrix addition is commutative:* If A and B are two matrices of the same order then  $(A + B) = (B + A)$
- b. *Matrix addition is associative:* If A and B are two matrices of the same order then  $(A + B) + C = A + (B + C)$
- c. *Existence of additive identity:* If O is the zero matrix i.e. O has all elements = 0 and O is of the same order as that of the matrix A, then  $A + O = A = O + A$

## Transpose of a Matrix Under Algebra

Dr. Seema Mam

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### Introduction

After understanding about different operations that can be applied on matrices, we need to understand the concept of transpose of matrix which helps in finding inverse of matrix. Lets understand the concept of Transpose of matrix.

### Concept of Transpose of Matrix

Let A be an  $m \times n$  matrix. The transpose of A denoted by 'A' or  $A^T$ , the  $n \times m$  matrix obtained from A by interchanging the rows and columns of A. Thus the first row of A is the first column of A' the second row of A is the second column of A' and so on.

### Example:

If A is a matrix of order 2x3 then Transpose of Matrix A shall be denoted by A' and it will be a different matrix of Order 3 x 2 as shown below:

$$A = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 1 & 4 \end{bmatrix} \quad A' = \begin{bmatrix} 2 & 3 \\ -4 & 1 \\ 6 & 4 \end{bmatrix}$$

## Determinants in Matrix Operations Under Algebra

*Ms. Shanu Jain*

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### Introduction

Matrix transpose along with a special number called “Determinant” is used to find out inverse of matrix and also solve system of linear equations in multiple variable. Let’s understand the concept of determinants and how is it calculated for different types of Matrices. Let’s understand different methods of calculating determinants.

### Concept of Determinants

If  $A$  is a square matrix, then the determinant function associates with  $A$  exactly one numerical value called the determinant of  $A$ . Determinant of a matrix  $A$  is denoted by  $|A|$

#### *Determinant of a Matrix of Order 1 x 1*

Let  $A [a_{11}]$  be a square matrix of order 1. The determinant of  $A$  is defined by the number  $a_{11}$  itself. That is,  $|a_{11}| = a_{11}$ . Example a matrix of order 1 x 1 with only 3 as its element will have determinant as  $|3| = 3$ .

#### *Determinant of a Matrix of Order 2 x 2*

Let  $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$  then  $|A| = (a_{11} \times a_{22}) - (a_{12} \times a_{21})$ .

## Inverse of Matrix Under Algebra

*Ms. Shruti Auplish*

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### Introduction

All the concepts associated with the matrix algebra like determinants, cofactors, minors etc. that we captured before this chapter are useful in finding inverse of a matrix. Inverse of a matrix is a new matrix that is found out by performing some operations on the original matrix. Lets see how it works.

### Concept of Inverse of Matrix

Let A be a square matrix of order n. Then a square matrix B of order n, if it exists, is called an inverse of A if  $AB=BA=I_n$ .

A matrix A having an inverse is called an invertible matrix.

The inverse of an invertible matrix A is denoted by  $A^{-1}$ . Not all matrices are invertible. If A is a square matrix such that  $|A| \neq 0$ , then A is invertible.

#### Formula:

$$A^{-1} = [1 \div |A|] \times \text{Adj}A$$

*Singular Matrix:* A square matrix A is said to be singular if  $|A|=0$

## System of Linear Equations

Mr. Swaraj Manchanda

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### Introduction

After understanding the concepts of adjoint and inverse of matrix now let us apply those concepts in solving equations. Equations can be of many types like linear equations in one variable, linear equations in multiple variables, quadratic equations, cubic equations. Here we will solve linear equations in 2 or more variables.

### Concept of System of Linear Equations

Consider the system of  $n$  linear equations in  $n$  unknowns  $x_1, x_2, \dots, x_n$ :

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

$$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$

$$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$$

Matrix representation of a System of Equations is as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{21} \\ a_{22} & a_{23} & a_{31} & a_{32} \\ a_{33} & & & \end{bmatrix}, X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \text{ and } B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

The given system of linear equation may be written as  $\mathbf{AX}=\mathbf{B}$

Matrix  $\mathbf{A}$  is called the *coefficient matrix* of the system.

## Properties of the Inverse Solution to a System of Linear Equations by: Adjoint Matrix Method and Gaussian Elimination Method

*Mr. Bhupender Singh*

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### Introduction

After forming system of linear equations into matrix format, the next step is to find out values of the variables in the system. This can be done by Adjoint Matrix Method and Gaussian Elimination method (also called as Row or Column Operations method).

Let's see both the methods one by one.

### Solution of System of Linear Equations–Adjoint Matrix Method

Consider the system of  $n$  linear equations in  $n$  unknowns  $x_1, x_2, \dots, x_n$ :

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

$$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$

$$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$$

## Cramer's Rule in Matrix Algebra

*Ms. Navya Jain*

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### Introduction

After forming system of linear equations into matrix format, the next step is to find out values of the variables in the system. This can be done by Adjoint Matrix Method and Gaussian Elimination method (also called as Row or Column Operations method). Another method is Cramer's Rule. Lets see the method

### Solution of System of Linear Equations–Adjoint Matrix Method

Consider the system of  $n$  linear equations in  $n$  unknowns  $x_1, x_2, \dots, x_n$ :

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

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## Rank of a Matrix, Rank of a System of Equations, Echelon Matrix

*Ms. Parul Grover*

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### Introduction

Concept of Rank of matrix and Rank of system of equations is discussed in this chapter. Lets see what does Rank mean and how is it calculated?

### Meaning of Rank of a Matrix

The rank of a matrix refers to the maximum number of linearly independent columns or rows it contains. The rank cannot surpass the number of rows or columns in the matrix. In the case of a square matrix, its columns or rows are linearly independent only if the matrix is nonsingular. This means that any nonsingular matrix of size “ $m$ ” will have a rank equal to “ $m$ ”. The rank of a matrix is denoted as  $\rho(A)$ . A null matrix, which has no non-zero rows or columns, has a rank of zero. Since there are no independent rows or columns in a null matrix, its rank is zero.

To determine the rank of a matrix, we can transform it into echelon form and count the number of non-zero rows to find the rank. When analyzing a specific matrix, if one row is a multiple of another row, it does not count as an independent row.

## Application of Matrices to Business Problems

*Ms. Pooja Tripathi*

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### **Introduction**

Concept of Matrices is used to solve commercial and industrial problems. Lets see various applications of matrix algebra and solve some numerical problems based on that.

### **Applications of Matrix Algebra**

There exist various applications for matrices, and some examples are presented below:

1. **Linear Algebra** – Matrices play a crucial role in linear algebra, enabling the solution of systems of equations, computation of eigenvalues and eigenvectors, and performing various mathematical operations.
2. **Physics** – Matrices find applications in physics as they aid in solving problems related to linear equations and provide a means to model physical systems.
3. **Engineering** – Matrices are extensively utilized in engineering to address problems involving linear equations and serve as a tool for modeling physical systems.

## Depreciation Lapse Schedule

*Ms. Pooja Tripathi*

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### **Introduction**

Concept of Matrices is also used to calculate Depreciation of assets and make depreciation Lapse schedule. Lets understand the concept of Lapse schedule.

### **Meaning of Depreciation**

Depreciation entails the gradual reduction of a capital asset's value over its useful life. When a business acquires a capital asset, it does not immediately recognize the purchase price as an expense. Instead, the business accounts for the expense by depreciating the asset over time. This approach allows the business to distribute the expense gradually rather than claiming it all at once, thereby enabling the distribution of its tax burden over a period of time.

There are various methods available to calculate depreciation, with the straight-line method being the most commonly used. In the straight-line method, a fixed amount is depreciated each year. For instance, if a piece of machinery costs \$50,000, has a useful life of 10 years, and has no residual value at the end of its useful life, the depreciation would amount to \$5,000 per year. However, alternative depreciation methods may involve varying amounts depreciated each year.

## Leontief Input Output Model in Matrix Algebra

*Dr. Poorva Ranjan*

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### **Introduction**

Concept of Matrices is also used to make Leontief Input output schedule to understand the relationship between qty of input used in producing output and qty of output produced. There is a fixed proportional relationship between inputs and outputs.

### **Meaning of Leontief Input Output Model**

The Leontief input- output model is named after Wassily Leontief who received a Nobel Prize in Economics in 1973.

This model gives a description of an economy in which it is assumed that whatever is produced is consumed, i.e. *Production equals Consumption* or, in other words *Input equals Output*.

There are two types of Leontief Models:

- Closed
- Open

*Closed Model:* In this, the entire production is consumed by those participating in the production, i.e. production is consumed internally.

## Permutation and Combination

*Dr. Ravi Kant Swami*

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### **Introduction**

Concept of Permutation and Combination is very useful in determining arrangement of objects in a particular sequence or without following a sequence. This concept is used in production of products in batches, designing of number plates for vehicles, creating phone numbers and so on. Lets understand this concept.

### **Meaning of Permutations**

Permutation refers to the arrangement or ordering of a set of objects or elements in a specific sequence. It is a concept in combinatorial mathematics that focuses on determining the number of different ways in which the elements of a set can be arranged.

In permutation, the order of the elements is crucial. Even a slight change in the order results in a different permutation. The concept is commonly used when considering different possibilities or arrangements in various fields, such as mathematics, statistics, computer science, and even everyday life situations.

The number of permutations of a set with  $n$  elements can be calculated using factorial notation. The factorial of a positive integer  $n$ , denoted by  $n!$ , is the product of all positive integers from 1 to  $n$ . For example,  $5!$  is calculated as  $5 \times 4 \times 3 \times 2 \times 1$ , which equals 120.

## Derivative of a Parametric Function

*Ms. Roli Wadhwa*

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### Introduction

Derivative is an important and fundamental concept of mathematics that has wider applications in various disciplines. Derivative is the measure of rate of change of something. It is used in Physics, Engineering, Chemical Industries, Operations Management, Research, Traffic controlling and many other useful areas. Lets check the meaning of Derivatives and numerical problems based on derivative of parametric functions.

### Meaning of Derivative

In mathematics, a derivative is a fundamental concept in calculus that measures the rate of change of a function with respect to its independent variable. It represents the instantaneous rate at which a quantity is changing at a specific point. The derivative provides information about how a function behaves near a particular point, including the slope of the function's graph at that point.

More formally, the derivative of a function  $f(x)$  at a given point  $x$  is denoted as  $f'(x)$  or  $dy/dx$ . It represents the limit of the ratio of the change in the function's output ( $y$ ) to the corresponding change

## Logarithmic Differentiation

*Dr. Seema Mam*

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### **Introduction**

Derivatives or Differentiation is a very broad concept which encompasses use of several tools in calculation of derivatives of different types of functions. Among these tools, we have

### **Meaning of Logarithmic and Logarithmic Differentiation**

Logarithm is a mathematical function that helps us solve exponential equations and manipulate numbers more conveniently. It is the inverse operation of exponentiation. In simpler terms, the logarithm of a number is the exponent to which another fixed number, called the base, must be raised to produce that number.

For example, in the equation  $10^2 = 100$ , the base is 10, the exponent is 2, and the logarithm of 100 to the base 10 is 2, which can be represented as  $\log_{10} 100 = 2$ , or simply  $\log(100) = 2$ .

### ***Logarithmic Differentiation***

Logarithmic differentiation is a technique used in calculus to simplify the differentiation of functions that involve products, quotients, or powers. It allows us to differentiate complicated functions by taking the logarithm of both sides of an equation and then applying differentiation rules.

## Derivative of an Inverse Function

*Ms. Shanu Jain*

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### Introduction

In the context of derivatives, the inverse function refers to a function that “undoes” the effect of another function. If you have a function  $f(x)$  and its inverse function is denoted as  $f^{-1}(x)$ , then applying the function  $f(x)$  followed by its inverse  $f^{-1}(x)$  should result in the original value of  $x$ . Now, let’s consider the derivative of the inverse function. If  $f(x)$  has an inverse function  $f^{-1}(x)$ , then the derivative of the inverse function, denoted as  $(f^{-1})'(x)$  or sometimes written as  $(dy/dx)|_{(x=f^{-1}(x))}$ , represents the rate of change of the inverse function with respect to  $x$ . The derivative of the inverse function can be related to the derivative of the original function using the following formula:

$$(f^{-1})'(x) = 1 / [f'(f^{-1}(x))]$$

In words, the derivative of the inverse function at a point  $x$  is equal to the reciprocal of the derivative of the original function at the corresponding point  $f^{-1}(x)$ . This formula allows us to find the derivative of the inverse function if we know the derivative of the original function.

## Optimisation Using Calculus

*Ms. Shruti Auplish*

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### **Introduction**

Calculus plays an immense role in real and commercial problems of the economy. Tools of calculus are important in maximizing profits, minimizing costs of production, and increasing the sales of the products.

Calculus is thus, important for reaching optimum levels of efficiency of anything.

Lets understand the meaning of the term optimization and how calculus helps in it via some practical examples.

### **Meaning of Optimisation Through Calculus**

Optimization using calculus refers to the process of finding the maximum or minimum values of a function using mathematical techniques from calculus. In optimization problems, we aim to determine the optimal solution that either maximizes or minimizes a certain objective or criterion. The general approach to optimization involves the following steps:

- (1) **Formulating the problem:** Clearly define the objective or criteria to be optimized and identify any constraints or limitations.

## Point of Inflexion, Absolute and Local Maxima and Minima

*Mr. Swaraj Manchanda*

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### Introduction

Calculus involves finding the maximum and minimum values within a function. These maximum and minimum values are called as Local Maxima and Local Minima.

Lets understand the concept of Local Maxima and Minima and point of inflexion.

### Meaning of Point of Inflexion, Absolute and Local Maxima and Minima

In calculus, a point of inflection (also spelled as “inflexion”) is a point on the graph of a function where the concavity changes.

More specifically, it is a point where the curve changes from being concave upward (opening upward like a “U”) to concave downward (opening downward like an “n”), or vice versa. At a point of inflection, the curvature of the graph changes. This means that the concavity changes from being “cup-shaped” to “bowl-shaped” or from “bowl-shaped” to “cup-shaped.”

## Optimisation in Case of Multivariate Function

*Mr. Bhupender Singh*

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### Introduction

Calculus deals with the study of change and motion, and it is not limited to single-variable functions. Bivariate calculus extends the concepts and techniques of calculus to functions of two variables. In bivariate calculus, we work with functions that have two independent variables ( $x$  and  $y$ ) and a dependent variable (usually denoted as  $z$  or  $f(x, y)$ ).

Bivariate functions can represent various real-world phenomena and systems that involve multiple variables. Some common examples include temperature distribution over a surface, elevation of a terrain, population density in a region, or the profit of a company based on two input variables.

Lets understand how calculus and Bivariate functions are connected and how optimisation of a Bivariate function can be done in Calculus.

### How Calculus is Important in a Bivariate Function?

In bivariate calculus, we extend the concepts of differentiation and integration to functions of two variables. Here are some key concepts and techniques in bivariate calculus:

## Lagrangian Multipliers in Differential Calculus

*Ms. Navya Jain*

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### **Introduction**

Lagrange multipliers are a technique used in calculus to optimize a function subject to one or more constraints. They were introduced by the mathematician Joseph-Louis Lagrange and are commonly used in problems involving optimization with constraints.

The general idea behind Lagrange multipliers is to introduce additional variables, known as Lagrange multipliers, and incorporate them into the optimization problem through a system of equations. These multipliers help us find the optimal values of the variables that satisfy both the objective function and the given constraints. Lets see how we can apply Lagrangian Multipliers in Calculus.

### **Procedure of Lagrangian Multipliers**

1. **Formulate the problem:** Define the objective function that needs to be maximized or minimized and any constraints that restrict the variables.
2. **Construct the Lagrangian function:** The Lagrangian function is formed by combining the objective function and the constraints using the Lagrange multipliers. It is expressed

## Derivative as a Rate Measure

*Ms. Parul Grover*

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### Introduction

The derivative is a fundamental concept in calculus that measures the rate of change of a function at a particular point. It represents the slope of the tangent line to the graph of the function at that point. The derivative provides valuable information about how a function is changing, whether it is increasing or decreasing, and the steepness of the curve. One of the Applications of the derivative is that it is a Rate of Change. The derivative is commonly used to measure rates of change in various fields such as physics, economics, and engineering. For example, in physics, the derivative of position with respect to time gives the velocity, and the derivative of velocity gives acceleration. Lets us understand this application.

### Application of Derivative as a Rate Measure

Let's see how derivative can be used as a rate measure to solve some numerical problems.

#### Problem 1:

A car is traveling along a straight road, and its position at time  $t$  is given by the function  $s(t) = 3t^2 + 2t + 1$ . Find the instantaneous velocity of the car at time  $t = 2$ .

## Application of Differential Calculus in Business

*Dr. Pooja Sharma*

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### **Introduction**

Differential calculus, a branch of calculus that deals with the study of rates of change and slopes, also has several applications in business. Example: Marginal Analysis, Optimization, Demand and Supply Analysis, Cost Analysis, Revenue Analysis, Risk Management, Financial Analysis. Overall, differential calculus provides businesses with analytical tools and techniques to make informed decisions, optimize processes, understand market dynamics, and manage risks. Its applications extend to various aspects of business, including production, pricing, finance, and strategic planning.

### **Applications of Differential Calculus for Business**

1. **Cost Analysis and Optimization:** Differential calculus is used to analyze cost functions and optimize business operations. By finding the derivative of the cost function, businesses can determine the marginal cost, which represents the cost of producing one additional unit. This information helps in cost estimation, production planning, and identifying cost-saving opportunities.

## Introduction to Mathematics of Finance Such as Annuities

*Ms. Pooja Tripathi*

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### Introduction

The Mathematics of Finance refers to the application of mathematical concepts, techniques, and models to analyze and solve financial problems. It involves the use of mathematical tools to understand and quantify financial phenomena, make informed financial decisions, and manage risk in various areas of finance, such as investments, portfolio management, risk management, asset pricing, and financial planning.

The Mathematics of Finance encompasses a wide range of mathematical techniques, including algebra, calculus, probability theory, statistics, optimization, and differential equations. These mathematical tools are applied to financial concepts and data to derive insights, develop models, and solve complex financial problems.

Mathematics of Finance has many important concepts which are used in commercial world too. This is called as Annuities. Lets understand the concept of Annuities and how do we find value of annuities using Calculus and Mathematics of Finance.

## Indefinite Integrals Under Integral Calculus

*Dr. Poorva Ranjan*

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### **Introduction**

Integral calculus is a branch of mathematics that deals with the concept of integration, which is the reverse process of differentiation. It involves finding the antiderivative (or indefinite integral) of a function, which represents a family of functions that, when differentiated, give the original function. The integral symbol "+" represents the operation of integration. It is followed by the function to be integrated and the variable of integration. The result is expressed as an antiderivative with a constant of integration (C).

Integration is used to calculate quantities such as areas, volumes, and accumulated quantities over a given interval. The definite integral is used to find the exact value of the area under a curve or the accumulated value of a quantity between two specified points. The process of integrating involves applying various integration techniques, such as power rule, substitution, integration by parts, and partial fractions, depending on the complexity of the function.

### **Process and Application of Integration**

Now the concept of integration is the reverse of derivative of a function. Its also called as Anti Derivative. If we are given the

## Techniques of Integration

*Dr. Ravi Kant Swami*

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### Introduction

Techniques of integration refer to various methods and strategies used to find the antiderivative (indefinite integral) of a given function. These techniques help simplify and solve integrals that cannot be immediately evaluated using basic integration rules.

Here are some common techniques of integration:

1. **Power Rule:** This technique applies to functions of the form  $x^n$ , where  $n$  is any real number except  $-1$ . It states that the antiderivative of  $x^n$  is  $(1/(n+1)) * x^{(n+1)}$ , where  $n \neq -1$ .
2. **Substitution:** Substitution involves replacing a variable or expression within the integral with a new variable to simplify the integral. The choice of substitution is made to make the integral look similar to a standard form that can be easily integrated.
3. **Integration by Parts:** Integration by parts is based on the product rule of differentiation. It allows for the integration of the product of two functions by selecting one function to differentiate and the other function to integrate.
4. **Trigonometric Substitution:** Trigonometric substitution is used to simplify integrals that involve expressions with radicals

## Definite Integrals Under Integral Calculus

*Ms. Roli Wadhwa*

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### Introduction

The definite integral is a fundamental concept in calculus that represents the accumulation of a quantity over a specific interval. It is used to calculate the net area under a curve or the total change in a function within a given range.

More formally, the definite integral of a function  $f(x)$  over the interval  $[a, b]$  is denoted by  $\int [a, b] f(x) dx$ , where  $f(x)$  is the integrand,  $dx$  represents an infinitesimal change in  $x$ , and  $[a, b]$  specifies the interval of integration.

Geometrically, the definite integral represents the signed area between the curve of the function and the  $x$ -axis, bounded by the vertical lines  $x = a$  and  $x = b$ . If the area above the  $x$ -axis is considered positive and the area below the  $x$ -axis is considered negative, the definite integral gives the net area between the curve and the  $x$ -axis.

The definite integral has several interpretations and applications in mathematics and science.

## Business Application of Integral Calculus

*Dr. Seema Mam*

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### Introduction

Integral calculus, a branch of calculus that deals with the concepts of integration and finding the area under curves, has several business applications like Revenue and Profit Analysis, Supply and Demand Analysis, Optimisation Problems, Probability and Statistics, Market Research and Statistics, etc. Lets understand them in detail with Numerical Problems.

### Business Applications of Integral Calculus

1. **Revenue and Profit Analysis:** Integrals are used to calculate total revenue and profit functions in business. By integrating the revenue function, one can find the total revenue generated over a given interval. Similarly, integrating the profit function provides the total profit earned. These calculations help businesses analyze their financial performance and make informed decisions.
2. **Supply and Demand Analysis:** Integrals are employed in analyzing supply and demand functions. By integrating the demand function, one can find the total quantity demanded

## Producers and Consumers' Surplus

*Ms. Shanu Jain*

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### **Introduction**

In Integral Calculus, Producers and Consumers Surplus are also calculated. Lets understand their meaning and calculation.

### **Producer's Surplus**

Producer's surplus is an economic concept that represents the difference between the price a producer receives for a good or service and the minimum price they are willing to accept in order to supply that good or service. It measures the benefit or surplus gained by producers in a market.

More specifically, producer's surplus is the area above the supply curve and below the market price. It reflects the additional revenue producers receive from selling a product at a price higher than their production cost or willingness to supply. It represents the difference between the total amount producers receive from selling a good and the amount they would have been willing to accept to supply that quantity.

Producer's surplus is a measure of economic welfare for producers, as it indicates their ability to earn profits above and

## Learning Curve in Integral Calculus

*Ms. Shruti Auplish*

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### **Introduction**

Integral Calculus is used to understand one more concept—Learning Curve which is more strictly related to psychology. Lets understand the importance of Integral Calculus in understanding this concept.

### **Learning Curve—Meaning and Importance**

In the context of integral calculus, the learning curve may refer to the process of acquiring knowledge and improving skills in solving integrals. As you practice solving different types of integrals and gain experience, your understanding and proficiency in integral calculus generally improve, leading to a smoother learning curve.

The learning curve in integral calculus is about gradually building a foundation of knowledge, developing problem-solving techniques, and becoming more comfortable with the various methods and strategies used in integrating functions. As you progress through learning, you may find that you can tackle more complex integrals, apply integration techniques more efficiently, and gain a deeper understanding of the underlying concepts.

**Unit-3**  
**Financial Accounting and Analysis**

**71**

**Meaning and  
Scope of Accounting**

*Mr. Swaraj Manchanda*

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**Introduction**

Accounting plays a vital role in commercial activities by maintaining accurate and comprehensive records of transactions and events. These records are classified, summarized, and analyzed to provide valuable information for businesses and other activities. Over the centuries, accounting has evolved significantly. Let's explore the meaning and scope of accounting in today's world.

**Meaning of Accounting**

According to the American Institute of Certified Public Accountants, accounting is "the art of recording, classifying, and summarizing transactions and events, interpreted in financial terms, which are, at least in part, of a financial nature." Accounting serves as a language of business, communicating the outcomes of transactions through financial statements such as the Profit and Loss account and Balance sheet to internal and external users. The first definition of accounting encompasses several aspects, including:

- **Recording:** Financial transactions are systematically recorded in books of daily entry, commonly known as the Journal.

## Objectives and Nature of Accounting

*Mr. Bhupender Singh*

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### **Introduction**

After understanding the meaning of the term accounting, we need to understand the objectives and nature of accounting.

### **Objectives of Accounting**

The objectives of accounting focus on maintaining systematic records of transactions, summarizing and analyzing financial reports to evaluate the financial position of a business entity. The following are the key objectives of accounting:

1. **Systematic maintenance of financial records:** Accounting aims to keep accurate and organized records of day-to-day transactions, providing insights into the financial activities of the business, including income received and payments made.
2. **Determining profits or losses:** Recording revenue and expenditure transactions enables the calculation of profits or losses at the end of the financial year. Determining the financial outcome is crucial for making payments and assessing the business's performance.

## **Book Keeping and Accounting– The Difference**

*Ms. Navya Jain*

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### **Introduction**

Accounting means recording, classifying, summarizing, analyzing and interpreting financial information and communicating the results to the users. Merely recording and classifying information comes under Book-Keeping. So, let's understand what are the differences between book-keeping and accounting to understand why Accounting is important.

### **Meaning of Book Keeping**

Bookkeeping is the process of systematically recording, organizing, and maintaining financial transactions and information of a business or organization. It involves the detailed and accurate recording of financial activities such as sales, purchases, receipts, and payments in appropriate books or accounting software.

In bookkeeping, every financial transaction is categorized, classified, and recorded in a chronological order, ensuring that all transactions are properly documented. This includes recording information about the date, amount, parties involved, and specific accounts affected by the transaction.

## Inter-relationship of Accounting with other Disciplines

*Ms. Parul Grover*

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### **Introduction**

Accounting is not just a separate subject in itself. It is closely related with other areas and disciplines. Let see what is the relationship between accounting and other areas.

### **Relationship of Accounting with other Areas**

Accounting is closely interconnected with various other areas, as it serves as a fundamental component in managing and evaluating the financial aspects of different disciplines. Here are some key relationships of accounting with other areas:

1. **Finance:** Accounting and finance are closely related fields. Accounting provides the necessary financial data and information that finance professionals utilize for financial analysis, forecasting, and decision-making. Finance relies on accounting records to assess the financial health of an organization, analyze investment opportunities, manage cash flows, and make strategic financial decisions.
2. **Economics:** Accounting and economics share a strong connection, particularly in terms of resource allocation and

## **Branches of Accounting– Financial, Cost and Management**

*Dr. Pooja Sharma*

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### **Introduction**

Accounting has evolved a lot over time. Accounting as a subject and profession started with Financial accounting but over the time due to limitations of financial accounting, cost accounting emerged. As the size of businesses grew, needs of management also grew. To cater to those needs, cost accounting further developed and transformed into management accounting.

### **Difference Between Financial and Cost Accounting**

Financial accounting and cost accounting are two distinct branches of accounting that serve different purposes within an organization. Here are the key differences between financial accounting and cost accounting:

#### ***Purpose***

**Financial Accounting:** The main purpose of financial accounting is to provide financial information to external stakeholders, such as investors, creditors, and regulatory authorities. It focuses on summarizing and reporting financial transactions and results for decision-making and accountability.

## Advantages and Limitations of Financial Accounting

*Ms. Pooja Tripathi*

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### **Introduction**

Accounting as a subject, body of knowledge, and profession has both pros and cons. Let see the advantages and limitations of Accounting.

### **Advantages of Accounting**

Accounting offers several advantages to businesses and organizations. Here are the key advantages of accounting:

- 1. Financial Information and Decision-Making:** Accounting provides essential financial information that aids in decision-making processes. It enables businesses to assess their financial position, performance, and profitability. By analyzing financial statements, such as the balance sheet, income statement, and cash flow statement, managers can make informed decisions about resource allocation, investments, pricing, and budgeting.
- 2. Monitoring and Control:** Accounting helps in monitoring and controlling various aspects of a business. It allows managers to track expenses, revenues, and other financial

## Accounting Principles, Concepts and Conventions

*Dr. Poorva Ranjan*

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### **Introduction**

Accounting is a diverse and organized body of knowledge. Accounting like English has certain rules, regulations and certain norms. These are called as Principles of Accounting and standards of Accounting.

Lets see the various GAAP's or Generally Accepted Accounting Principles.

### **Meaning of Accounting Principles**

Accounting principles are uniform practices followed for Preparation of company's financial statements in order to present true and fair view of state of affairs of entity. These are Commonly understood and followed principles and Universally adopted.

Accounting principles are of two types:

- (a) **Accounting Concepts**—Assumptions on which science of accounting is based.
- (b) **Accounting Conventions**—Rules followed by accountants based on their experience.

## Meaning and Significance of GAAP

*Dr. Ravi Kant Swami*

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### **Introduction**

Generally Accepted Accounting Principles (GAAP) refer to a set of standard accounting principles, procedures, and guidelines used in the preparation and presentation of financial statements. These principles provide a framework for financial reporting, ensuring consistency, comparability, and transparency in financial statements across different organizations.

The purpose of GAAP is to establish a common language for financial reporting, enabling users of financial statements, such as investors, creditors, and regulators, to understand and evaluate the financial performance and position of an entity. GAAP helps ensure that financial information is reliable, relevant, and faithfully represents the financial activities of an organization. Lets understand the concept in more detail.

### **GAAP–Meaning and Significance**

Some key characteristics of GAAP include:

- **Relevance:** Financial information should be capable of making a difference in the decisions of financial statement users.

## **Introduction to AS Introduced by ICAI: Ind-AS and other Standards**

*Ms. Roli Wadhwa*

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### **Introduction**

Ind AS, or Indian Accounting Standards, refers to the set of accounting standards adopted in India for the preparation and presentation of financial statements. Ind AS is largely based on International Financial Reporting Standards (IFRS) issued by the International Accounting Standards Board (IASB) and is aligned with the global accounting framework.

The adoption of Ind AS aims to enhance the transparency, comparability, and quality of financial reporting in India. It is applicable to certain classes of companies, including listed companies, large unlisted companies, and certain specified companies. The Ministry of Corporate Affairs (MCA) in India is responsible for issuing and implementing Ind AS.

Ind AS covers a wide range of financial reporting areas, including recognition, measurement, presentation, and disclosure of assets, liabilities, income, expenses, and equity. It provides detailed guidelines on various topics, such as revenue recognition, leases, financial instruments, business combinations, and consolidation of financial statements.

## Overview of International Finance Accounting Standards

*Dr. Seema Mam*

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### **Introduction**

International Financial Reporting Standards (IFRS) are a set of accounting standards developed and maintained by the International Accounting Standards Board (IASB). IFRS provide a globally recognized framework for the preparation, presentation, and disclosure of financial statements.

The main objective of IFRS is to ensure that financial statements are transparent, comparable, and reliable across different countries and industries. They aim to enhance the quality, consistency, and relevance of financial reporting, thereby enabling investors, creditors, and other stakeholders to make informed decisions based on the financial information provided. Lets dive into details of IFRS.

### **Importance of IFRS**

IFRS cover a wide range of financial reporting areas, including recognition, measurement, presentation, and disclosure of assets, liabilities, income, expenses, and equity. They provide detailed guidance on various topics, such as revenue recognition, lease accounting, financial instruments, business combinations, and fair value measurement.

## Application of Journal Entries

*Ms. Shanu Jain*

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### **Introduction**

Accounting is concerned with recording, classifying and summarizing in significant manner and in terms of money transactions and events which are in part atleast of a financial character, and interpreting the results thereof.

For the purpose of recording financial transactions, we need to maintain a book in chronological order. This book is called as Journal.

Lets see the meaning and importance of Journal and its application through Journal entries.

### **Meaning of Journal**

In accounting, a journal is a chronological record of financial transactions. It is the initial step in the accounting process and serves as the foundation for maintaining accurate and organized financial records.

The journal captures the details of each transaction, including the date, description, and the amounts debited and credited. It follows a standardized format known as the “double-entry” system, which

## Compound Journal Entries and Numericals

*Ms. Shruti Auplish*

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### **Introduction**

The term “compound journal entry” refers to a type of accounting entry that involves multiple debits and/or multiple credits. In other words, it is an entry that affects more than one account simultaneously. Compound journal entries are used when a single transaction or event has an impact on multiple accounts.

For example, let’s consider a business that receives cash for providing services and settles a portion of its accounts payable. In this case, a compound journal entry would be made to record both the increase in cash and the decrease in accounts payable. The entry may include multiple debit and credit entries, reflecting the different accounts affected by the transaction.

Lets dive deep in case of compound journal entries.

### **Compound Journal Entries**

Compound journal entries are necessary to ensure accurate and comprehensive recording of complex financial transactions. They help maintain the fundamental accounting equation, where assets equal liabilities plus equity, by capturing all the relevant changes to different accounts in a single entry.

## Opening Journal Entry: Practical Aspect

*Mr. Swaraj Manchanda*

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### **Introduction**

The term “opening journal entry” refers to the initial entry recorded in the accounting books at the beginning of a new accounting period or when a new set of books is established. It is the first entry made to initiate the recording of financial transactions for that specific period.

### **Purpose of Opening Journal Entry**

The opening journal entry serves several purposes:

1. **Starting Point:** It establishes the starting balances of various accounts for the new accounting period. These balances are carried forward from the closing balances of the previous period or can be based on other sources such as trial balances, financial statements, or adjustments.
2. **Continuity:** The opening journal entry ensures a seamless transition from one accounting period to the next. It helps maintain the continuity of financial records and provides a foundation for subsequent transactions and journal entries.

## Cash Book: Types and Advantages

*Mr. Bhupender Singh*

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### **Introduction**

Journal though can record all types of transactions, still for better record making and classification purposes, we have sub types or subsidiaries of Journal called as Subsidiary Books.

Lets see one of the most important Subsidiary Book called as Cash Book in detail.

### **Cash Book–Meaning**

A cash book is a financial ledger or register that records all cash-related transactions of a business. It serves as a primary accounting record specifically dedicated to cash inflows and outflows. The cash book is maintained to track the company’s cash position, monitor cash receipts and payments, and reconcile the cash balance with the bank statement.

The cash book typically includes the following information:

**Date:** The date when the cash transaction occurs.

**Particulars:** A brief description or explanation of the transaction, such as “Cash sales,” “Cash purchase,” or the name of the customer or supplier.

## Sales and Purchases Day Book

*Ms. Navya Jain*

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### **Introduction**

Cash book records all sorts of cash transactions. But business also has credit transactions like credit purchase of goods and credit sales of goods. So, a part from Cash Book, we also have Purchases and Sales Day book which are used to record transactions of Credit purchase and Sales of goods and services. These books are called as Purchases Day Book or Purchases Journal and Sales Day Book or Sales Journal. Let's understand them in detail with Numeric example as well.

### **Meaning of Day Purchases and Sales Book**

The Purchases and Sales Book, also known as the Purchase Journal and Sales Journal, is a specialized accounting book used to record purchases and sales transactions of a business. It is a subsidiary book that provides a detailed record of individual purchases made by the company and sales made to customers.

### ***The Purchases Book***

The Purchases Book is used to record all purchases of goods or services made by the business on credit. It typically includes the following information for each purchase: