VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELGAVI -590 014

Study Materials

Technological Innovation and Management Entrepreneurship (BEC501)

(Effective from the academic Year 2025-2026**)**

SEMESTER – V

Subject Code: BEC501

(Choice Based Credit System)

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Akshaya Institute of Technology

(Recognized by AICTE, New Delhi and Affiliated to Visvesvaraya Technological , University, Belagavi)

Akshaya Institute of Technology lingapura, Obalapura post, Koratagere Road, Tumakuru-distric-572106, Karnataka State, INDIA.

Year: 2025 - 2026

Technological Innovation and Management Entrepreneurship (BEC501)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Effective from the academic Year 2025-26**)**
SEMESTER – V

Subject Code: BEC501
(Choice Based Credit System)

STUDENT'S NAME: ………………………………..….........…….................………..

USN: …………………………………………………………………………….......

BRANCH: ……………………………………….....………………..................…..

SECTION: ……….. **YEAR:** …………………………………..................

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

<u>Vision</u>

To produce competent engineering professionals in the field of Electronics & Communincations Engineering by imparting value based quality technical education to meetthe societal needs and develop socially responsible citizens

<u>Mission</u>

M1: To provide strong fundamentals and technical skills in the field of Electronics and communication Engineering through effective teaching learning process.

M2: Enhancing employ ability of the students by providing skills in the fields of VLSI, Embedded systems

M3: Encourage the students to participate in co curricular and extra curricular activities that creates a spirit of social responsibility and leadership qualities.

Program Outcomes

Sl. No.	Description	POs
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

B. E. (EC / TC) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V				
Technological Innovation and Management Entrepreneurship				
Course Code	BEC501	CIE Marks		50
Number of Lecture Hours/Week	03	SEE Marks		50
Total Number of Lecture Hours	40 (08 Hours / Module)	Exam Hours		03

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CREDITS-03

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Course Learning Objectives: This course will enable students to:

- Understand basic skills of Management
- Understand the need for Entrepreneurs and their skills.
- Identify the Management functions and Social responsibilities.
- Understand economic development, creativity and Innovation.
- Understand the Ideation Process, creation of Business Model, Feasibility Study and sources of funding.

MODULE-1	RBT Level
Management: Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession **(Selected topics of Chapter 1, Text1).** **Planning:** Planning-Nature, Importance, Types, Steps and Limitations of Planning; Decision Making – Meaning, Types and Steps in Decision Making **(Selected topics from Chapters 4 & 5, Text 1).**	L1,L2
MODULE-2	
Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing**-Need and Importance**,** Recruitment and Selection Process **(Selected topics from Chapters 7, 8 & 11,Text 1).** **Directing and Controlling:** Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioural Approach of Leadership; Coordination-Meaning, Types, Techniques of Coordination; Controlling – Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process **(Selected topics from Chapters 15 to 18 and 9, Text 1).**	L1,L2
MODULE-3	
Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance **(Selected topics from Chapter 3, Text 1).** **Entrepreneurship**: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship **(Selected topics from Chapter 2, Text 2).**	L1,L2
MODULE-4	

Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only) (**Selected topics from Chapter1, Text 2**). **Idea Generation and Feasibility Analysis-** Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.(**Selected topics from Chapter 6(Page No. 111-117) & Chapter 7(Page No. 140-142), Text 2**)	**L1,L2**
MODULE-5	
Business model – Meaning, designing, analyzing and improvising; Business Plan – Meaning, Scope and Need; Financial, Marketing, Human Resource and Production/Service Plan; Business plan Formats; Project report preparation and presentation; Why some Business Plan fails? (**Selected topics from Chapter 8 (Page No 159-164, Text 2**) **Financing and How to start a Business?** Financial opportunity identification; Banking sources; Nonbanking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise (**Selected topics from Chapter 7(Page No 147-149), Chapter 5 (Page No 93-99) & Chapter 8(Page No. 166-172) Text 2**) **Project Design and Network Analysis:** Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences.(**Selected topics from Chapters 20, Text 3**).	**L1,L2, L3**

Course Outcomes: After studying this course, students will be able to:

1. Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business
2. Describe the functions of Managers, Entrepreneurs and their social responsibilities
3. Understand the components in developing a business plan, along with the integration of CSR-Corporate Social Responsibility.
4. Describe the importance of small scale industries in economic development and institutional support to start a small scale industry and understand the concepts of Creativity and Innovation and Identification of Business Opportunities.
5. Awareness about various sources of funding and institutions supporting entrepreneurs

Text Books:

1. Principles of Management – P.C Tripathi, P.N Reddy, McGraw Hill Education, 6th Edition, 2017. ISBN-13:978-93-5260-535-4.
2. Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath, Pearson Education 2008, ISBN 978-81-7758-260-4.
3. Dynamics of Entrepreneurial Development and Management by Vasant Desai. HPH 2007, ISBN: 978-81-8488-801-2.
4. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, "Entrepreneurship", 8th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012.

Reference Book:

1. Essentials of Management: An International, Innovation and Leadership perspective by Harold Koontz, Heinz Weihrich McGraw Hill Education, 10th Edition 2016. ISBN- 978-93-392-2286-4.

Digital Signal Processing		Semester	5
Course Code	**BEC502**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	3 Hours
Examination nature (SEE)	Theory		

Course objectives:
1. Preparation: To prepare students with fundamental knowledge/ overview in the field of Digital Signal Processing
2. Core Competence: To equip students with a basic foundation of Signal Processing by delivering the basics of Discrete Fourier Transforms, their properties, efficient computations & the design of digital filters.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method, but different type of teachingmethods may be adopted to develop the outcomes.
2. Show Video/animation films to explain the different concepts of Digital Signal Processing
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes criticalthinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinkingskills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up withtheir own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.
9. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and havediscussions on the that topic in the succeeding classes.
10. Give Programming Assignments.

MODULE-1

Introduction: Signals, Systems and Signal Processing, Classification of Signals, The Concept of Frequency in Continuous Time and Discrete Time Sinusoidal Signals. [Text1: 1.1, 1.2, 1.3: 1.3.1, 1.3.2]

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems.

[Text 1: 2.1.1, 2.1.2, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2, 2.3.3, 2.3.5]

MODULE-2

Z-Transforms: The z-Transform, Properties of the z-Transform (Statements only), The System Function of a Linear Time Invariant system. Text1:3.1, 3.2, 3.3.3.

The Discrete Fourier Transform: Frequency Domain sampling and Reconstruction of Discrete Time Signals, The DFT, The DFT as Linear Transformation. Properties of DFT: Periodicity, Linearity and Symmetry for real valued sequence, Multiplication of two DFTs and Circular Convolution.

[Text1: 7.1.1, 7.1.2, 7.1.3, 7.2: 7.2.1, 7.2.2]

MODULE-3

DFT Properties: Time reversal of a sequence, Circular Time shift of a sequence, Circular frequency shift, Complex conjugate property, Multiplication of two sequences, Perceval's theorem. Linear Filtering Methods based on the DFT. (Text 1: 7.3).

Efficient Computation of the DFT- FFT Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms: computation of DFT and IDFT in decimation in time.

[Text1: 8.1: 8.1.1, 8.1.3].

MODULE-4

Design of FIR Filters: Characteristics of practical frequency-selective filters, Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR (low pass and High pass) filters using windows - Rectangular, Bartlett, Hanning, Hamming and Blackman windows. Structure for FIR Systems: Direct form and Cascade form.
[Text1: 10.1.2, 10.2.1, 10.2.2]

MODULE-5

IIR Filter Design: Infinite Impulse response Filter Format, Bilinear Transformation Design Method, Analog Filters using Low pass prototype transformation, Normalized Butterworth Functions, Bilinear Transformation and Frequency Warping, Bilinear Transformation Design Procedure, Digital Butterworth Filter Design (Lowpass and Highpass) using BLT. Realization of IIR Filters in Direct form I and II.
[Text2: 8.1, 8.2, 8.3 (Butterworth filter design), 8.8.1]

PRACTICAL COMPONENT OF IPCC

List of Programs to be implemented & executed using any programming languages like   **Moku:Go/ MATLAB/OCTAVE (but not limited to)**

Sl.NO	Experiments
1	Program to generate the following discrete time signals. a) Unit sample sequence, b)Unit step sequence, c) Exponential sequence, d)Sinusoidal sequence, e) Random sequence
2	Program to perform the following operations on signals. a) Signal addition, b) Signal multiplication, c)Scaling, d) Shifting, e)Folding
3	Program to perform convolution of two given sequences (without using built-in function) and display the signals.

4	Consider a causal system $y(n) = 0.9y(n-1)+x(n)$.
	     a) Determine $H(z)$ and sketch its pole zero plot.
	     b) Plot $|H(e^{j\omega})|$ and $\angle H(e^{j\omega})$
	     c) Determine the impulse response $h(n)$.

5	Computation of N point DFT of a given sequence (without using built-in function) and to plot the magnitude and phase spectrum.
6	Using the DFT and IDFT, compute the following for any two given sequences a)Circular convolution b) Linear convolution
7	Verification of Linearity property, circular time shift property & circular frequency shift property of DFT.
8	Develop decimation in time radix-2 FFT algorithm without using built-in functions.
9	Design and implementation of digital low pass FIR filter using a window to meet the given specifications
10	Design and implementation of digital high pass FIR filter using a window to meet the given specifications
11	Design and implementation of digital IIR Butterworth low pass filter to meet the given specifications.
12	Design and implementation of digital IIR Butterworth high pass filter to meet the given specifications

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:
- Analyse the different types of signals and systems used in digital signal processing.
- Compute the response of an LTI system using time and frequency domain techniques.
- Develop algorithms for the efficient computations of DFT and IDFT.
- Design of digital FIR filters for the given specifications using different window methods.
- Design of digital IIR digital filters using bilinear transformation method.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The IPCC means the practical portion integrated with the theory of the course. CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.

CIE for the theory component of the IPCC

- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

- The minimum marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum marks-25) in the theory component and 10 (40% of maximum marks -25) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 sub-questions are to be set from the practical component of IPCC, the total marks of all questions should not be more than 20 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.
- The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100)

in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Suggested Learning Resources:

Text Books:

1. Proakis & Manolakis, "Digital Signal Processing - Principles Algorithms & Applications", 4th Edition, Pearson education, New Delhi, 2007. ISBN: 81-317-1000-9.

2. Li Tan, Jean Jiang, "Digital Signal processing - Fundamentals and Applications", Academic Press, 2013, ISBN: 978-0-12-415893.

3. Vinay K. Ingle, John G Proakis , "Digital Signal Processing Using MATLAB, A problem Solving Companion", Cengage Learning, 2018, ISBN: 93-86668-11-4

Reference Books:

1. Simon Haykin and Barry Van Veen, "Signals and Systems", 2nd Edition, 2008, Wiley India. ISBN9971-51- 239-4.

2. Sanjit K Mitra, "Digital Signal Processing, A Computer Based Approach", 4th Edition, McGraw Hill Education, 2017. ISBN:978-1-25-909858

3. Oppenheim & Schaffer, "Discrete Time Signal Processing", PHI, 2003.

4. D Ganesh Rao and Vineeth P Gejji, "Digital Signal Processing" Cengage India Private Limited, 2017, ISBN: 9386858231

Web links and Video Lectures (e-Resources):
1. Digital Signal processing, https://nptel.ac.in/courses/117102060

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Programming Assignments / Mini Projects can be given to improve programming skills

DIGITAL COMMUNICATION		Semester	5
Course Code	**BEC503**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	4:0:0:0	SEE Marks	50
Total Hours of Pedagogy	50 Hours	Total Marks	100
Credits	04	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course objectives:

- Understand the concept of signal processing of digital data and signal conversion to symbols at the transmitter and receiver.
- Compute performance metrics and parameters for symbol processing and recovery in ideal and corrupted channel conditions.
- Understand the principles of spread spectrum communications.
- Understand the basic principles of information theory and various source coding techniques.
- Build a comprehensive knowledge about various Source and Channel Coding techniques.
- Discuss the different types of errors and error detection and controlling codes used in the communication channel.
- Understand the concepts of convolution codes and analyze the code words using time domain and transform domain approach.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale communication industries.
3. Show Video/animation films to explain the functioning of various modulation techniques, Channel, and source coding.
4. Encourage collaborative (Group) Learning in the class
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize & analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Bandpass Signals to Equivalent Lowpass: Hilbert Transform, Pre-envelopes, Complex envelopes of Band-pass Signals, Canonical Representation of Bandpass signals.

Signalling over AWGN Channels- Introduction, Geometric representation of signals, Gram- Schmidt Orthogonalization procedure, Conversion of the continuous AWGN channel into a vector channel , Optimum receivers using coherent detection: ML Decoding, Correlation receiver, matched filter receiver.

Module-2

Digital Modulation Techniques: Phase shift Keying techniques using coherent detection: generation, detection and error probabilities of BPSK and QPSK, M–ary PSK, M–ary QAM. Frequency shift keying techniques using Coherent detection: BFSK generation, detection and error probability. BFSK using Noncoherent Detection, Differential Phase Shift Keying.

Module-3

Information theory: Introduction, Entropy, Source Coding Theorem, Lossless Data Compression Algorithms, Discrete Memoryless Channels, Mutual Information, Channel capacity, Channel Coding Theorem, Information Capacity Law (Statement).

Module-4

Error Control Coding: Error Control Using Forward error Correction,
Linear Block Codes: Definitions, Matrix Descriptions, Syndrome and its properties, Minimum distance Considerations, Syndrome Decoding, Hamming Codes.
Cyclic Codes: Properties, Generator and Parity Check Polynomial and matrices, Encoding, Syndrome computation, Examples.

Module-5

Convolutional Codes: Convolutional Encoder, Code tree, Trellis Graph and State graph, Recursive systematic Convolutional codes, Optimum decoding of Convolutional codes, Maximum Likelihood Decoding of Convolutional codes: The Viterbi Algorithm, Examples.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :
1. Apply the concept of signal conversion to vectors in communication transmission and reception.
2. Perform the mathematical analysis of digital communication systems for different modulation techniques.
3. Apply the Source coding and Channel coding principles for the discrete memoryless channels.
4. Compute the codewords for the error correction and detection of a digital data using Linear Block Code, Cyclic Codes and Convolution Codes.
5. Design encoding and decoding circuits for Linear Block Code, Cyclic Codes and Convolution Codes.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:
- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB4.2, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Text Book

1. Simon Haykin, "Digital Communication Systems", John Wiley & sons, 2014, ISBN 978-81- 265-4231-4.

Reference Books

1. B.P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems",4th Edition, Oxford University press, ISBN: 9780198073802, 2017
2. K Sam Shanmugam, "Digital and analog communication systems", Wiley India Pvt. Ltd, 2017, ISBN:978-81-265-3680-1,.
3. K.N Hari Bhat, D. Ganesh Rao, "Information Theory and Coding", Cengage Learning India Pvt Ltd, 2017, ISBN: 93-866-5092-4,.

Web links and Video Lectures (e-Resources):
1. Principles of Communication Systems Part II, https://onlinecourses.nptel.ac.in/noc19_ee47/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
1. Experiential Learning by using free and open source software's SCILAB or OCTAVE or Python

Intelligent Systems and Machine Learning Algorithms		Semester	5
Course Code	**BEC515A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	THEORY		

Course objectives:

This course will enable students to:

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward Problem-Solving
- Get to know approaches of inference, perception, knowledge representation, and learning
- Define Machine Learning and understand the basic theory underlying machine learning.
- Differentiate supervised, unsupervised, and reinforcement learning

Teaching-Learning Process (General Instructions)

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These are sample Strategies teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method; different teaching methods may be adopted to develop the outcomes.

2. Encourage collaborative (Group) Learning in the class.

3. Ask at least three HOTS (Higher Order Thinking) questions in the class, which promotes criticalthinking.

4. Adopt Problem-Based Learning (PBL), which fosters students' Analytical skills, and develops thinking skillssuch as evaluating, generalizing, and analyzing information rather than simply recalling it.

5. Topics will be introduced in a multiple representation.

6. Show the different ways to solve the same problem and encourage the students to come up withcreative ways to solve them.

7. Discuss how every concept can be applied to the real world and when that's possible, it helps improve the student's understanding.

8. Adopt the Flipped class technique by sharing the materials/Sample Videos before the class and having discussions on the topic in the succeeding classes.

Module-1
Introduction: What is AI? Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. Text book 1: Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4
Module-2
Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search; Text book 1: Chapter 3- 3.1, 3.2, 3.3, 3.4
Module-3

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic

Text book 1: Chapter 3-3.5,3.6 Chapter 4 – 4.1, 4.2 Chapter 7- 7.1, 7.2, 7.3, 7.4, 7.5

Module-4
Introduction: Machine learning Landscape: what is ML?, Why, Types of ML, main challenges of ML Concept learning and Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Find S-Version Spaces and Candidate Elimination Algorithm – Remarks on VS- Inductive bias. Text book 3: Chapter 1, Textbook 4:Chapter 1 and 2
Module-5
End-to-end Machine learning Project: Working with real data, Look at the big picture, Get the data, Discover and visualize the data, Prepare the data, select and train the model, Fine tune your model. Classification: MNIST, training a Binary classifier, performance measure, multiclass classification, error analysis, multi-label classification, multi-output classification Textbook 4: Chapter 2, Chapter 3
Course outcome (Course Skill Set)   At the end of the course, the student will be able to: CO1. Apply knowledge of agent architecture, searching, and reasoning techniques for different Applications. CO 2. Compare various Searching and Inferencing Techniques. CO 3. Develop knowledge base sentences using propositional logic and first-order logic CO 4. Understand the concept of Machine Learning and Concept Learning. CO 5. Apply the concept of ML and various classification methods in a project

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:
- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:
Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Text Book:
1. Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015
2. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd Edition,Tata McGraw Hill,2013.
3. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 2013
4. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn &Tensor Flow , O'Reilly, Shroff Publishers and Distributors Pvt. Ltd 2019.

Reference Books:
1. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
2. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980
3. Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014.

4. Ethem Alpaydin, Introduction to Machine Learning, PHI Learning Pvt. Ltd, 2nd Ed., 2013
5.   T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning, Springer, 1st edition, 2001
6.   Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley, 2019
7. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson,2020

Web links and Video Lectures (e-Resources):

- NPTEL Video lectures: https://nptel.ac.in/courses/106105077
- NPTEL Video lectures: https://nptel.ac.in/courses/106102220
- https://archive.nptel.ac.in/courses/106/105/106105152
- https://archive.nptel.ac.in/courses/106/106/106106202
- https://nptel.ac.in/domains/discipline/106?course=106_0

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Group Discussion/Quiz
- Mini projects.

-

Digital Switching and Finite Automata Theory			
Course Code	**BEC515B**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	42	Total Marks	100
Credits	3	Exam Hours	3

Course objectives:

1. To understand the basics of switching theory, including combinational logic design and testing.
2. To learn finite-state machine design and testing, essential for modeling computational processes.
3. To illustrate methods for logic synthesis and optimization, crucial for efficient digital system design.
4. To understand the modern topics such as CMOS gates, logic design for emerging nanotechnologies, digital system testing, and asynchronous circuit design
5. To assess the practical examples to reinforce the learning and application concepts

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various techniques.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1
Logic design: Design with basic logic gates, Logic design with integrated circuits, NAND and NOR circuits, Design of high-speed adders, Metal-oxide semiconductor (MOS) transistors and gates(5.1 to 5.6 of Text1) **Threshold Logic:** Introductory Concepts: Threshold element, capabilities and limitations of threshold logic, Elementary Properties, Synthesis of Threshold networks: Unate functions, Identification and realization of threshold functions, The map as a tool in synthesizing threshold networks. (Sections 7.1, 7.2 of Text 1)

Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos,
	RBT Level: L1, L2, L3

Module-2

Testing for Combinational circuits

Fault models, Structural testing, IDDQ testing, Delay fault testing, Synthesis for testability, Testing for nanotechnologies (8.1 to 8.6 of Text1)

Teaching-Learning Process	Chalk and talk method, Power point presentation, YouTube videos, **RBT Level:** L1, L2, L3

Module-3

Finite-state machines: Introduction to synchronous sequential circuits and iterative networks, Sequential circuits – introductory example, The finite-state model – basic definitions, Memory elements and their excitation functions, Synthesis of synchronous sequential circuits, An example of a computing machine, Iterative networks (9.1 to 9.6 of Text1)

Capabilities, minimization, and transformation of sequential machines

The finite-state model – further definitions, Capabilities and limitations of finite-state machines State equivalence and machine minimization, Simplification of incompletely specified machines (10.1 to 10.4 Text1)

Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTubevideos **RBT Level:** L1, L2, L3

Module-4

Asynchronous sequential circuits: Modes of operation, Hazards, Synthesis of SIC fundamental-mode circuits. **Structure of Sequential Machines:** Introductory example, State assignment using partitions: closed partitions, The lattice of closed partitions, Reduction of output dependency, Input dependence and autonomous clocks, Covers and generation of closed partitions by state splitting: Covers, The implication graph, An application of state splitting to parallel decomposition. (Section 11.1, 11.2, 11.3, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6 of Text1)

Teaching-Learning Process	Chalkandtalkmethod, PowerPoint Presentation, YouTube videos, **RBT Level:** L1, L2, L3

Module-5

Memory, definiteness, and information loss lessness of finite automata

Memory span with respect to input–output sequences (finite-memory machines), Memory span with respect to input sequences (definite machines), Memory span with respect to output sequences, Information-lossless machines(14.1 to 14.4 of Text1)

Teaching-Learning Process	Chalk and talk method/Power point presentation, YouTube videos **RBT Level:** L1, L2, L3

Course outcomes (Course Skill Set)

At the end of the course the student will be able to:

1. Make use of mapping tool to synthesize threshold logic

2. Analyze effects of hazards and fault diagnosis in digital logical circuits

3. Examine the capabilities of Finite State Machines by minimization Procedures

4. Model the structures of sequential machines

5. Develop the methods of state identification and fault detection

6. Design the fault detection algorithm

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB4.2, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
    1. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books:

1. Switching and Finite Automata Theory – Zvi Kohavi and Niraj K. Jha, Cambridge University press, 3rd edition, 2010.

Reference Books:

2. Introduction to switching theory and logic design Fredriac J. Hill, Gerald Peterson, 3rd edition,

3. Fault Tolerant and Fault Testable Hardware Design-Parag K Lala, Prentice Hall Inc. 1985.

4. Digital Circuits and Logic Design. -Charles Roth Jr, Larry L. Kinney, Cengage Learning, 2014, ISBN: 978-1-133-62847-7.

Web links and Video Lectures (e-Resources)

https://onlinecourses.nptel.ac.in/noc20_cs67

https://onlinecourses.nptel.ac.in/noc24_cs61

Data Structures using C++		Semester	5
Course Code	**BEC515C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:
- Learn the Basic Concepts of C++
- Describe the concepts of Pointers and Arrays
- Concepts of Data Structures
- Understanding of the implementation of a linked list and Algorithms

Teaching-Learning Process (General Instructions)
These are sample Strategies teachers can use to accelerate the attainment of the various course outcomes.
1. **Online coding platforms can be used to execute programs**
2. **Mobile applications can be used to execute the codes.**
3. **Presentation of concepts**

<table>
<tr><td align="center">Module-1</td></tr>
</table>

UNIT-I: Software Engineering Principles And C++ Classes
Software Life Cycle, Software Development Phase, Classes.
Page No. 1-7, 17-33
OOD: Inheritance, Polymorphism, Templates
Page No. 60-78,84-112

UNIT-II: Pointers & Array based Lists
Pointer Data Type and Pointer Variables, Classes & Pointers, Inheritance Pointers &Virtual functions, Abstract Classes & Pure Virtual functions, Array Based Lists
Page No. 131-183

<table>
<tr><td align="center">Module-2</td></tr>
</table>

UNIT-III: Linked Lists &Stacks
Linked List, Linked List as an ADT, Unordered Linked List, ordered Linked List, Doubly Linked Lists
Page No. 265-320
Stack: Stacks, Implementation of Stacks as Arrays , Linked Implementation of Stacks
Page No. 395-428

<table>
<tr><td align="center">Module-3</td></tr>
</table>

UNIT-IV: Queues and Algorithms
Queue Operations, Implementation of Queues as Arrays, Linked Implementation of Queues, STL class queue, Priority Queues, Application of Queues: Simulation.
Page No. 451-490
Search Algorithms, Hashing, Sorting Algorithms: Selection sort, Insertion sort, Shell Sort.
Page No. 497-524,533-550

<table>
<tr><td align="center">Module-4</td></tr>
</table>

UNIT-V: Binary Trees and B-Trees
Binary Trees, Binary Tree Traversal, Binary Search Trees, Binary Search Tree: Analysis, Non-recursive Binary Tree Traversal Algorithms, Binary Tree Traversal and Functions as Parameters, AVL (Height-Balanced) Trees, B-Trees
Page No. 599-675

Module-5
UNIT-VI: Graphs Introduction, Graph Definitions and Notations, Graph Representation, Operations on Graphs, Graphs as ADTs, Graph Traversals, Shortest Path Algorithm, Minimum Spanning Tree, Topological Order, Euler Circuits Page No.685-721

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Distinguish between procedures and object-oriented programming.

2. Apply advanced data structure strategies for exploring complex data structures.

3. Compare and contrast various data structures and design techniques in Performance.

4. Implement data structure algorithms through C++. Incorporate data structures into the applications such as binary search trees, AVL, and B Trees

5. Implement all data structures like stacks, queues, trees, lists, and graphs and compare their Performance and trade-offs.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

* There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
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* Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
* The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Text Book:

1.D.S.Malik - Data Structures using C++2nd Edition.

Reference Book

1. Sartaj Sahni – Data Structures, Algorithms, and Applications in C++ 2nd Edition

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/106106127
- https://nptel.ac.in/courses/106102064
- https://nptel.ac.in/courses/106106133

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Students Can use Mobile applications/Online compilers/Code blocks to execute the programs and check output for different cases.

Satellite and Optical Communication		Semester	V
Course Code	BEC515D	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	03	Exam Hours	
Examination type (SEE)	Theory/practical/Viva-Voce /Term-work/Others		

Course objectives:

- Understand the basic principle of satellite orbits and trajectories.
- Study of electronic systems associated with a satellite and the earth station.
- Understand the various technologies associated with the communication satellite.
- Learn the basic principle of optical fiber communication with different modes of light propagation.
- Understand the transmission characteristics and losses, optical components and its applications in optical communication.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various techniques.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1
Satellite Orbits and Trajectories: Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle. [Text 1: 2.1,2.2,2.3,2.4,2.5,3.3,3.4,3.5,3.6,3.7]   L1, L2

Module-2
Satellite subsystem: Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload. **Earth Station:** Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking. [Text 1: 4.1,4.5,4.6,4.7,4.8, 8.1,8.2,8.3,8.4,8.5,8.6,8.7]   L1, L2

Module-3

Communication Satellites: Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Telephony, Satellite Television, Satellite radio, Regional satellite Systems, National Satellite Systems.   [Text 1: 9.1,9.2,9.3,9.4,9.5,9.6,9.7,9.8,9.10]   L1, L2

Module-4
Optical Fiber Structures: Optical Fiber Modes and Configurations, Mode theory for circular waveguides, Single mode fibers, Fiber materials. Attenuation and Dispersion: Attenuation, Absorption, Scattering Losses, Bending loss, Signal Dispersion: Modal delay, Group delay, Material dispersion. [Text 2 : 2.3[2.3.1 to 2.3.4], 2.4[2.4.1, 2.4.2],2.5, 2.7],3.1, 3.2   L1, L2, L3

Module-5
Optical Sources and detectors: Light Emitting Diode: LED Structures, Light source materials, Quantum efficiency and LED power, Laser Diodes: Modes and threshold conditions, Rate equations, External quantum efficiency, Resonant frequencies, Photodetectors: The pin Photodetector, Avalanche Photodiodes.   **WDM Concepts:** Overview of WDM, Isolators and Circulators, Fiber grating filters (No derivation), Dielectric thin-film filters, Diffraction Gratings.   [Text 2: 4.2 ,4.3, 6.1, 10.1, 10.3, 10.4, 10.5, 10.7]   L1, L2

Course outcome (Course Skill Set)   At the end of the course, the student will be able to :   1. Describe the satellite orbits and its trajectories with the definitions of parameters associated with it.   2. Describe the Electronic hardware systems associated with the satellite subsystem and earth station.   3. Describe the communication satellite with the focus on national satellite system.   4. Classification and characterization of optical fibers with different modes of signal propagation.   5. Describe the constructional features and the characteristics of optical fiber and optical devices used for signal transmission and reception.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
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- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Book:

1. Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015, ISBN: 978-81-265-2071-8.
2. Gerd Keiser, Optical Fiber Communication, 5th Edition, McGraw Hill Education (India) Private Limited, 2016. ISBN:1-25-900687-5.

Reference Books :

1. Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd , 2017, ISBN: 978-81-265-0833-4
3. John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3
4. Theodore Rappaport, Wireless Communications: Principles and Practice, 2nd Edition,

Prentice Hall Communications Engineering and Emerging Technologies Series, 2002, ISBN 0-13-042232-0.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/117105131
- Basic Introduction To Satellite Communications | Satellite Communications - YouTube
- How Satellite Works (Animation) - YouTube
- Introduction video: Fiber Optic Communication Technology (youtube.com)
- Introduction (youtube.com) (Introduction to Fiber optics)

Digital Communication Lab		Semester	5
Course Code	BECL504	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Total SEE+CIE	100
		Exam Hours	2 Hours
Examination type (SEE)	Practical		

Course objectives:

This laboratory course enables students to

- Design of basic digital modulation techniques using electronic hardware.
- Simulation of vector computations and derive the orthonormal basis set using Gram Schmidt procedure.
- Simulate the digital transmission and reception in AWGN channel
- Simulate the digital modulations using software and display the signals and its vector representations.
- Implement the source coding algorithms using a suitable software platform.
- Simulate the channel coding techniques and perform decoding for error detection and correction.

Sl.NO	Experiments
	Hardware Experiments
1	Generation and demodulation of the Amplitude Shift Keying signal.
2	Generation and demodulation of the Phase Shift Keying signal.
3	Generation and demodulation of the Frequency Shift Keying signal.
4	Generation of DPSK signal and detection of data using DPSK transmitter and receiver.
Simulation Experiments (Use MUKU:GO / MATLAB / Scilab /LabVIEW or any other suitable software)	
5	Gram-Schmidt Orthogonalization: To find orthogonal basis vectors for the given set of vectors and plot the orthonormal vectors.
6	Simulation of binary baseband signals using a rectangular pulse and estimate the BER for AWGN channel using matched filter receiver.
7	Perform the QPSK Modulation and demodulation. Display the signal and its constellation.
8	Generate 16-QAM Modulation and obtain the QAM constellation.
9	Encoding and Decoding of Huffman code.
10	Encoding and Decoding of binary data using a Hamming code.
11	For a given data, use CRC-CCITT polynomial to obtain the CRC code. Verify for the cases, a) Without error b) With error
12	Encoding and Decoding of Convolution code

Course outcomes (Course Skill Set):
At the end of the course the student will be able to:
1. Design the basic digital modulation and demodulation circuits for different engineering applications.
2. Design of optimum communication receivers for AWGN channels.
3. Illustration of different digital modulations using the signals and its equivalent vector representations.
4. Implement the source coding and channel coding procedures using suitable software.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):
CIE marks for the practical course are **50 Marks**.
The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.
- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).
The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):
- SEE marks for the practical course are 50 Marks.
- **SEE shall be conducted by the two examiners. One from the same institute as an internal examiner and another from a different institute as an external examiner, appointed by the university.**
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall

be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. B. P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems" 4th Edition, Oxford University Press, 2017, ISBJ:978-0-19-947628-2
2. Herbert Taub, Donald L Schilling, Goutam Saha, "Principles of Communication Systems", Mc Graw Hill Education, 2013, ISBN: 978-1-25-902985-1.

MODULE- 1
MANAGEMENT

INTRODUCTION
- Management is a function of guidance and leadership control of efforts of a group or individuals in order to achieve goals/objectives of an organization.

MEANING
- Management is a critical element in the **economic growth** of a country. Management is the dynamic, life-giving element in every organization. The managing has become essential to ensure the coordination of individual efforts. The definitions of the management are:
- ➢ Management is the **art of getting things done** through people.
- ➢ Management is a process consisting of **planning, organizing, actuating and controlling, performed to determine and accomplish** the objectives by use of people and resources.

NATURE AND CHARACTERISTICS OF MANAGEMENT
- The production process involves land, labour, capital, organization and entrepreneurship.
- The production is the result of their combined efforts.
- The success of production depends on their effective combination and cooperation.
- The effective balance is a challenging task. Proper skills and knowledge is the management.
- The important characteristics of management are:
  - Stable
  - Applicable to all kinds of organizations
  - Transparent
  - Approaches to be clear and goal oriented
  - Simple and effective
  - It should be responsive to many external elements like economic, technological, social, political and ethical factors.
  - Well defined goals and effective means to accomplish the goals.
  - Good planning, organizing, staffing, directing and controlling functions.
  - Provide conducive atmosphere of work.

SCOPE OF MANAGEMENT
- The management is a must for every organization.
- Management plans the activities, coordinates and utilizes the available resources effectively and efficiently at minimum cost.
- The scope of management is not limited only to business organization but it is extended to Business establishments
- The scope can be extended to important areas of life such as:
  - ➢ Development management
  - ➢ Distribution management
  - ➢ Financial management
  - ➢ Marketing management
  - ➢ Personnel management
  - ➢ Production management
  - ➢ Office management
  - ➢ Transport management
  - ➢ Purchase management
  - ➢ Sales management
  - ➢ Supply chain management
  - ➢ Business management

- Its scope starts from self management to home management and to the management of organizations.

MANAGEMENT AS A SCIENCE, ART OR PROFESSION

- The art is doing things in the light of the realities of a situation under "art" one normally learns the "how" of a phenomenon.
- It is the art of getting things done through others in dynamic and mostly non- repetitive situations.
- The science is an organization knowledge.
- The essential feature of any science is the application of scientific methods to the development of knowledge.
- So management is partly an art and partly a science. Management does not possess the characteristics of a profession.
- A profession is expected to have organized and systematic knowledge, formalized methods of acquiring training and experience.
- But nowadays, management has become a profession than art or science.

MANAGEMENT AND ADMINISTRATION

- People feel that administration involves "thinking". It is a top level function that centers around the preparation of plans, rules, policies and objectives of an organization.
- Whereas management involves "doing" and is a lower level function, concerning with execution and direction of policies and operations.
- So administration is more important at lower levels. The time spent in administrative and managerial function at different levels is as in fig.
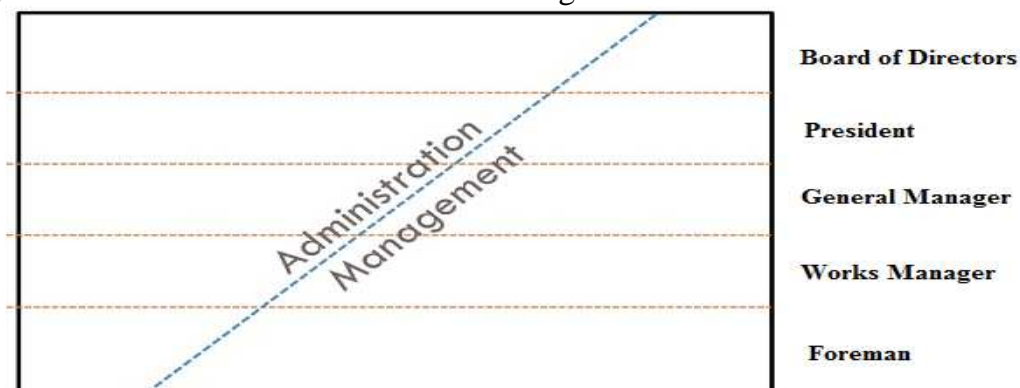
- Management is regarded as comprehensive generic function covering entire process of planning, organizing, directing and controlling.
- Administration is regarded as a branch of management that has two functions- planning and controlling.
- The function of management is divided into two categories the upper level management called as administrative management and lower level management termed as operative management.
- This can also be defined as managing of business enterprises is called management and managing non-business organizations is called administration.
- Administration determines the policies upon which the enterprise is to be conducted while the function of management is to carry out the policies that are laid down by the administrative group.
- Differences between administration and management

| Characteristics	Administration	Management
Main Function	Planning ,Organising and staffing	Leading & Controlling
Status	Act as owner	Act as an agency
Skills	Good Administrative skills	More technical skills
Level in the organization	Top level	Middle/Lower level
Position	MD, Owner, CEO	Manager , Supervisor, foremen etc...
Objective	Makes the polices & objective to be achieved	Implements the plans and policies
Involvement	No direct involvement in production or service	Directly involves in the execution of plans and achieving objectives

ROLES OF MANAGER
- The three important roles played by a manager are
  - Interpersonal Roles
  - Informational Roles
  - Decisional Roles

> **Interpersonal Roles**
- Figure head: The manager has to perform some duties that are casual and informal such as attending the functions, taking for lunch etc.
- Leader: Manager must motivate and encourage his employees. He must try to reconcile their individual needs with the goals of the organization.
- Liaison: Manager must cultivate contacts outside to collect information useful for his organization.

> **Informational Roles**
- Monitor: The manager monitors his environment and collects information through his personal contacts.
- Disseminator: The manager passes some of his information directly to his subordinates.
- Spokesman: The manager communicates the information/goals of organization to his superiors. He also communicates the performance of company to shareholders and the rules and responsibility to his subordinates.

> **Decisional Roles**
- Entrepreneur: For the improvement of the organization the manager continuously looks for new ideas, which may result in the development of new products or service or finding a change in work environment.
- Disturbance Handler: manager works as a problem solver. He finds solutions of various un-anticipated problems both within and outside the organization.
- Resource Allocator: The manager must divide work and delegate authority among his subordinates. He must decide who will get what.
- Negotiator: The manager has to spend considerable time in negotiations. Must try to resolve any internal problems like trade agreements, strikes and solve the problems of employees.

LEVELS OF MANAGEMENT

- Almost all managers perform the same functions of management like planning, organizing, directing and controlling there are levels among them.
  - Top management
  - Middle management
  - First line or supervisory or Lower level management
- Top management consists of Chairman. Directors, Company Presidents, Vice- Presidents, CEO's. These are the people who make policies for the company, set goals and targets. They should possess conceptual and design skills.
- Middle management include finance manager, sales manager, marketing manager, personnel manager, department heads etc.
- Lower level managers are supervisors and foremen.
- Skills at different levels of management or managerial skills
  - Conceptual skills: The ability to view of organization and its future, think in abstract, analyze the forces working in a situation, creative and innovative ability and the ability to assess the environment and changes taking place.
  - Human relations skill: Ability to interact effectively with people at all levels. This skill develops the ability to recognize the feelings and sentiments, to judge the possible reactions, to examine his own concepts and values to develop more useful attitudes.
  - Technical skill: The person's knowledge and proficiency in any type of process or technique.

Fig. 1. Skills Used At Different Management Levels
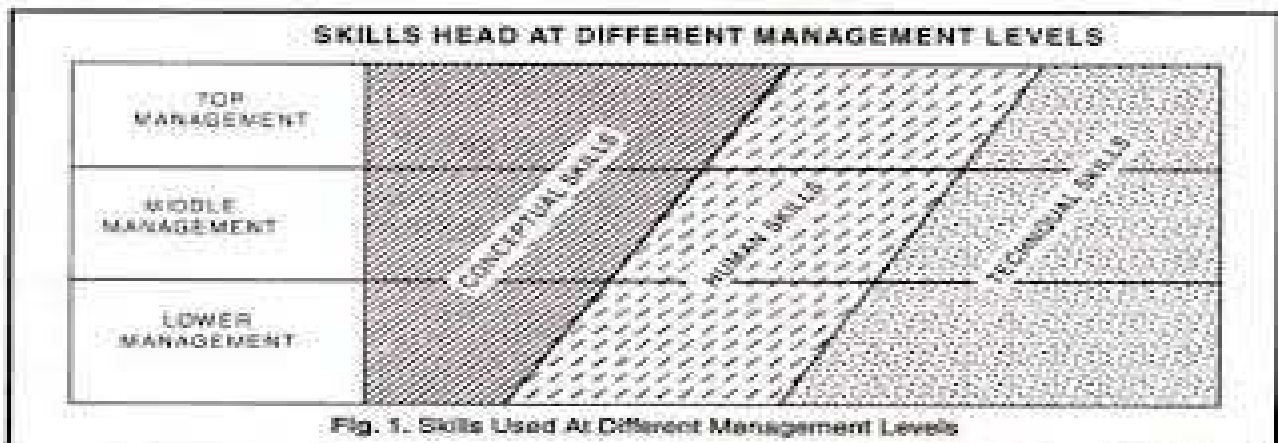
FUNCTIONS OF MANAGEMENT OR PROCESS OF MANAGEMENT

- The five functions of management are:
  - Planning
  - Organizing
  - Staffing
  - Directing (leading)
  - Controlling
- **Planning:** Determines in advance what should be done. Planning is the function that is referred to as decision making. It involves mission and objectives and action to achieve them.
- This involves the following:
  - Setting short and long term goals for organization.
  - Selecting objectives , strategies and polices for accomplishing the planned goals.
  - Deciding in advance what to do, how to do, who has to do, when to do and where to do.
  - Planning bridges the gap from where we are now to where we want to be in future.
- **Organizing :** Organizing is a part of management that involves in establishing an intentional structure of roles for people to fill in an organization. To organize a business well, it is required

to provide all the useful things for its proper functioning. They are raw materials, tools, capital and personnel. This involves :

- Determination of activities required to achieve goals.
- Grouping these activities into department.
- Assigning groups of activities to manager.
- Forming delegation of authority.
- Making provisions for coordination of activities.

- **Staffing:** This makes the provision for man power to fill different positions. This is done by identifying work-force requirements, recruiting new staff, selecting, placing, promoting, appreciating, planning their career, training the staff to accomplish their tasks effectively and efficiently. This involves:
  - Finding the right person for right job.
  - Selecting the personnel.
  - Placement, training and developing new skills required for present and future jobs.
  - Creating new positions.
  - Apprising the staff and planning their growth and promotions etc.
- **Directing:** Directing involves three sub functions namely communication, leadership and motivation.
- Communication is the process of passing information and understanding from one person to another.
- Leadership is the process by which a manager guides and influences the work of his subordinates.
- Motivation means encouraging the minds of employees of an organization to perform their best.
- **Controlling:** Controlling is measuring and correcting of activities of subordinates to make sure that the work is going on as per the plans. Controlling relates to the measurement of achievement. This involves:
- Establishing standards of performance.
- Measuring performance and comparing with established standards.
- Taking necessary corrective action to meet the set standards.

Management Cycle

PLANNING
- **NATURE OF PLANNING**
- Planning is the most basic function of management. It is "deciding in advance" what to do, how to do, when to do and who has to do it etc.
- It is an intellectual process, which requires a manager to think before acting. It is nothing but thinking in advance. A manager should continuously watch the progress of the plans like a

navigator. Planning involves selection of objectives and goals and determines the ways and means of achieving them.

- Planning bridges the gap from where we are to where we want to be. Planning is vital at all levels of an organization.
- Planning involves four essential qualities:
    - It must contribute to accomplish purpose and objectives.
    - It must be considered as parent exercise in all processes.
    - It must spread through all management functions.
    - It must be efficient in such a manner so as to achieve the designed goals at the least cost.

IMPORTANCE OF PLANNING

- Planning is important because:
    - It overcomes uncertainty and change and minimizes risk.
    - It facilitates effective control.
    - It focuses attention and concentration only on the objectives of enterprise.
    - It makes economic operation and leads to success.
    - It forms the bridge between the present and the future.
- Uncertainty and minimize risk: Planning provides logical facts and procedure to managers for making decisions. This logical decision making based on plans to organization minimizes uncertainty and risk.
- Effective control: Planning sets goals, targets and means to accomplish these goals. These goals and plans become standards or bench marks against which performance can be measured. Thus good plans help effective control on the activity.
- Focuses attention and concentration on the objectives of the enterprise: Planning helps the managers to focus their attention on the goals and activates of organization. This makes entire organization to accomplish the goals.
- Economic operation and leads to success: Planning does not ensure success, but leads to success. If the work is planned in advance, there will be no confusion and things will happen as per plan and can even reduce uncoated expenditure.
- Bridge between the present and the future: There is a vast gap between what we are today and what we want to be in future. A proper and systematic plan forms the bridge between the present and future. Hence planning is important for the success of any organization.

PURPOSE OF PLANNING

- The purpose of planning are:
    - To select from many available alternatives so as to achieve the objectives of the enterprise, economically, effectively and efficiently.
    - To direct all other functions of management.
    - To set up the goals of an enterprise in perspective, within the environment.
    - To help planned goals of an enterprise to break-up into more easily hand able additive-segmented goals.
    - To form the basis for budget.
    - To forecast the future to avoid uncertainty and change.
    - To provide effective control.
    - To search for alternatives and adopt the best way of accomplishing the work.
    - To focus the vision on the objectives and goals.

TYPES OF PLANS

- Based on nature of planning, the planning is classified as strategic planning (Long range planning) and tactical planning (short range planning). The difference between them are:

Forms of Planning	
Strategic Planning	Tactical Planning
It is long term.	It is short term.
Done at top management.	Done at lower levels of management.
It decides the major goals and policies of allocation of resources to achieve these goals.	It decides the detailed use of resources for achieving each goal.
It is generally based on long-term forecasts about technology, political environment etc. and is more uncertain.	It is generally based on the past performance of the organization and is less uncertain.
It is less detailed because it is not involved with the day-to-day operations of the organization.	It is more detailed because it is involved with the day-to-day operations of the organization.

- The hierarchy of organizational plans are:

- Objectives are the broad end of the organization which are achieved by means of strategies. Strategies has two major groups plans – single-use plans and standing plans. Single-use plans, are developed to achieve a specific end; when end is reached the plan is dissolved. The plans are programmes and budgets. Standing plans are designed for situations that recur often.
- **Objectives**
  - Objectives are goals or aims which the management wishes the organization to achieve. These are end points towards which all business activities like organizing, staffing, directing and controlling are directed.
  - The objectives should have "vision" "purpose" and "mission".

- The vision is the dream that an entrepreneur creates and the root for all objectives.
- The purpose of an organization is its primary role defined by the society.
- The mission is the unique aim that sets the organization apart from others.
- Objectives are the specific target to be reached by an organization.
- Characteristics of Objectives:
  - Objectives are multiple in number.
    - These are market standing, innovation, productivity, physical and financial resources, profitability, manager performance and development, worker performance and attitude and public responsibility.
  - Objectives are either tangible or intangible.
  - Objectives have a priority.
  - Objectives are generally arranged in a hierarchy.
  - Objectives sometimes clash with each other.
- Requirements of sound objectives:
  - Objective must be both clear and acceptable.
  - Objectives must support one another.
  - Objectives must be precise and measurable.
  - Objectives should always remain valid.
- Advantages of objectives:
  - Provide a basis for planning
  - They act as motivators
  - They eliminate haphazard action
  - They facilitate coordinated behavior.
  - Function as a basis for managerial control.
  - They facilitate better management.
  - They lessen misunderstanding and conflict.
  - They provide legitimacy to organization's activity.

Strategies
- Strategies is a plan which account the environmental opportunities and threats and the organizational strengths and weaknesses and provides an optimal match between the firm and the environment.
  - Environment Appraisal: An analysis of the relevant environment result in the identification of threats and opportunities. Some of the key factors are:
    - Political and legal factors
    - Economic factors
    - Competitive factors
    - Social and cultural factors
  - Corporate Appraisal: This involves an analysis of the company's strengths and weaknesses.

Standing Plans
- Policies: A policy is general guideline for decision-making. It sets up boundaries around decisions, including those that can be made and shutting out those that cannot.
- Policy is verbal, written or implied overall guide, setting up boundaries that supply the general limits and directions in which managerial action will take place.
- Policy deals with "how to do" the work.
- Advantages of polices
  - Policies ensure uniformity of action and makes action more predictable.
  - Policies speed up decisions at lower levels.

- Policies make it easier for the superior to delegate more and more authority to his subordinates.
- Policies give a practical shape to the objectives.
- Types of policies: They are classified on the basis of sources, functions or organizational level.
- Classification on the basis of sources:
    - On this basis, policies are divided into originated, appealed, implied and externally imposed policies.
- Classification on the basis of organizational level:
    - On the basis of business functions, policies may be classified into production, sales, finance, personnel policies etc.
- Classification on the basis of organizational level:
    - Policies range from major company policies through major departmental policies to minor or derivative policies applicable to the smallest segment of the organization.
- Guidelines for effective policy-making:
    - Policies should be in writing
    - Policies should reflect the objectives
    - Top managers and subordinates must participate in the formation of policies.
    - Policy must strike a reasonable balance between stability and flexibility.
    - Policies in the organization should not pull in different directions.
    - Policies should not be detrimental to the interest of society.
    - Policies must be comprehensive.
    - Policies should be periodically reviewed.
- Procedures: A procedure provides a detailed set of instructions for performing a sequence of actions involved in doing a certain piece of work.
- Procedures are to be followed every time when activity is performed.
- Difference between policy and procedure:

Policy	Procedure
General guidelines of the organization.	General guidelines at the action level.
Top level activity.	Departmental activity.
Policies fulfill the objectives of an organization	Procedures guide the way to implement the policies.
Policies are often made without any study or analysis.	Procedures are always made after through study and analysis of work.

- Methods:
    - A method is a prescribed way in which one step of a procedure is to be performed. Thus method is a part of procedure.
    - Method help in increasing the effectiveness and usefulness of the procedure.
    - A procedure has a number of steps, each step may have number of methods to do it.
- Rules:
    - Rules are detailed and recorded instructions that a specific action must or must not be performed in a given situation.
- Single-use plans
    - Programmes

- ◦ Budgets

STEPS IN PLANNING
- **Establishing goals/objectives**
  - ◦ To determine the enterprise objectives and once the organizations objectives are determined, the section wise or department wise objectives are planned at the lower level.
- **Establishing planning premises**
  - ◦ That is the conditions under which planning activities will be undertaken.

The planning premises can be classified as below:
- · Internal and External premises.
- · Tangible and Intangible premises.
- · Controllable and non-controllable premises.
- **Deciding the planning period**

The factors which influence the choice of a period are:
- ◦ Lead time in development and commercialization of a new product.
- ◦ Time required for recovering capital investment or the pay back period.
- ◦ Length of commitment already made.
- **Identification of alternatives course of action**
  - ◦ A particular objective can be achieved through various actions.
- **Evaluation and selection of course of action**
- **Developing derivative/supportive plans**
- **Measuring and controlling the process**

LIMITATIONS OF PLANNING
- Planning is time consuming Process. It involves significant amount of money energy and risk without any assurance of the fulfillment of organization's objectives.
- Planning sometimes restricts the organization to the most rational and risk free opportunities.
- Scope of planning is said to be limited in the case of organizations with rapidly changing situations.
- Establishment of advance plans tend to make administration inflexible.
- Difficulty of formulating accurate premises.
- Planning may sometimes face people's resistance to it.

DECISION-MAKING
Meaning
- A decision is choice between two or more alternatives.
- Decisions are made by the managers and actions are taken by others.
- Decision- making is commitment to something, a point of view, a principle or course of action.

It implies three things:
- ▪ When manager make decisions they are choosing-they are deciding what to do on certain basis.
- ▪ Managers have alternatives available when they are making a decision. It requires wisdom and experience to select best one.
- ▪ Managers have a purpose in mind when they make decision.

TYPES OF DECISIONS
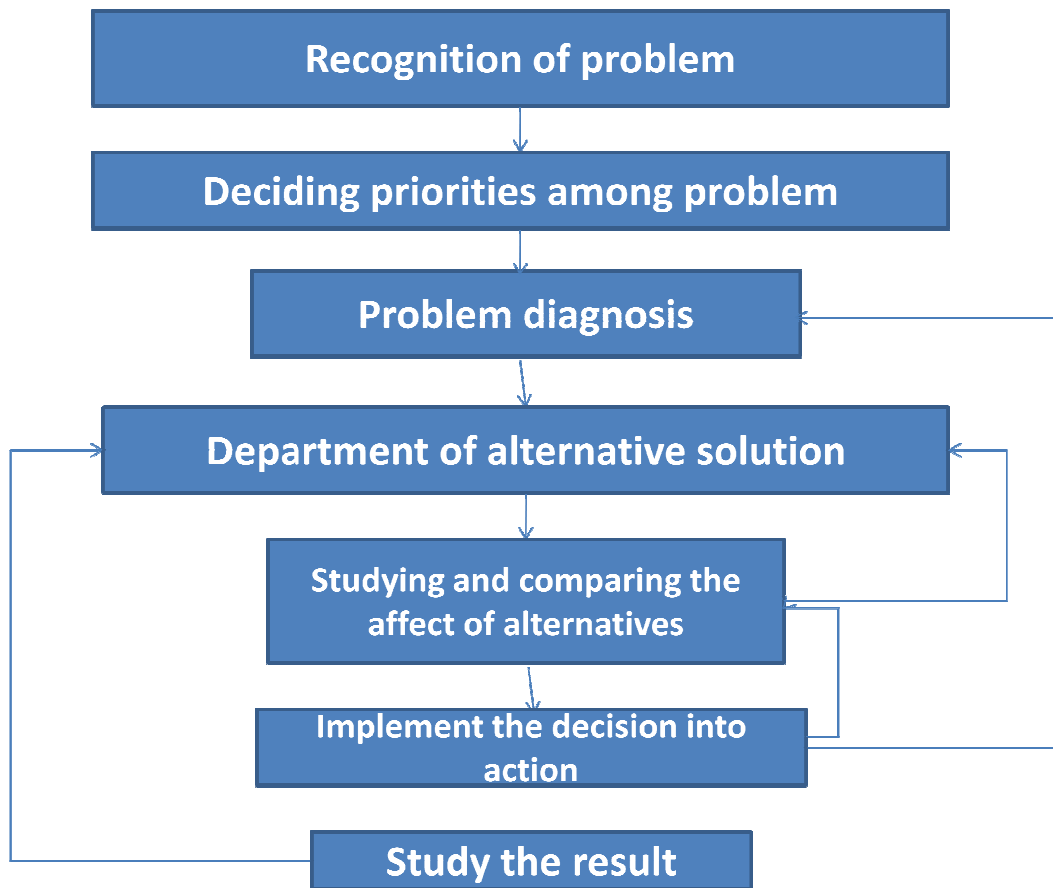- **Decisions are classified as:**
  - ▪ **Programmed and non-programmed decisions:**
    - ▪ Programmed or Pragmatic are those decisions taken within purview of the policies, rules or procedure. These are routine decisions or structured decisions.

- Non-programmed or non Pragmatic decisions are called as strategic decisions. These involve heavy expenditure and are generally taken by top management.
- **Individual and collective decisions**
  - Group decision-making has advantages like increased acceptance, better communication and better coordination.
- **Major and minor decisions**
  - Minor decision are related to day to day periodical occurrences.
    - Example: Purchase of stationary, granting leaves and permissions etc.
  - Major decisions generally done by top management.
    - Example purchase of new machinery, employing new technology, hiring new people etc.
- **Strategic and routine decisions**
  - Strategic decisions are generally done by top management.
  - Example price increase/ discount, Change in product range etc
  - Routine decisions are day to day decisions.
- **Simple and complex decisions**
- **Temporary (Ad-hoc) and permanent decisions.**
  - Some decisions are to be taken depending on situation till the solution is found.
  - Permanent decisions are taken on permanent basis.

Decision Making Process: Steps in Rational Decision Making
- The steps in decision making are:
  - Recognizing the problem.
  - Deciding priorities among the problems.
  - Diagnosing the problem.
  - Developing alternative solutions or courses of action.
  - Measuring and comparing the consequences of alternative solutions.
  - Converting the decision into effective action and follow up of action.

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│          Recognition of problem          │
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│       Deciding priorities among problem  │
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│      │  Implement the decision into│──────────┘
│      │           action            │
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│      ┌───────────────────────────┐
└──────│       Study the result     │
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- Recognition of problem
  - A problem may exist either due to deviation from past experience, deviation from plan, when competitors outperform and when people bring problems to the manager.
- Deciding priorities among problem
  - The manager must identify the problems which he can solve, which he feels that his subordinates can solve and which are to be referred to higher officials.
- Problem diagnosis
  - Managers should follow system approach in diagnosing a problem. A thorough study need to done before arriving at solution.
- Development of alternative solutions
  - Every problem there will be some alternative solutions. Alternatives do exist. Manager has to find it out.
- Studying and comparing the affect of alternatives
  - The alternative solutions are measured and compared as well as quality and acceptability is analyzed.
- Implementation of the decision into action
  - This requires the communications of the decisions to the concerned employees in clear and simple terms.
- Study of results
  - The manager has to carry out the follow up action. If the result is not satisfactory, the manager has to take necessary corrective action or modify his decision. Some of the difficulties faced by manager are: Incomplete information, Non-conductive environment, Opposition by subordinates, improper communication, Wrong timing, Statutory regulations, Government policies, External influences and Lack of support.