Sant Gadge Baba Amravati University, Amravati

B.E. in Electronics & Telecommunication Engineering Syllabus
(Semester- IV)

PROGRAM CORE COURSE –I (PCC-I)
4ET209PC Analog & Digital Communications

Course Requisite:

1. Electronics Devices and Circuits.
2. Introduction to Digital Electronics.

Course Objectives:

1. To gain an understanding of the fundamentals of various AM modulation techniques and their significance in communication systems.
2. To explore FM modulation and the design of FM transmitters.
3. To examine the characteristics of radio receivers and the different detection techniques used for signal reception.
4. To analyse the effects of noise and random processes in communication systems.
5. To understand and apply various pulse modulation techniques.
6. To introduce the concepts of digital communication and different digital modulation techniques.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Apply various Amplitude Modulation (AM) techniques, their mathematical principles, and practical applications in communication systems.
2. Illustrate the knowledge of Frequency Modulation (FM) and design FM transmitters for communication systems.
3. Analyse the characteristics of radio receivers and evaluate detection techniques for AM and FM signals.
4. Assess the impact of noise and random processes on communication systems and their effect on signal integrity and performance.
5. Apply pulse modulation techniques (PAM, PWM, PPM) in digital communication systems.
6. Illustrate the digital communication concepts and apply digital modulation techniques (PSK, FSK, QAM) in real-world systems.

Unit No.	Contents	No. of lectures
1	**AM Transmitters:** Modulation, need of modulation, AM Modulation with mathematical expression and numerical, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, DSBFC Transmitter.	06
2	**FM Transmitters:** FM Modulation, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, pre-emphasis and De-emphasis. Stereo FM Transmitter.	06

3	**Radio Receivers:** Characteristics of Radio Receivers: Sensitivity, Selectivity, and Fidelity, TRF receiver, Superheterodyne Receiver, Detection Techniques for AM (diode detector) and FM (slope detectors, Foster Seeley discriminator) Signals.	**06**
4	**Random Process and Noise:** Classification of Noise, Concept of Random Variables, Ensemble, Mean, Moments, Probability Density Function Sources, Cumulative Distribution Function , Random process: Ensemble Average, Time Average, Stationarity, Ergodic process.	**06**
5	**Pulse Modulation:** Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Introduction to Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.	**06**
6	**Introduction to Digital Communication System:** Functional Blocks of Digital Communication System, Need for Line coding, Properties of Line Coding, Types of Line Coding, Scrambler and Unscrambler, Digital Modulation Techniques: ASK, FSK, PSK, QPSK, DPSK.	**06**

Text Books:

1. Kennedy G. “Electronic Communication System” Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., “Principles of Communication Systems”, Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Shanmugam K.S., “Digital & Analog Communication Systems”, John Wiley & Sons, NewYork, 1996.
4. Lathi B. P., “Modern Digital and Communication Systems”, Holt Rinchart and Winston Inc.,New York, 1993.
5. Simon Haykin, “Digital Communication”, John Wiley and Sons,Pvt. Ltd., Singapore.

References:

1. Proakis J. K., “Digital Communication”, Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, “Digital Communication”, Prentice Hall Publication
3. Collins Dennis, Collins John, “Electronic Communications” PHI.
4. Wayne Tomasi, “Electronic Communication Systems” Pearson Education, (Fifth Edition).
5. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

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PROGRAM CORE COURSE-II (PCC-II)
4ET210PC Analog Circuits

Course Requisite:

1. Electronics Devices and Circuits.

Course Objectives:

1. To understand the basics and internal structure of Op-Amp.
2. To analyse and design linear and non-linear applications of Op-Amp.
3. To understand and design concepts of voltage regulators.
4. To study and synthesize the waveform generators using IC 555 and IC 565.
5. To demonstrate applications of Op-Amp in temperature monitoring.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Comprehend the knowledge of basic concepts and parameters of Op-Amp-741.
2. Use of Op-Amp for implementation of linear applications.
3. Use of Op-Amp for implementation of non-linear applications.
4. Explore various types of Filters
5. Analysis of various analog circuits using Voltage regulator IC723.
6. Comprehend the knowledge of Timers, PLL and its applications.

Unit No.	Contents	No. of lectures
1	**Operational amplifier** Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, frequency response, study of ICuA741, Op-Amp parameters.	**06**
2	**Linear applications of Op-Amp** Theory & Design of Inverting and non-inverting amplifiers, scaling, summing, differential amplifier, integrator and differentiator, Basic principle of oscillators, Types of sinusoidal RC oscillators, Design of RC- phase shift and Wein bridge oscillator using IC 741.	**06**
3	**Non Linear Applications of Op-Amp** Theory & Design of Op-amp IC 741 based comparator, zero-crossing detector, window detectors, Schmitt trigger, Astable multivibrator as square and triangular wave generator, Monostable multivibrator, Bistable multivibrator.	**06**

4	**Active filters** Design of Butterworth first and second order low pass, high pass, Band pass, Band reject, all pass filter, design of notch filter, Design of instrumentation amplifier, bridge amplifier, temperature Controller/indicator using RTD.	**06**
5	**Voltage regulators** Design of fixed and variable Voltage regulators using IC 723 and LM 317, Design of fixed Voltage regulators using 78XX and 79XX ICs	**06**
6	**Timer IC 555 and PLL IC 565** Introduction to IC 555, IC 555 based design of Astable, Monostable multivibrator, **PLL:** Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC LM 565 and its application.	**06**

Text Books:

1. OP-AMP and Linear Integrated Circuits, R.A. Gayakwad Pearson Education Publications.
2. Linear Integrated Circuits, D. Roy Choudhury, New Age International Publications.
3. Integrated Circuits, K R Botkar, Khanna Publications.

Reference Books:

1. OPAMPS, Design, Application, and Troubleshooting, DavidL.Terrell, Butterworth-Heinemann, Elsevier.
2. Analysis and Design of Analog Integrated Circuits, Gray and Meyer, Wiley Intl. Publication.
3. Electronic Circuit Design, S.N. Talbar, Dr. T.R. Sontakke, Sadhu Sudha Prakashan.

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PROGRAM CORE COURSE-III (PCC-III)
4ET211PC Network Theory

Course Requisite:

1. Basic Electrical Engineering
2. Engineering Mathematics

Course Objectives:

1. Understand fundamental concepts of Node and Mesh analysis for linear circuits.
2. Apply network theorems to simplify and analyze electrical circuits.
3. Analyze and apply graph theory and network topology in network analysis.
4. To apply the Laplace Transform Technique for the analysis of linear circuits.
5. Understand network functions and create time-domain behavior analysis from pole-zero plots.
6. Apply and analyze two-port network parameters to solve network problems.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Analyze electrical circuits using Mesh and Node analysis.
2. Apply a suitable Network Theorem to analyze electrical circuits.
3. Transform and analyze the network using graph theory.
4. Implement the concept of Laplace Transform for electrical circuit analysis.
5. Evaluate the time domain behavior of the network function.
6. Apply Two-Port network parameters for electrical network analysis.

Unit No.	Contents	No. of lectures
1	**Mesh and Node Analysis:** Circuit components, Sources of electrical energy, Kirchoff's laws, Node and Mesh analysis, Matrix approach of the network containing voltage and current sources for AC only.	4
2	**Network Theorems:** Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum power transfer theorem applied to DC circuits.	4
3	**Network Topology:** Graph of a network, Trees, cotrees, and loops, Incidence matrix, Tie set and Cut set of a network, Analysis of a network using Tie set and Cut set matrix, Duality.	4
4	**Application of Laplace Transform:** Initial and Final value theorems, analysis of RL, RC and RLC networks with and without initial conditions.	4

5	**Network Functions:** Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function and transfer function, Time domain behavior from pole-zero plot (By partial fraction method)	4
6	**Two Port Networks:** Open circuit impedance parameters, short circuit admittance parameters, Transmission parameters, Hybrid parameters, Conditions for reciprocity and symmetry of a two-port network.	4

Text Books:

1. Ravish R. Singh, “Network Analysis and Synthesis”, McGraw Hill Publication
2. D. Roy Choudhary, "Networks and Systems", New Age International.

Reference Books:

1. Sudhakar A., Shyammohan S. P. “Circuits and Network”, Tata McGraw-Hill, New Delhi, 1994.
2. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill, New Delhi.
3. Abhijit Chakrabarti, “Circuit theory, Analysis and Synthesis”, Dhanpat Rai and Co. Pub.
4. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 3rd Edition.

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PROGRAM CORE COURSE– I (PCC-I)

4ET212PC Analog & Digital Communications Lab

Course Requisite:

1. Analog & Digital Communication.

Course Objectives:

1. Understand the Analog Modulation and demodulation techniques.
2. Understand the Digital Modulation and demodulation techniques.
3. Understand the multiplexing and Demultiplexing Techniques.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the Analog Modulation and demodulation techniques.
2. Apply the Digital Modulation and demodulation techniques.
3. Illustrate the multiplexing and Demultiplexing Techniques.

Expt. No	Experiment
1	To study the function of Amplitude Modulation & Demodulation (under modulation, perfect modulation & over modulation) and also to calculate the modulation index.
2	To study the process of frequency modulation and demodulation and calculate the depth of modulation by varying the modulating voltage.
3	To generate SSB using phase method and detection of SSB signal using Synchronous detector.
4	To study the frequency division multiplexing and Demultiplexing Techniques
5	To study the Pulse amplitude modulation & demodulation Techniques. To study the effect of amplitude and frequency variation of modulating signal. On PAM.
6	To study the Pulse Width Modulation (PWM) and Demodulation. To study the effect of Amplitude and Frequency of Modulating Signal on PWM output.
7	To study the generation Pulse Position Modulation (PPM) and Demodulation. To study the effect of Amplitude and the frequency of modulating signal on its output and observe the wave forms.
8	To convert an analog signal into a pulse digital signal using PCM system and to convert the digital signal into analog signal using PCM demodulation system.
9	Time Division Multiplexing And Demultiplexing
10	Differential Pulse Code Modulation.
11	Delta Modulation & Demodulation.
12	Ask Modulation And Demodulation.
13	Frequency Shift Keying.
14	Differential Phase Shift Keying.

* Minimum 08 experiments should be conducted out of above enlisted (4 on Analog + 4 Digital Communication).

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PROGRAM CORE COURSE– II (PCC-II)

4ET213PC Analog Circuits Lab

Course Requisite:

1. Electronics Devices and Circuits.
2. Analog Circuits.

Course Objectives:

1. To verify operation of various wave shaping circuits.
2. To demonstrate linear and non-linear applications of Op-Amp.
3. To analyze multivibrator circuits using BJT and Op-Amp.
4. To understand functions and characteristics of PLL.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Implement wave shaping circuits using passive components, diode and BJT and perform their analysis.
2. Demonstrate linear and non-linear applications of Op-Amp.
3. Implement PLL in certain applications.

Expt. No	Experiment
1	To verify Op-Amp IC 741 as an inverting and non- inverting amplifier with a specific gain value
2	Design of summing amplifier using IC 741.
3	To demonstrate integrator and differentiator circuit using Op-Amp IC 741
4	To verify RC- phase shift oscillator using Op-Amp IC 741.
5	To verify Op-Amp IC 741 as a Schmitt trigger and calculate the hysteresis voltage.
6	To verify operation of a stable multivibrator using Op-Amp IC 74
7	To plot frequency response of first order Butterworth LPF for a specific pass-band gain and cut-off frequency.
8	To verify characteristics of PLL.
9	Application of PLL as AM detector/FM detector/frequency translator (Any one application)
10	Design transistorized series voltage regulator
11	Design a low voltage variable regulator to 7 V using IC 723
12	Design and setup a Wien-bridge oscillator
13	Design the square and triangular wave generator using IC 741.
14	Design a Butterworth high pass filter with specifications

* Minimum 08 experiments should be conducted out of above enlisted.

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MULTIDISCIPLINARY MINOR –II (MDM- II)
4ET214MD Digital IC's & Applications

Course Requisite:

1. Fundamentals of Digital Electronics

Course Objectives:

1. The systematic analysis and design of basic digital integrated circuits in CMOS technology.
2. To analysis and design of combinational circuits.
3. To the analysis and design of sequential circuits.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Understand digital logic families and their characteristics.
2. Identify, analyse and design combinational circuits.
3. Identify, analyse and design sequential circuits

Unit No.	Contents	No. of lectures
1	**CMOS Logic:** CMOS LOGIC: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.	08
2	**Combinational Circuits Using TTL 74XX ICS:** Combinational Circuits Using TTL 74XX ICS: Study of logic gates using 74XX ICs, Four-bit parallel adder (IC 7483), Comparator (IC 7485), Decoder (IC74138, IC 74154), BCD-to-7- segment decoder (IC 7447), Encoder (IC 74147), Multiplexer (IC 74151), Demultiplexer (IC74154).	08
3	**Sequential Circuits Using TTL 74XX ICS:** Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), 4- bit asynchronous binary counter (IC 7493).	08

Text Books:

1. M. Morris Mano and M.D.Ciletti, "Digital Design", Pearson Education.
2. R P Jain, "Modern Digital Electronics", TMH.

Reference Books:

1. Wakerly, "Digital Design: Principles and Practices", 3rdedition, Pearson Education, 2004.
2. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication
3. Lee S.C, "Digital Circuits and Logic Design", PHI.
4. Richard S. Sandige, "Modern Digital Design", McGraw-Hill Series in Electrical Engineering.

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Vocational Skill Enhancement Course-III (VSEC-III)
4ET215VS Object Oriented Programming

Course Requisite:

1. Computer Programming.

Course Objectives:

1. To learn object-oriented concepts and build simple applications using C++ and Java.
2. To understand the basic concepts and techniques which form the object-oriented programming paradigm.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Justify the basic concepts of object-oriented programming such as data types, functions, classes, objects, constructors, inheritance, overloading etc.
2. Design, implement, test, and debug simple programs in C++.
3. Describe how the class mechanism supports encapsulation and information hiding.
4. To know the concept of operator overloading
5. Understand inheritance in C++
6. Design and test the implementation of Java programming concepts.

Unit No.	Contents	No. of lectures
1	Principles of object-oriented Programming: OOP'S paradigm, basic concept of OOP'S, benefits of OOP'S, Four pillars of OOP, structure of C++ programming, basic data types.	02
2	User defined data type, derived data type, Abstract data types in C++, operators and control statement, Functions in C++: Functions, Function over loading, Friend Functions and virtual functions.	02
3	Classes and objects in C++: Types of classes and its use, concept of object and its implementation, constructor and destructors.	02
4	Operator and their definition, overloading unary and binary operator, rules for overloading operators, overloading binary operators using friends and string manipulation.	02
5	Inheritance in C++: Extending classes: Multilevel Inheritance, Multiple inheritances, Hierarchical inheritance, Hybrid inheritance, Virtual base classes and Abstract classes.	02
6	Introduction to Java programming, JVM, Basics of classes, objects, creating objects, and methods in Java.	02

Text Books:

1. E Balagurusamy, "Object Oriented Programming Using C++ and JAVA", Tata McGraw-Hill.
2. E Balagurusamy, "Object Oriented Programming Using C++" ,Tata McGraw-Hill.

Reference Books :

1. Bjarne Stroustrup, "C++ Programming Language", Pearson Education.
2. H. M. Dietel and P. J. Dietel, "Java How to Program" Pearson Education/PHI, Sixth Edition.
3. Robert Lafore, "Object-Oriented Programming in C++ ", Pearson Education India, (4th Edition).
4. Herbert Schildt , "Java : The Complete Reference" Tata McGraw-Hill (7th Edition).
5. Yeshwant Kanetkar "Let us C++", BPB Publications.
6. Dr. N.B. Vekateswarlu, Dr. E.V. Prasad, "Learn Object Oriented Programming Using Java: An UML Based", S. Chand Publication.

Laboratory on Object Oriented Programming

Expt. No	Experiment
01	Use of cin and cout - Write a C++ program to swap two variables a) Using third variable b) Without using third variable.
02	Inline Function- Write a program in C++ to find result of different arithmetic operations on given input using inline function.
03	Function Overloading- Write a C++ program to find volume of different shapes using function overloading.
04	Class and Object- Develop programs to implement the concepts of classes and object, accessing members: e.g. a. Design an EMPLOYEE class to contain Data members: Employee_Number, Employee_Name, Basic_Salary, All_Allowances, IT, Net_Salary. Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members.
05	Friend Function- Write a program in C++ to find average of two numbers using Friend Function. The two numbers are entered through objects of two different classes.
06	Constructor- Write a program in C++ to implement parameterized constructor /copy constructor.
07	Unary Operator Overloading- Write a C++ program to overload unary operator for inverting the value of data variable using member function.
08	Binary Operator Overloading- Write a C++ program to add two complex numbers by overloading binary operator.
09	Multilevel Inheritance- Write a program in C++ to demonstrate multilevel inheritance.
10	Hybrid/Hierarchial Inheritance- Write a program in C++ to demonstrate hybrid/hierarchial inheritance.
11	Virtual Function- Write a program in C++ to demonstrate the use of virtual function.

Minimum 08 experiments should be conducted out of above enlisted.

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OPEN ELECTIVE- II (OE-II)

4ET216OE Optical Fiber Communication

Course Requisite:

1. Engineering Physics.
2. Electromagnetic Waves.

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diode
4. To learn the fiber optical network components, variety of networking aspects, operational principles WDM.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Understand the principles fiber-optic communication, the components and Losses and dispersion in fiber.
2. Understand the operation of lasers, LEDs and detectors.
3. Analyze system performance of optical communication systems in networks.

Unit No.	Contains	No. of Lecturers
1	**Optical Fiber Communication System:** Basic optical laws and definitions, Optical fiber modes and configurations, N.A. **Attenuation:** Units, absorption, scattering losses radioactive losses, core and cladding losses. Step index fibers, Graded index fibers, Single mode fibers, Material dispersion, wave guide dispersion, intermodal dispersion.	08
2	**Optical Sources:** Light Emitting Diodes: Structure & Principles, Laser Diodes: Structure & Principles. **Optical Detectors:** Principles of photodiodes **Optical switches:** Principles of electro-optic-switches.	08
3	**WDM and DWDM systems:** Principles of WDM networks. Block Diagram of fiber optic communication, selection of optical fiber types for short haul, long haul and high speed data links, Repeaters, optical fiber amplifiers	08

Text Book:

1. G. Keiser, "Optical Fibre Communication", McGraw Hill International.

Reference:

1. Seniors J. M., "Optical Fibre Communication and Applications", Prentice Hall of India Pvt. Ltd., New Delhi.

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OPEN ELECTIVE- II (OE-II)

4ET216OE Satellite Communication

Course Requisite:

1. Engineering Physics
2. Electromagnetic Waves

Course Objectives:

1. To understand the frequency bands used in satellite communication
2. To know the basics of orbital mechanism, the types of satellite orbits and orbital aspects of Satellite communication.
3. To understand the various typical phenomenon in satellite communication.
4. To understand different satellite channel parameters.
5. To understand the working of different satellite subsystems
6. To understand the various services of satellite.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Visualize the architecture of satellite systems as means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite
3. Learn advanced techniques and regulatory aspects of satellite communication and Understand role of satellite in various applications like VSAT and GPS

Unit No.	Contents	No. of lectures
1	**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication, satellite types – LEO, MEO, GEO, HEO. **Orbital Mechanics:** Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity, look angle determination of a satellite	08
2	**Satellite Channels:** Atmospheric losses, Receiver noise, Carrier to Noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis. **Satellite sub-systems:** Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS).	08

3	**Very Small Aperture Satellite (VSAT):** Overview of VSAT system, Network architecture, Access control protocols, Signal format, Modulation coding and interference issues, VSAT antennas, Transmitter and Receiver, Link analysis for VSAT network. **Satellite Navigation and Global Positioning System (GPS):** Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS.	**08**

Text Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E.Allnutt: Satellite Communications: Wiley India. 2nd Edition, 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill,2009

Reference:

1. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

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4ET217EM Engineering Economics

Course Objectives:

1. To familiarize the basic concepts of Engineering Economics and Production.
2. To learn different types of cash flow and Engineering alternatives.
3. To learn depreciation analysis and Banking system.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Describe the concepts of Engineering Economics and Production.
2. Explain the different types of cash flow and Engineering alternatives.
3. Understand the depreciation analysis and Banking system.

Unit No.	Contents	No. of lectures
1	Definition and Scope of Engineering Economics, Principles of Engineering Economics, Micro-economics Vs Macro-economics, Laws of diminishing utility analysis, derivation of demand curve and law of Demand. **Theory of Production:** Theory, Importance, Isoquants and its properties, Law of variable proportions, Cost of Production and Cost of Curves, the law of supply.	**08**
2	Time value of Money, Techniques for adjusting time value of money, Types and components of cash flow, cash flow diagrams, Uses, significance and limitation of Cash flow statement. Evaluation of Engineering alternatives, Present worth method, Future worth Method, Rate of return method, Project evaluation and Cost benefit analysis.	**08**
3	Depreciation Analysis, Causes of depreciation, Depreciable property, depreciation Methods, Break even analysis, determination of breakeven point, Breakeven point in terms of quantity, sales and as percentage of capacity. Commercial Banking, Functions of Commercial Banks, types of banks, balance sheet of a bank, New developments in banking system.	**08**

Text Book:

1. Engineering Economics and Costing, Second Edition, PHI, 2010 by Sasmita Mishra.

References:

1. Engineering Economic Analysis, Volume 2, By Donald G. Newnan, Ted Eschenbach, Jerome P. Lavelle 2004.
2. Engineering Economics, PHI Learning, By R. Panneerselvam · 2013

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