MTEE204-3 CONTROL SYSTEM DESIGN AND ESTIMATION

Teaching Scheme:

Course code	Course name	Course	Teaching (L-P-T)	Total teaching hours
MTEE204-3	**CONTROL SYSTEM DESIGN AND ESTIMATION**	**Elective-IV**	**3-0-0**	**42**

Evaluation scheme:

Theory	Test	Continuous Assessment	Total	Credits
60	20	20	100	3

Course outcomes:

Upon successful completion of this course the student will be able to:

CO1	Understand controller design
CO2	Design controller using root locus method
CO3	Understand Kalman filters for state estimation
CO4	Design of estimator

Course Contents:

Unit-1. [6]

State space: General state space representation, Converting state transfer function and versa controller design introduction. Design with state feedback.

Unit-2. [7]

Controller design: Pole placement, controllability, different approaches for controller design, Introduction to observer, full order and reduced order observer, observability, different approaches for observability design.

Unit-3. [8]

Design of controller with root locus, design of P, I, D, PI, PD and PID controllers, lead lag controller by root locus method.

Unit-4. [6]

Introduction to random variables mean variance, normal distribution, stochastic estimation,

Unit-5 [7]

Introduction to Kalman Filter, Kalman filter elementary approach, linearized and extended Kalman filter. Unscented Kalman filter, particle filter,

Unit-6 [8]

Model based estimation of states and disturbance. Robust estimation. Use of estimation approach for detection and diagnosis

REFERENCES:

1. Norman Nise, “Control System Engineering, Willy India
2. K. Ogata, Modern control Engineering”, PHI
3. Friedland, “ Control System Design”, Dover Publication
4. Charles K. Chui, Guanrong Chen,” Kalman Filtering: With Real-Time Applications “, Springer Notes
5. Harold Wayne Sorenson,” Kalman Filtering: Theory and Application”, IEEE Press, 1960 .

MTEE 205-2 Sustainable Energy Systems

Teaching Scheme:

Course code	Course name	Course	Teaching (L-P-T)	Total teaching hours
MTEE 205-2	**Sustainable Energy Systems**	**Elective-V**	**3-0-0**	**42**

Evaluation scheme:

Theory	Test	Continuous Assessment	Total	Credits
60	20	20	100	3

Course Objective

1. Analyze energy technologies from a systems perspective.
2. Articulate the technical challenges for each of the renewable sources and
3. Discuss economic, technical and sustainability issues involved in the integration of renewable energy systems

Course Contents:

Unit-1. [6]

Introduction and Energy Fundamentals 1. Sustainability challenges and opportunities Physics of energy,

Unit-2. [7]

Energy and Carbon Accounting, Energy accounting EIA convention,. Energy accounting LCA convention . Energy growth analysis and carbon accounting.

Unit-3. [6]

Energy Supply . Fossil energy resources,. Electricity from fossil resources. Electricity from nuclear fuels and other generating systems . Electricity: Power Plant Economics and Regulation.

Unit-4. [6]

Energy Demand Industrial and Commercial Sectors Residential Sector , Transportation Sector

Unit-5 [9]

Renewable Energy Technologies and Policy: . Introduction renewable energy technologies and policy . Wind energy, Hydropower. Solar energy, Biomass: electricity , Biomass: transport fuels.

Unit-6 Other Emerging Sustainable Energy Technologies and Policy: [9]

EVs, HEVs, PHEVs, FCVs Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Plug in Hybrid Electric Vehicles (PHEV) or Fuel Cell Vehicles (FCV) , Building technologies and policy Storage technologies: electricity storage and carbon storage.

REFERENCES:

1. Vanek, F.M., and L.D. Albright. 2008. Energy Systems Engineering: Evaluation and Implementation. New York: McGraw Hill.
2. CRC handbook of energy efficiency / edited by Frank Kreith, Ronald E. West. Boca Raton, Fla. : CRC Press, 1997.
3. T. Johansson et al.. Renewable energy: power for a sustainable future / Oxford: Oxford University Press in association with the Open University, 1996
4. Charles Kutscher, Jana Milford, Frank Kreith Principles of Sustainable Energy Systems, Third Edition CRC press

MTEE 205- 4 Energy Storage Systems.

Teaching Scheme:

Course code	Course name	Course	Teaching (L-P-T)	Total teaching hours
MTEE 205-4	**Energy Storage Systems.**	**Elective-V**	**3-0-0**	**42**

Evaluation scheme:

Theory	Test	Continuous Assessment	Total	Credits

Course Content:

Unit-1. An Introduction to Modern Power Systems: [6]

The Smart Grid Architecture Model, Structure of the Power System , Fundamentals of Power System Analysis , Energy Management Systems, Computational Techniques ,Optimization Methods and Optimal Power Flow, Security-Constrained Optimal Power Flow, Microgrids, Regulation of the Electricity System and the Electrical Markets,

Unit-2 Review of Generating Systems Based on Renewable Power. [6]

Renewable Power Systems, Wind Power Systems, Solar Photovoltaic Power Systems, Renewable Power Generation Technologies, Photovoltaic Power Plants , Grid Code Requirements.

Unit-3. Energy Storage Technologies [8]

Pumped Hydroelectric Storage (PHS) , Compressed Air Energy Storage (CAES), Conventional Batteries and Flow Batteries, The Hydrogen-Based Energy Storage System (HESS),The Flywheel Energy Storage System (FESS), Superconducting Magnetic Energy Storage (SMES), The Super capacitor Energy Storage System,. Power Conversion Systems for Electrical Storage.Application: Electric Power Systems, Other The Field of Electromobility , Other Applications II: Buildings , The Battery Management System (BMS)

Unit-4 Cost Models and Economic Analysis [8]

Introduction, Cost Model for Storage Technologies, The Capital Costs, Operating and Maintenance Costs, Replacement Costs,, End-of-Life Costs, The Synthesis of a Cost Model, An Example of an Application on the Collection of Data for Evaluation of the Cost Model and Analysis .

Unit-5 Modeling, Control, and Simulation [7]

Modeling of Storage Technologies: A General Approach Orientated to Simulation Objectives. The Modeling and Control of the Grid-Side Converter. Modeling and Control of Storage-Side Converters and Storage Containers, Super capacitors and DC–DC Converters, Secondary Batteries and DC–DC Converters, Flywheels and AC–DC Converters, An Example of an Application: Discharging Storage Installations Following Various Control Rules: Discharge (Charge) Modes for Super capacitors, Discharge (Charge) Modes for Batteries, Discharge (Charge) Modes for Flywheels.

Unit-6. Applications of Energy Storage Installations in the Power System: [9]

Short-Term Applications

Fluctuation Suppression, Low-Voltage Ride-Through (LVRT),Voltage Control Support, Oscillation Damping. Primary Frequency Control, Flywheels for Wind Power Smoothing, ptimal Operation of the Flywheel for Wind Power Smoothing.

Mid- and Long-Term Applications

Description of Mid- and Long-Term Applications, Load Following, Peak Shaving, 8.2.3 Transmission Curtailment, Time Shifting, Unit Commitment, Seasonal Storage, Sizing of Batteries for Load Following in an Isolated Power System with PV Generation, Bank Considering PV Generation ,The Selection of Power Inverters.

Reference:

1. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt ,"Energy storage in power systems", John Wiley & Sons ,
2. Pio Lombardi, Przemyslaw Komarnicki, and Zbigniew Antoni Styczynski "Electric Energy Storage Systems: Flexibility Options for Smart Grids" Springer
3. Yves Brunet, Energy Storage", John Wiley & Sons

MTEE 205-6 FINANCE MANAGEMENT

Teaching Scheme:

Course code	Course name	Course	Teaching (L-P-T)	Total teaching hours
MTEE 205-6	**FINANCE MANAGEMENT**	**Elective-V**	**3-0-0**	**42**

Evaluation scheme:

Theory	Test	Continuous Assessment	Total	Credits
60	20	20	100	3

Course outcomes:

Upon successful completion of this course the student will be able to:

CO1	Apply selection criteria and select an appropriate project from different options
CO2	Write work break down structure for a project and develop a schedule based on it.
CO3	Identify opportunities and threats to the project and decide an approach to deal with then strategically.
CO4	Use Earned value technique and determine & predict status of the project.
CO5	Capture lessons learned during project phases and document them for future reference

Course Contents:

Unit-I Overview of Indian Financial System **[8]**

Characteristics, Components and Functions of Financial System. **Financial Instruments:** Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills.

Financial Markets: Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market.

Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-MerchantBanks and Stock Exchanges

Unit-II Concepts of Returns and Risks **[8]**

Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio.

Time Value of Money: Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.

Unit-III Overview of Corporate Finance **[8]**

Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision.

Financial Ratio Analysis: Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.

Unit-IV Capital Budgeting **[8]**

Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR).

Unit-V Working Capital Management **[10]**

Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity‘s Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.

REFERENCES:

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
4. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.