



DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH

डॉ० ए०पी०जे० अब्दुल कलाम प्राविधिक विश्वविद्यालय, उत्तर प्रदेश

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पत्रांक : ए०के०टी०यू० / डीन०यू०जी० / 2021 / 520

दिनांक: 17 अगस्त, 2021

सेवा में,

निदेशक / प्राचार्य

डा० ए०पी०जे० अब्दुल कलाम प्राविधिक विश्वविद्यालय उत्तर प्रदेश
से सम्बद्ध समस्त संस्थाएं।

विषय: विश्वविद्यालय में वर्ष 2018-19 से संचालित AICTE Model Curriculum में बी०टेक / एम०बी० ए० / एम०सी०ए० / विद्याओं की नवीन पाठ्यचर्या अन्तिम वर्ष सत्र 2021-22 के सम्बन्ध में।

महोदय,

उपर्युक्त विषय के संबंध में अवगत कराना है कि विश्वविद्यालय में वर्ष 2018-19 से संचालित AICTE Model Curriculum में विभिन्न विद्याओं की चतुर्थ वर्ष में की निम्न पाठ्यक्रमों की नवीन पाठ्यचर्या को सत्र 2021-22 से प्रोविजनल रूप से बेवसाइड पर प्रदर्शित किया जा रहा है:-

क्रमांक	पाठ्यक्रम का नाम	एप्लाइड ब्रांच
1	इलेक्ट्रिकल इंजी०	इलेक्ट्रिकल एण्ड इलेक्ट्रानिक्स इंजी०
2	एम०बी०ए०	एम०बी०ए० पाठ्यक्रम की Evaluation Scheme

उपरोक्त के संबंध में अनुरोध है कि उक्त पाठ्यक्रमों की पाठ्यचर्या में सुझाव यदि कोई हो ईमेल dean.ugse@aktu.ac.in पर एक सप्ताह के अन्दर उपलब्ध कराने का कष्ट करें।

भवदीय

संलग्नक: यथोक्त

(प्रो० सुबोध वैरिया)

डीन० यू०जी०एस०ई०

पृष्ठांकन सं० एवं दिनांक: उपरोक्त।

प्रतिलिपि- निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. कुलसचिव, ए०के०टी०यू० लखनऊ।
2. ई०आर०पी० इंचार्ज, ए०के०टी०यू०, लखनऊ को इस आशय से प्रेषित की शैक्षिक सत्र 2021-22 की पाठ्यचर्या को प्रदर्शित कराने का कष्ट करे।
3. स्टाफ आफिसर, मा० कुलपति कार्यालय, ए०के०टी०यू० लखनऊ।

(प्रो० सुबोध वैरिया)

डीन० यू०जी०एस०ई०

**DR. A.P.J. ABDUL KALAM TECHNICAL
UNIVERSITY, UTTAR PRADESH, LUCKNOW**



**EVALUATION SCHEME & SYLLABUS
FOR**

B. TECH. IV YEAR

ELECTRICAL ENGINEERING

ON

AICTE MODEL CURRICULUM)

[Effective from the Session: 2021-22]

ELECTRICAL ENGINEERING

ELECTRICAL ENGINEERING

EVALUATION SCHEME - B.TECH 4th YEAR

SEMESTER- VII													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	T A	Total	PS	TE	PE		
1	KHU701 /KHU702	HSMC -1 #/ HSMC-2 #	3	0	0	30	20	50		100		150	3
2	KEE07X	Departmental Elective-IV	3	0	0	30	20	50		100		150	3
3	KEE08X	Departmental Elective-V	3	0	0	30	20	50		100		150	3
4	KOE07X	Open Elective-II	3	0	0	30	20	50		100		150	3
5	KEE751	Industrial Automation & PLC Lab	0	0	2				25		25	50	1
6	KEE752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KEE753	Project	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		TOTAL	12	0	12							850	18

*The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

<p><u>Department Elective - IV</u> KEE070: Advanced Micro processors & Micro Controllers KEE071: Energy Conservation and Auditing KEE072: HVDC & AC Transmission KEE073: High Voltage Engineering KEE074: Power Quality and FACTS</p>	<p><u>Department Elective - V</u> KEE075: Electric drives KEE076: Power System dynamics and Control KEE077: Power System Protection KEE078: Deregulated Power System KEE079: Utilization of Electrical Energy & Electric Traction</p>
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SEMESTER- VIII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	C T	T A	Total	PS	TE	PE		
1	KHU801/ KHU802	HSMC-2#/HSMC-1#	3	0	0	3 0	2 0	50		100		150	3
2	KOE08X	Open Elective-III	3	0	0	3 0	2 0	50		100		150	3
3	KOE08X	Open Elective-IV	3	0	0	3 0	2 0	50		100		150	3
4	KEE851	Project	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	9	0	18							850	18

ELECTRICAL ENGINEERING

INDUSTRIAL AUTOMATION & PLC LAB [L T P: 0 0 2]

List of Experiments: minimum 10 nos. of experiments to be performed from following sets,

A) Industrial Automation:

1. Study hardware and software platforms for DCS
2. Simulate analog and digital function blocks
3. Study, understand and perform experiments on timers and counters
4. Logic implementation for traffic Control Application
5. Logic implementation for Bottle Filling Application
6. Tune PID controller for heat exchanger using DCS
7. FBD for auto-clavable laboratory fermenter
8. Develop graphical user interface for the fermenter plant

B) PLC

1. Study hardware and software used in PLC
2. Implementation Logic Gates
3. Implementation of DOL Starter
4. Implementation of On-Delay Timer
5. Implementation of Off-Delay Timer
6. Implementation of Up-Down Counter
7. Implementation of PLC Arithmetic Instructions
8. Implementation of PID Controller

Note: - virtual lab links:

For Industrial Automation:

<http://ial-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering>

For PLC:

<http://plc-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering>

DEPARTMENT
ELECTIVE – IV
[L T P: 3 0 0]

ELECTRICAL ENGINEERING

ADVANCED MICRO PROCESSORS & MICRO CONTROLLERS

Pre-requisites of course: Digital Electronics

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Explain the Architecture of 8086, memory segmentation and its mode.	K2
CO2	Describe the Instruction set of 8086, and develop various type of programs.	K2
CO3	Illustrate memory interfacing diagram , and explain various type of interfacing	k3
CO4	Illustrate various modes of processor.	K3
CO5	Explain the architecture of MSP430 and Develop GPIO controlling Program.	K2

UNIT1

8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, maximum mode and minimum mode signal descriptions.

UNIT2

Instruction formats, addressing modes, instruction set of 8086, simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.

UNIT3

Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing programmable peripheral interface 8255, Timer IC 8253 and Interrupt controller 8259 to 8086.

UNIT4

Mode of operation of higher order processors: Real mode and protected mode, Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi-Tasking & TSS, Block Diagram of 80286, ARM Processor

UNIT5

MSP430 Microcontroller: block diagram, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, addressing modes of MSP microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.

Text Book:

1. Ray, A.K. &Burchandi, K.m., “Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing” Tata Mc.Graw Hill.
2. Renu Sing &B.P.Singh, “Advanced Microprocessors and Microcontrollers” New Age

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3. International. 3. Krishna Kant, "Microprocessors and Microcontrollers" PHI Learning. 4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.
4. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

ELECTRICAL ENGINEERING

ENERGY CONSERVATION AND AUDITING

Pre-requisites of course: Basic Electrical Engineering, Power System-I & II

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Identify and assess the energy conservation/saving opportunities in different electric system and understand related legislations.	K1
CO2	Identify and assess the energy saving behavior of utilities through implementation of DSM and EMIS.	K1
CO3	Explain energy audit & management and to prepare energy audit report for different energy conservation instances.	K2
CO4	Illustrate the energy audit for Mechanical Utilities.	K3
CO5	Describe cost-effective measures towards improving energy efficiency and energy conservation by implementation of energy efficient technologies.	K2

UNIT-1: Energy Scenario: Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future.

Energy Conservation Act 2001 and related policies: Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003, Integrated energy policy, National action plan on climate change, ECBC code for Building Construction.

UNIT-2: Demand Side Management (DSM): Concept and Scope of Demand Side Management, Difference between Energy Efficiency and DSM, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application, Customer Acceptance & its implementation issues, National and International Experiences with DSM, UDAY scheme and other government initiatives for DISCOMs.

Energy Monitoring and Targeting: Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques –energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)

ELECTRICAL ENGINEERING

UNIT-3: Energy Audit: Aim of energy Audit, Strategies of Energy Audit, Energy management Team Consideration in implementing energy conservation Programme, Process flow diagram, Energy Audit report format, Benchmarking and Energy Performance, Instruments for energy audit, Economic analysis.

UNIT-4: System Audit of Mechanical Utilities: Pumps, types and application, unit's assessment, improvement option, parallel and series operating pump performance. Energy Saving in Pumps & Pumping Systems. Blowers (Blowers) types & application, its performance assessment, series & parallel operation applications & advantages. Energy Saving in Blowers Compressors, types & applications, specific power consumption, compressed air system & economic of system changes. Energy Saving in Compressors & Compressed Air Systems Cooling towers, its types and performance assessment & limitations, water loss in cooling tower. Case studies related to Energy Audit & Management in Industries

UNIT-5: Energy Efficient Technology: Need for Energy Efficient Devices, Life Cycle Assessment, Comparison between simple pay-back and life cycle cost assessment, Energy Efficient Motors-motor losses and loss reduction techniques, determining and comparing motor efficiencies, motor efficiency testing standards, BIS specification for Energy Efficient Motors, efficiency as a function of load, Energy Efficient Lighting Sources-compact fluorescent lamp, light emitting diode, LED lamp, role of voltage on the efficiency of lighting system, Importance of Automatic power factor controllers, Variable Frequency Drives.

Reference Books:

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
3. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
4. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing
5. Heating and Cooling of Buildings -Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994.

ELECTRICAL ENGINEERING

HVDC & AC TRANSMISSION

Pre-requisites of the course: Power System-I & II

Course Outcome U No.	Statement	Knowledge Level, KL
N I CO1	Describe the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission.	K1
T CO2	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance.	K3
I : CO3	Explain the generation and measurement circuits for impulse, high DC & AC voltages. While considering the design parameters evaluate the effect on the performance of the EHV lines.	K2
N e e d CO4	Classify the DC links and choice of converter configuration to investigate the impact of inductance on operation of converters and identify different control schemes as well as starting and stopping methods of DC links.	K4
o CO5	Describe the converter faults, protections including MTDC types and applications .	K2

UNIT-I: EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission, UHVAC transmission system.

UNIT-II:EHV AC Transmission: Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III: Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.

Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, working principle and characteristics of a 6 pulse converter with two & three valve conduction mode, three valve conduction mode and three and four valve conduction mode, Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

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Text Books:

1. R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern.
2. K. R. Padiyar, "HVDC Power Transmission Systems: Technology and System Reactions" New Age International.
3. J. Arrillaga, "High Voltage Direct Current Transmission" IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4. M. S. Naidu & V. Kamaraju, "High Voltage Engineering" Tata Mc Graw Hill.

Reference Books:

5. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.
6. S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Publisher.
7. "EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute, Palo Alto, California, 1982.

ELECTRICAL ENGINEERING

HIGH VOLTAGE ENGINEERING

Pre-requisites of course: Power System-I and II

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Describe conduction and breakdown phenomenon in gases, liquid dielectrics and solid dielectrics.	K1
CO2	Explain generation of high voltages and currents	K2
CO3	Explain measurement techniques for high voltages and currents	K2
CO4	Describe overvoltage phenomenon and insulation coordination in electric power systems.	K2
	Describe non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus	K2

UNIT-I: Conduction and Breakdown in Gases:

Gases as Insulating Media, Collision Process, Ionization Processes, Townsend's Current Growth Equation, Current Growth in the Presence of Secondary Processes, Townsend's Criterion for Breakdown, Experimental Determination of Coefficients α and γ , Breakdown in Electronegative Gases, Time Lags for Breakdown, Streamer Theory of Breakdown in Gases, Paschen's Law, Breakdown in Non-Uniform Fields and Corona Discharges.

Conduction and Breakdown in Liquid Dielectrics:

Liquids as Insulators, Pure Liquids and Commercial Liquids, Conduction and Breakdown in Pure Liquids, Conduction and Breakdown in Commercial Liquids.

Breakdown in Solid Dielectrics:

Introduction, Intrinsic Breakdown, Electromechanical Breakdown, Thermal Breakdown.

UNIT-II: Generation of High Voltages and Currents:

Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT –III: Measurement of High Voltages and Currents:

Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

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UNIT-IV: Overvoltage Phenomenon and Insulation Coordination in Electric Power Systems

Natural Causes for Overvoltages - Lightning Phenomenon, Overvoltage due to Switching Surges, System Faults and Other Abnormal, Principles of Insulation Coordination on High Voltage and Extra High Voltage Power Systems.

UNIT-V: Non-Destructive Testing of Materials and Electrical Apparatus

Measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing: Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Books:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, Tata Mc-Graw Hill.
2. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.

Reference Books:

1. E. Kuffel and W. S. Zaengal, "High Voltage Engineering", Pergamon Press.
2. M. P. Chaurasia, "High Voltage Engineering", Khanna Publishers
3. R. S. Jha, "High Voltage Engineering", DhanpatRai & sons
4. M. Khalifa, 'High Voltage Engineering Theory and Practice,' Marcel Dekker.
5. Subir Ray, 'An Introduction to High Voltage Engineering' Prentice Hall of India

ELECTRICAL ENGINEERING

POWER QUALITY AND FACTS

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Classify the power quality issues in electrical distribution network	K2
CO2	Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS.	K1
CO3	Describe the different phenomenon causing electrical transients and devices for over voltage protection.	K2
CO4	Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC.	K2
CO5	Explain the causes of harmonics, its effect on motor ,capacitor, cables and mitigation techniques.	K2

Unit-I: Introduction to Power Quality:

Terms and definitions of transients, Long duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.

Unit-II: Voltage Sag:

Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III: Electrical Transients:

Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV: FACT Systems:

Introduction – Terms & Definition, Fact Controllers, Type of FACT devices i.e. SSC, SVC, TSC, SSSC, TCSC, UPFC Basic relationship for power flow control.

Unit- V: Harmonics:

Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Communication Lines etc., Harmonic Mitigation Techniques.

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Text Books:

1. Roger C Dugan, McGrahan, Santoso&Beaty, “Electrical Power System Quality” McGraw Hill
2. Arindam Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “Power Quality” CRC Press.
4. S. Sivanagaraju& S. Satyanarayana, “Electric Power Transmission and Distribution” Pearson Education
5. Narain G. Hingorani& Laszlo Gyugyi “Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems” Wiley

DEPARTMENT
ELECTIVE – V
[L T P: 3 0 0]

ELECTRICAL ENGINEERING

ELECTRIC DRIVES

Pre-requisites of the course: Power Electronics, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the operation of electric drives and its classification.	K1
CO2	Explain the electric drive stability and selection of motor power rating.	K2
CO3	Illustrate electric braking and its dynamics.	K3
CO4	Describe the types of DC drives and its control.	K2
CO5	Describe the types of AC drives and its control.	K2

UNIT-I: Fundamentals of Electric Drive:

Electric Drives and its parts, advantages of electric drives, Classification of electric drives, Speed-torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification.

UNIT-II: Dynamics of Electric Drive:

Dynamics of motor-load combination, Steady state stability of Electric Drive, Transient stability of electric Drive

Selection of Motor Power rating:

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty., Load equalization.

UNIT-III: Electric Braking:

Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking.

UNIT-IV: Power Electronic Control of DC Drives:

Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.

UNIT-V: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

ELECTRICAL ENGINEERING

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.

Reference Books:

- 1 M.Chilkin, "Electric Drives", Mir Publishers, Moscow.
- 2 Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt. Ltd. Singapore.
- 3 N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd.
- 4 V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

ELECTRICAL ENGINEERING

POWER SYSTEM DYNAMICS AND CONTROL

Pre Requisite- Electrical Machines-II, Power System-I, Power System-II, Control Systems

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Explain the fundamental dynamic behavior and controls of power systems to perform basic stability analysis.	K2
CO2	Describe modeling of Synchronous Machine and per unit quantities-Equivalent circuits.	K2
CO3	Describe modeling of main power system components, such as synchronous machines, excitation systems and calculation of Initial conditions	K2
CO4	Illustrate Small signal analysis, synchronizing and damping torque analysis.	K3
CO5	Explain the concept of Power System Stabilizers, Structure & tuning and dynamic compensator analysis.	K2

UNIT- I: Basic Concepts: Power system stability states of operation and system security, system dynamics, problems system model analysis of steady State stability and transient stability, simplified representation of Excitation control.

UNIT- II: Modeling of Synchronous Machine: Synchronous machine, Park's Transformation-analysis of steady state performance, per unit quantities-Equivalent circuits of synchronous machine determination of parameters of equivalent circuits.

UNIT- III: Excitation System: Excitation system modeling-excitation systems block Diagram – system representation by state equations, Dynamics of a synchronous generator connected to infinite bus, system model Synchronous machine model-stator equations rotor equations, Synchronous machine model with field circuit, one equivalent damper winding on q axis, calculation of Initial conditions.

UNIT- IV: Analysis of Single Machine System: Small signal analysis with block diagram – Representation Characteristic equation and application of Routh Hurwitz criterion, synchronizing and damping torque analysis-small signal model, State equations.

UNIT – V: Application of Power System Stabilizers: Basic concepts in applying PSS, Control signals, Structure and tuning of PSS, Washout circuit , Dynamic compensator analysis of single machine infinite bus system with and without PSS.

TEXT BOOKS:

1. K. R. PADIYAR," Power system dynamics " - B.S. Publications.
2. P.M. Anderson and A. A. Fouad, "Power system control and stability", IEEE Press

REFERENCE:

3. R. Ramanujam, "Power Systems Dynamics"- PHI Publications.

ELECTRICAL ENGINEERING

POWER SYSTEM PROTECTION

Pre-requisites of the course: Power System-I, Power System-II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the relays and different protective schemes.	K1
CO2	Explain Relay types and its application.	K2
CO3	Describe types of faults and protection scheme for major components of power system.	K2
CO4	Describe the circuit breaker operation, testing and types.	K2
CO5	Explain the electronic relay, microprocessor and computer based protection schemes.	K2

Unit-I: Protection Scheme

Need for Protective systems, Evolution of protective relays - Zones of protection - Primary and Back -up Protection - Essential qualities of Protection - Classification of Protective schemes -Automatic reclosing - current transformer for Protection - potential transformer - summation transformer -phase – sequence current - segregating network

Unit-II: Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay. Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III: Protection of Components

Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.) - Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection - Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.

Unit-IV: Circuit Breaking

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings. Testing of Circuit Breaker: Classification, testing station and equipment, testing procedure, direct and indirect testing, selection of circuit breakers. constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF₆, Vacuum and d. c. circuit breakers.

ELECTRICAL ENGINEERING

UNIT V- Modern Trends in Protection

Electronic relays - static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes - software development for protection, security and reliability.

Text Books:

1. S. S. Rao, "Switchgear and Protection", Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.
3. B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Mc. Graw Hill

ELECTRICAL ENGINEERING

DEREGULATED POWER SYSTEM

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the deregulation, unbundling of electric utilities and its benefits.	K1
CO2	Explain the operational planning activities of independent system operator in pool & bilateral markets and describe competitive bidding.	K2
CO3	Explain the open access of transmission line and management of security & congestion in deregulation.	K2
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	K2
CO5	Illustrate the Reliability Analysis of Generation, transmission and distribution and the regulation of the market.	K3

UNIT-I: Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation

UNIT-II: Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding.

UNIT-III: Power wheeling, Transmission open access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation

UNIT-IV: General description of some ancillary services, ancillary services management in various countries, and reactive power management in some deregulated electricity markets.

UNIT-V: RELIABILITY ANALYSIS: Interruption criterion, stochastic components, component models, Calculation methods, Network model: stochastic networks, series and parallel connections, minimum cut sets, reliability cost. Generation, transmission and distribution reliability, Reliability and deregulation: conflict, reliability analysis, effects on the actual reliability, regulation of the market.

Text Books:

1. K. Bhattacharya, MHT Bollen and J.C Doolder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, USA, 2001.
2. Lei Lee Lai, "Power System restructuring and deregulation", John Wiley and Sons, UK. 2001.
3. Fred I Denny and David E. Dismukes, "Power System Operations and Electricity Markets", CRC Press, LLC, 2002.

ELECTRICAL ENGINEERING

UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

Pre-requisites of the course: Basic Electrical Engineering, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the methods of electric heating and their advantages.	K1
CO2	Explain the types of Electric welding and the principle of Electro-deposition, laws of electrolysis and its applications	K2
CO3	Explain the laws of illumination and explain the principle of refrigeration and air-conditioning.	K2
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	K2
CO5	Describe the salient features of traction drive and concept of energy saving using power electronic control of AC and DC drives	K2

Unit-I: Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating and Dielectric heating

Unit-II: Electric Welding: Electric Arc Welding Electric Resistance Welding Electronic welding controls Electrolyte Process: Principles of electro deposition, Laws of electrolysis, and applications of electrolysis

Unit-III: Illumination: Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV: Electric Traction – I: Types of electric traction, Review of existing electric traction systems in India, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V: Electric Traction – II: Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:

1. H. Partab, “Art and Science of Electrical Energy” Dhanpat Rai & Sons.
2. J.B. Gupta, “Utilization of Electric Power and Electric Traction”, Kataria & Sons publishers, Delhi, IX Edition, 2004.

ELECTRICAL ENGINEERING

3. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited Publishers, 3rd Edition, 2010.

Reference Books:

1. H. Partab, "Modern Electric Traction" Dhanpat Rai & Sons.
2. G.K. Dubey, "Fundamentals of Electric Drives" Narosa Publishing House.

**DR. A.P.J. ABDUL KALAM TECHNICAL
UNIVERSITY, UTTAR PRADESH, LUCKNOW**



**EVALUATION SCHEME & SYLLABUS
FOR**

B. TECH. IV YEAR

ELECTRICAL & ELECTRONICS ENGINEERING

ON

AICTE MODEL CURRICULUM)

[Effective from the Session: 2021-22]

ELECTRICAL & ELECTRONICS ENGINEERING

ELECTRICAL & ELECTRONICS ENGINEERING

EVALUATION SCHEME - B.TECH 4th YEAR

SEMESTER- VII													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	T A	Total	PS	TE	PE		
1	KHU701 /KHU702	HSMC -1 #/ HSMC-2 #	3	0	0	30	20	50		100		150	3
2	KEE07X	Departmental Elective-IV	3	0	0	30	20	50		100		150	3
3	KEE07X	Departmental Elective-V	3	0	0	30	20	50		100		150	3
4	KOE07X	Open Elective-II	3	0	0	30	20	50		100		150	3
5	KEN751	Industrial Automation & PLC Lab	0	0	2				25		25	50	1
6	KEN752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KEN753	Project	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		TOTAL	12	0	12							850	18

*The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

<u>Department Elective - IV</u>	<u>Department Elective - V</u>
KEN070: Power System Operation & Control KEE070: Advanced Micro processors & Micro Controllers KEE071: Energy Conservation and Auditing KEE072: HVDC & AC Transmission KEE074: Power Quality and FACT	KEN071: Electric & Hybrid Vehicles KEE075: Electric drives KEE077: Power System Protection KEE078: Deregulated Power System KEE079: Utilization of Electrical Energy & Electric Traction

SEMESTER- VIII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	C T	T A	Total	PS	TE	PE		
1	KHU801/ KHU802	HSMC-2#/HSMC-1#	3	0	0	3	2	50		100		150	3
2	KOE08X	Open Elective-III	3	0	0	3	2	50		100		150	3
3	KOE08X	Open Elective-IV	3	0	0	3	2	50		100		150	3
4	KEE851	Project	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	9	0	18							850	18

ELECTRICAL & ELECTRONICS ENGINEERING

INDUSTRIAL AUTOMATION & PLC LAB [L T P: 0 0 2]

List of Experiments: minimum 10 nos. of experiments to be performed from following sets,

A) Industrial Automation:

1. Study hardware and software platforms for DCS
2. Simulate analog and digital function blocks
3. Study, understand and perform experiments on timers and counters
4. Logic implementation for traffic Control Application
5. Logic implementation for Bottle Filling Application
6. Tune PID controller for heat exchanger using DCS
7. FBD for auto-clavable laboratory fermenter
8. Develop graphical user interface for the fermenter plant

B) PLC

1. Study hardware and software used in PLC
2. Implementation Logic Gates
3. Implementation of DOL Starter
4. Implementation of On-Delay Timer
5. Implementation of Off-Delay Timer
6. Implementation of Up-Down Counter
7. Implementation of PLC Arithmetic Instructions
8. Implementation of PID Controller

Note: - virtual lab links:

For Industrial Automation:

<http://ial-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering>

For PLC:

<http://plc-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering>

DEPARTMENT
ELECTIVE – IV
[L T P: 3 0 0]

ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM OPERATION & CONTROL

Pre-requisites of the course: Power System-I, Power System-II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the significance of Power System Operation and Control.	K1
CO2	Describe Real power-frequency interaction and explicate the concept of designing a power-frequency controller.	K2
CO3	Illustrate Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.	K3
CO4	Determine the necessary variables for an operating state to obtain the economic operation.	K3
CO5	Describe power system security and identification of Linear and non-linear models	K2

UNIT-I: Introduction: Structure of power systems, significance of voltage and frequency control. Power system control center and real time computer control, SCADA and EMS functions, system monitoring- RTU, PMU- concept of synchrophasor, data acquisition and controls. Power scenario in Indian grid, National and Regional load dispatching centers

UNIT-II: Load Frequency Control: Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-III: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers, static and dynamic analysis of AVR

Voltage and Reactive Power control: Concept of voltage control, methods of voltage control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation, concept of voltage stability in power system

UNIT-IV: Economic Operation of Power System- Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints, optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients), penalty factor, incremental transmission loss, Hydrothermal scheduling long and short terms, Concept of optimal power flow, Formulation

Unit – V: Power System Security- Three state model, operating states, state transition, Distribution factors- Generation Shift Distribution Factor, Outage Distribution Factor- Derivation through DC load flow

State Estimation: Detection and identification, Linear and non-linear models.

Text Books:

1. D.P. Kothari & I.J. Nagrath, “Modern Power System Analysis” Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, “Operation and control in Power Systems” B.S. Publications.

ELECTRICAL & ELECTRONICS ENGINEERING

3. Olle. I. Elgerd, "Electric Energy systems theory- An Introduction", Tata Mc Graw Hill publishing Ltd, New Delhi, 2008

4. A. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.

Reference Books:

1. P. Kundur, " Power System Stability and Control Mc Graw Hill.

2. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

ELECTRICAL & ELECTRONICS ENGINEERING

ADVANCED MICRO PROCESSORS & MICRO CONTROLLERS

Pre-requisites of course: Digital Electronics

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Explain the Architecture of 8086, memory segmentation and its mode.	K2
CO2	Describe the Instruction set of 8086, and develop various type of programs.	K2
CO3	Illustrate memory interfacing diagram , and explain various type of interfacing	k3
CO4	Illustrate various modes of processor.	K3
CO5	Explain the architecture of MSP430 and Develop GPIO controlling Program.	K2

UNIT1

8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, maximum mode and minimum mode signal descriptions.

UNIT2

Instruction formats, addressing modes, instruction set of 8086, simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.

UNIT3

Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing programmable peripheral interface 8255, Timer IC 8253 and Interrupt controller 8259 to 8086.

UNIT4

Mode of operation of higher order processors: Real mode and protected mode, Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi-Tasking & TSS, Block Diagram Of 80286, ARM Processor

UNIT5

MSP430 Microcontroller: block diagram, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, addressing modes of MSP microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.

Text Book:

1. Ray, A.K. &Burchandi, K.m., “Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing” Tata Mc.Graw Hill.
2. Renu Sing &B.P.Singh, “Advanced Microprocessors and Microcontrollers” New Age

ELECTRICAL & ELECTRONICS ENGINEERING

3. International. 3. Krishna Kant, "Microprocessors and Microcontrollers" PHI Learning.
4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.
4. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

ELECTRICAL & ELECTRONICS ENGINEERING

ENERGY CONSERVATION AND AUDITING

Pre-requisites of course: Basic Electrical Engineering, Power System-I & II

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Identify and assess the energy conservation/saving opportunities in different electric system and understand related legislations.	K1
CO2	Identify and assess the energy saving behavior of utilities through implementation of DSM and EMIS.	K1
CO3	Explain energy audit & management and to prepare energy audit report for different energy conservation instances.	K2
CO4	Illustrate the energy audit for Mechanical Utilities.	K3
CO5	Describe cost-effective measures towards improving energy efficiency and energy conservation by implementation of energy efficient technologies.	K2

UNIT-1: Energy Scenario: Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future.

Energy Conservation Act 2001 and related policies: Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003, Integrated energy policy, National action plan on climate change, ECBC code for Building Construction.

UNIT-2: Demand Side Management (DSM): Concept and Scope of Demand Side Management, Difference between Energy Efficiency and DSM, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application, Customer Acceptance & its implementation issues, National and International Experiences with DSM, UDAY scheme and other government initiatives for DISCOMs.

Energy Monitoring and Targeting: Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques –energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)

ELECTRICAL & ELECTRONICS ENGINEERING

UNIT-3: Energy Audit: Aim of energy Audit, Strategies of Energy Audit, Energy management Team Consideration in implementing energy conservation Programme, Process flow diagram, Energy Audit report format, Benchmarking and Energy Performance, Instruments for energy audit, Economic analysis.

UNIT-4: System Audit of Mechanical Utilities: Pumps, types and application, unit's assessment, improvement option, parallel and series operating pump performance. Energy Saving in Pumps & Pumping Systems. Blowers (Blowers) types & application, its performance assessment, series & parallel operation applications & advantages. Energy Saving in Blowers Compressors, types & applications, specific power consumption, compressed air system & economic of system changes. Energy Saving in Compressors & Compressed Air Systems Cooling towers, its types and performance assessment & limitations, water loss in cooling tower. Case studies related to Energy Audit & Management in Industries

UNIT-5: Energy Efficient Technology: Need for Energy Efficient Devices, Life Cycle Assessment, Comparison between simple pay-back and life cycle cost assessment, Energy Efficient Motors-motor losses and loss reduction techniques, determining and comparing motor efficiencies, motor efficiency testing standards, BIS specification for Energy Efficient Motors, efficiency as a function of load, Energy Efficient Lighting Sources-compact fluorescent lamp, light emitting diode, LED lamp, role of voltage on the efficiency of lighting system, Importance of Automatic power factor controllers, Variable Frequency Drives.

Reference Books:

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
3. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
4. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing
5. Heating and Cooling of Buildings -Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994.

ELECTRICAL & ELECTRONICS ENGINEERING

HVDC & AC TRANSMISSION

Pre-requisites of the course: Power System-I & II

Course Outcome U No.	Statement	Knowledge Level, KL
N I CO1	Describe the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission.	K1
T CO2	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance.	K3
I : CO3	Explain the generation and measurement circuits for impulse, high DC & AC voltages. While considering the design parameters evaluate the effect on the performance of the EHV lines.	K2
N e e d CO4	Classify the DC links and choice of converter configuration to investigate the impact of inductance on operation of converters and identify different control schemes as well as starting and stopping methods of DC links.	K4
o CO5	Describe the converter faults, protections including MTDC types and applications .	K2

UNIT-I: EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission, UHVAC transmission system.

UNIT-II:EHV AC Transmission: Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III: Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.

Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, working principle and characteristics of a 6 pulse converter with two & three valve conduction mode, three valve conduction mode and three and four valve conduction mode, Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

ELECTRICAL & ELECTRONICS ENGINEERING

Text Books:

1. R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern.
2. K. R. Padiyar, "HVDC Power Transmission Systems: Technology and System Reactions" New Age International.
3. J. Arrillaga, "High Voltage Direct Current Transmission" IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4. M. S. Naidu & V. Kamaraju, "High Voltage Engineering" Tata Mc Graw Hill.

Reference Books:

5. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.
6. S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Publisher.
7. "EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute, Palo Alto, California, 1982.

ELECTRICAL & ELECTRONICS ENGINEERING

POWER QUALITY AND FACTS

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Classify the power quality issues in electrical distribution network	K2
CO2	Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS.	K1
CO3	Describe the different phenomenon causing electrical transients and devices for over voltage protection.	K2
CO4	Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC.	K2
CO5	Explain the causes of harmonics, its effect on motor ,capacitor, cables and mitigation techniques.	K2

Unit-I: Introduction to Power Quality:

Terms and definitions of transients, Long duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.

Unit-II: Voltage Sag:

Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III: Electrical Transients:

Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV: FACT Systems:

Introduction – Terms & Definition, Fact Controllers, Type of FACT devices i.e. SSC, SVC, TSC, SSSC, TCSC, UPFC Basic relationship for power flow control.

Unit- V: Harmonics:

Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Communication Lines etc., Harmonic Mitigation Techniques.

ELECTRICAL & ELECTRONICS ENGINEERING

Text Books:

1. Roger C Dugan, McGrahan, Santoso&Beaty, “Electrical Power System Quality” McGraw Hill
2. Arindam Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “Power Quality” CRC Press.
4. S. Sivanagaraju& S. Satyanarayana, “Electric Power Transmission and Distribution” Pearson Education
5. Narain G. Hingorani& Laszlo Gyugyi “Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems” Wiley

DEPARTMENT
ELECTIVE – V
[L T P: 3 0 0]

ELECTRICAL & ELECTRONICS ENGINEERING

ELECTRIC & HYBRID VEHICLES

Pre-requisites of the course: Power System-I & II, Power Electronics, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the importance of hybrid and electric vehicles, its characterization and mathematical model for performance.	K1
CO2	Explain basic concept of hybrid traction, drive-train topologies and regenerative braking in electric vehicles.	K2
CO3	Explain the components used in hybrid and electric vehicles and different motor drives.	K2
CO4	Illustrate the sizing of propulsion motor, power electronics and selection of storage technology.	K3
CO5	Describe the energy management and different strategies used in hybrid and electric vehicle.	K2

Unit I: History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance. Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

Unit II: Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis, braking fundamentals and regenerative braking in EVs.

Unit III: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives, configuration and control of Permanent Magnet Motor Drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit IV: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology, Communications, supporting subsystems.

ELECTRICAL & ELECTRONICS ENGINEERING

Unit V: Introduction to energy management and their strategies used in hybrid and electric vehicle
Classification of different energy management strategies Comparison of different energy management
strategies Implementation issues of energy strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and
G2V fundamentals.

Text Books

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.
2. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003
3. Iqbal Hussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011

Reference Books

1. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
2. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.

ELECTRICAL & ELECTRONICS ENGINEERING

ELECTRIC DRIVES

Pre-requisites of the course: Power Electronics, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the operation of electric drives and its classification.	K1
CO2	Explain the electric drive stability and selection of motor power rating.	K2
CO3	Illustrate electric braking and its dynamics.	K3
CO4	Describe the types of DC drives and its control.	K2
CO5	Describe the types of AC drives and its control.	K2

UNIT-I: Fundamentals of Electric Drive:

Electric Drives and its parts, advantages of electric drives, Classification of electric drives, Speed-torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification.

UNIT-II: Dynamics of Electric Drive:

Dynamics of motor-load combination, Steady state stability of Electric Drive, Transient stability of electric Drive

Selection of Motor Power rating:

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty., Load equalization.

UNIT-III: Electric Braking:

Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking.

UNIT-IV: Power Electronic Control of DC Drives:

Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.

UNIT-V: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

ELECTRICAL & ELECTRONICS ENGINEERING

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.

Reference Books:

- 1 M.Chilkin, "Electric Drives", Mir Publishers, Moscow.
- 2 Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt. Ltd. Singapore.
- 3 N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd.
- 4 V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM PROTECTION

Pre-requisites of the course: Power System-I, Power System-II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the relays and different protective schemes.	K1
CO2	Explain Relay types and its application.	K2
CO3	Describe types of faults and protection scheme for major components of power system.	K2
CO4	Describe the circuit breaker operation, testing and types.	K2
CO5	Explain the electronic relay, microprocessor and computer based protection schemes.	K2

Unit-I: Protection Scheme

Need for Protective systems, Evolution of protective relays - Zones of protection - Primary and Back -up Protection - Essential qualities of Protection - Classification of Protective schemes -Automatic reclosing - current transformer for Protection - potential transformer - summation transformer -phase – sequence current - segregating network

Unit-II: Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay. Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III: Protection of Components

Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.) - Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection - Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.

Unit-IV: Circuit Breaking

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings. Testing of Circuit Breaker: Classification, testing station and equipment, testing procedure, direct and indirect testing, selection of circuit breakers. constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

ELECTRICAL & ELECTRONICS ENGINEERING

UNIT V- Modern Trends in Protection

Electronic relays - static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes - software development for protection, security and reliability.

Text Books:

1. S. S. Rao, "Switchgear and Protection", Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.
3. B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Mc. Graw Hill

ELECTRICAL & ELECTRONICS ENGINEERING

DEREGULATED POWER SYSTEM

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the deregulation, unbundling of electric utilities and its benefits.	K1
CO2	Explain the operational planning activities of independent system operator in pool & bilateral markets and describe competitive bidding.	K2
CO3	Explain the open access of transmission line and management of security & congestion in deregulation.	K2
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	K2
CO5	Illustrate the Reliability Analysis of Generation, transmission and distribution and the regulation of the market.	K3

UNIT-I: Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation

UNIT-II: Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding.

UNIT-III: Power wheeling, Transmission open access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation

UNIT-IV: General description of some ancillary services, ancillary services management in various countries, and reactive power management in some deregulated electricity markets.

UNIT-V: RELIABILITY ANALYSIS: Interruption criterion, stochastic components, component models, Calculation methods, Network model: stochastic networks, series and parallel connections, minimum cut sets, reliability cost. Generation, transmission and distribution reliability, Reliability and deregulation: conflict, reliability analysis, effects on the actual reliability, regulation of the market.

Text Books:

1. K. Bhattacharya, MHT Bollen and J.C Doolder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, USA, 2001.
2. Lei Lee Lai, "Power System restructuring and deregulation", John Wiley and Sons, UK. 2001.
3. Fred I Denny and David E. Dismukes, "Power System Operations and Electricity Markets", CRC Press, LLC, 2002.

ELECTRICAL & ELECTRONICS ENGINEERING

UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

Pre-requisites of the course: Basic Electrical Engineering, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the methods of electric heating and their advantages.	K1
CO2	Explain the types of Electric welding and the principle of Electro-deposition, laws of electrolysis and its applications	K2
CO3	Explain the laws of illumination and explain the principle of refrigeration and air-conditioning.	K2
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	K2
CO5	Describe the salient features of traction drive and concept of energy saving using power electronic control of AC and DC drives	K2

Unit-I: Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating and Dielectric heating

Unit-II: Electric Welding: Electric Arc Welding Electric Resistance Welding Electronic welding controls Electrolyte Process: Principles of electro deposition, Laws of electrolysis, and applications of electrolysis

Unit-III: Illumination: Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV: Electric Traction – I: Types of electric traction, Review of existing electric traction systems in India, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V: Electric Traction – II: Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:

1. H. Partab, “Art and Science of Electrical Energy” Dhanpat Rai & Sons.
2. J.B. Gupta, “Utilization of Electric Power and Electric Traction”, Kataria & Sons publishers, Delhi, IX Edition, 2004.

ELECTRICAL & ELECTRONICS ENGINEERING

3. C.L. Wadhwa, “Generation, Distribution and Utilization of electrical Energy”, New Age International (P) Limited Publishers, 3rd Edition, 2010.

Reference Books:

1. H. Partab, “ Modern Electric Traction” Dhanpat Rai & Sons.
2. G.K. Dubey, “Fundamentals of Electric Drives” Narosa Publishing House.

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR
PRADESH, LUCKNOW**



Proposed Evaluation Scheme

For

MBA

(Business Analytics)

II Year

(Draft, August 12, 2021)

AS PER AICTE MODEL CURRICULUM

(Effective from the Session: 2021-22)

Preamble

Summer Training Project Report

At the end of the second semester examination, it is mandatory for every student of MBA (Business Analytics) to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

2. During the training, the student is expected to learn about the organization and analyse and suggest solutions to a live problem. The objective is to equip the students with the knowledge of actual functioning of an organization and problems faced by them for exploring feasible solutions.
3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.
4. The student, after the completion of training will submit a report to the College/Institute which will be part of the third semester examination. However, the report must be submitted by the end of September .
5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of a micro problem, ordinarily assigned by the organization where the student undergoes training. Relevant tables and bibliography should support it. One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. This chapter will form part 1 of the report. Part 2 of the report will contain the study of micro research problem. The average size of report ordinarily will be of minimum 100 pages in standard font size (12) and double spacing. Two neatly typed (one sided only) and soft bound copies of the report will be submitted to the College/Institute. The report will be typed on A-4 size paper.
6. The report will have two certificates, one by the Head of the Department, another by the Faculty guide and third one from reporting officer of the organization where the student has undergone training. These three certificates should be attached in the beginning of the report.
7. The Summer Training Project Report will carry 150 marks and will be evaluated by two examiners (external and internal). The evaluation will consist of (1) Project Report evaluation (2) Project Presentation and Viva Voce.

The Project Report evaluation will comprise of 50 sessional marks and would be evaluated by internal project guide. The Presentation and Viva Voce would comprise of 100 marks and would be evaluated by two examiners (1 external and 1 internal). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to a third examiner. Only such person will evaluate the project report who has minimum three years of experience of teaching MBA (Business Analytics) classes in a College/University. Experience of teaching MBA (Business Analytics) classes as guest faculty shall not be counted.

8. The parameters on which external evaluation would be carried out are as under:

Project Report Evaluation:

Evaluation Criteria	Understanding of Objectives with topic (20)	Understanding Of Reliance of topic (20)	Interpretation & Analysis (20)	Presentation (20)	Query handling (20)
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9. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.
10. The student shall prepare the Summer Training Project Report as per the format given in the Summer Training Manual as prescribed by the University

MBA
(Business Analytics)
IInd Year Course Structure (2021-22)

Semester III

SNo	Code s	SUBJECT	PERIODS			INTERNAL EVALUATIO NSCHEME				ENDSEME STEREVAL UATION		TOTAL	CREDI T
			L	T	P	CT	TA	PS	TOTAL	TE	PE		
1	KMBA301	Strategic Management	4	0	0	30	20	0	50	100	0	150	3
2	KMBA302	Artificial Intelligence And Machine Learning	4	0	0	30	20	0	50	100	0	150	3
3	KMBA303	Human Values And Ethics	3	1	0	30	20	0	50	100	0	150	3
4	KMBA304	Supply Chain Analytics	3	0	1	30	20	0	50	100	0	150	3
5	KMBA305	Foundation Course In Big Data And Hadoop	3	0	1	15	10	25	50	100	0	150	3
6	KMBA306	Marketing& Retail Analytics	3	0	1	15	10	25	50	100	0	150	3
7	KMBA307	Summer Training Project Report & Viva Voce		2	0	0	0	0	50	100	0	150	4
LAB/PRACTICALS													
8	KMBA351	Machine Learning With “R”	0	0	3	0	25	25	50	0	100	150	3
												1200	25

Semester IV

SNo	Codes	SUBJECT	PERIODS			INTERNAL EVALUATION SCHEME				ENDSEMESTER EVALUATION		TOTAL	CREDIT
			L	T	P	CT	TA	PS	TOTAL	TE	PE		
1	KMBA401	Emerging Technologies In Business	4	0	0	30	20	0	50	100	0	150	3
2	KMBA402	HR Analytics	3	0	1	15	10	25	50	100	0	150	3
3	KMBA403	Social Media and Web Analytics	3	0	1	15	10	25	50	100	0	150	3
4	KMBA404	Financial & Credit Risk Analytics	4	0	0	30	20	0	50	100	0	150	3
5	KMBA405	Healthcare Analytics	4	0	0	30	20	0	50	100	0	150	3
6	KMBA406	Data Base Management System	4	0	0	30	20	0	50	100	0	150	3
7	KMBA407	Research Project Report & Viva Voce	0	2	0	0	0	0	50	100	0	150	4
PRACTICAL/LAB													
8	KMBA451	DBMS Lab With MY SQL	0	0	3	0	25	25	50	0	100	150	3
												1200	25



Proposed Evaluation Scheme

For

MBA Second Year

(Draft, August 12, 2021)

AS PER AICTE MODEL CURRICULUM

(Effective from the Session: 2021-22)

Preamble

Summer Training Project Report

At the end of the second semester examination, it is mandatory for every student of MBA to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

2. During the training, the student is expected to learn about the organization and analyse and suggest solutions to a live problem. The objective is to equip the students with the knowledge of actual functioning of an organization and problems faced by them for exploring feasible solutions.
3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.
4. The student, after the completion of training will submit a report to the College/Institute which will be part of the third semester examination. However, the report must be submitted by the end of September.
5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of a micro problem, ordinarily assigned by the organization where the student undergoes training. Relevant tables and bibliography should support it. One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. This chapter will form part 1 of the report. Part 2 of the report will contain the study of micro research problem. The average size of report ordinarily will be of minimum 100 pages in standard font size (12) and double spacing. Two neatly typed (one sided only) and soft bound copies of the report will be submitted to the College/Institute. The report will be typed on A-4 size paper.
6. The report will have two certificates, one by the Head of the Department, another by the Faculty guide and third one from reporting officer of the organization where the student has undergone training. These three certificates should be attached in the beginning of the report.
7. The Summer Training Project Report will carry 150 marks and will be evaluated by two examiners (external and internal). The evaluation will consist of (1) Project Report evaluation (2) Project Presentation and Viva Voce.

The Project Report evaluation will comprise of 50 sessional marks and would be evaluated by internal project guide. The Presentation and Viva Voce would comprise of 100 marks and would be evaluated by two examiners (1 external and 1 internal). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to a third examiner. Only such person will evaluate the project report who has minimum three years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.

8. The parameters on which external evaluation would be carried out are as under:

Project Report Evaluation:

Evaluation Criteria	Understanding of Objectives with topic (20)	Understanding Of Reliance of topic (20)	Interpretation & Analysis (20)	Presentation (20)	Query handling (20)
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9. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.
10. The student shall prepare the Summer Training Project Report as per the format given in the Summer Training Manual as prescribed by the University

Specialisation

1. In the beginning of III semester and before commencement of regular classes each student has to choose dual specialization of his/her choice or interest. University offers dual specialization in area Human Resource Management (HR), Marketing Management (MM), Financial Management (FM), International Business (IB) and Information Technology (IT). Institute shall help students to choose specialization by conducting workshop, Industry Interaction etc.
2. Institute has a right to close the date of choosing area of specialization in order to smooth functioning of classes and department and effective utilization of resources. However, this process shall complete before commencement of regular classes of third semester.

Research Project Report (RPR)

In fourth semester, the candidates will have to submit a Research Project Report on a problem/topic (from the specialization areas) to be assigned by the MBA department under the supervision of a core faculty member of the department. The Research Project Report will carry 150marks. The evaluation of the project report will be done by two examiners (external & internal). The evaluation will consist of (1) Evaluation of Project Report (2) Presentation and Viva Voce. The evaluation of Project Report will comprise of 50 marks and would be evaluated by the internal guide. The evaluation of Viva Voce of Project would comprise of 100 marks and would be evaluated by two examiners (1 external and 1 internal). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the marks given by the examiners is 30 or more, the project report will be referred to a third examiner. In such cases the average of two closer awards (given by three examiners) will be taken into account for the results. The report will contain the objectives and scope of the study. Research Methodology, use and importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit two copies of the report to the Head of MBA program. The number of pages in the report will be minimum 75 or more. The report should be typed in A-4 size paper. The parameter on which both evaluation (1 & 2) would be carried on would be on the basis of:

The scheme of evaluation for Project Report

Criteria	Relevance of Objectives with topic (10)	Relevance of Research Methodology(20)	Interpretation & Analysis (20)	Total (50)
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The scheme of evaluation of Viva voce

Evaluation Criteria	Understanding of Objectives with topic (20)	Understanding of the relevance of Research (20)	Interpretation & Analysis (20)	Presentation & Communication skills (20)	Query Handling (20)	Total (100)
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The student shall prepare the Research Project Report as per the format given in the Research Project Report Manual as prescribed by the University.

MBA II Year Proposed Scheme of Teaching & Evaluation for Session 2021-22

SEMESTER III

SNo	Code s	SUBJECT	PERIODS			INTERNAL EVALUATIO NSCHEME				ENDSEME STEREVAL UATION		TOTAL	CREDI T
			L	T	P	CT	TA	PS	TOTAL	TE	PE		
1	KMBN301	Strategic Management	4	0	0	30	20	0	50	100	0	150	3
2	KMBN302	Innovation And Entrepreneurship	4	0	0	30	20	0	50	100	0	150	3
3	KMBN303	Human Values And Ethics	3	1	0	30	20	0	50	100	0	150	3
4		Elective- 1 Specialization Group-1	4	0	0	30	20	0	50	100	0	150	3
5		Elective -2 Specialization Group-1	4	0	0	30	20	0	50	100	0	150	3
6		Elective -3 Specialization Group-2	4	0	0	30	20	0	50	100	0	150	3
7		Elective -4 Specialization Group-2	4	0	0	30	20	0	50	100	0	150	3
8	KMBN308	Summer Training Project Report & Viva Voce	0	0	0	0	50	0	50		100	150	4
		TOTAL										1200	25

MBA SEMESTER IV (2021-22)

SNo	Code s	SUBJECT	PERIODS			INTERNAL EVALUATIO NSCHEME				ENDSEME STEREVAL UATION		TOTAL	CREDI T
			L	T	P	CT	TA	PS	TOTAL	TE	PE		
1	KMBN401	Emerging Technologies in Global Business	4	0	0	30	20	0	50	100	0	150	3
2		Elective- 3 Specialization Group-1	4	0	0	30	20	0	50	100	0	150	3
3		Elective -4 Specialization Group-1	4	0	0	30	20	0	50	100	0	150	3
4		Elective- 5 Specialization Group-1	4	0	0	30	20	0	50	100	0	150	3
5		Elective -3 Specialization Group-2	4	0	0	30	20	0	50	100	0	150	3
6		Elective -4 Specialization Group-2	4	0	0	30	20	0	50	100	0	150	3
7		Elective -5 Specialization Group-2	4	0	0	30	20	0	50	100	0	150	3
8	KMBN408	Research Project Report & Viva Voce	0	2	0	0	50	0	50	0	100	150	4
		TOTAL										1200	25

Specialization Group: **Human Resource**

Elective Papers in III Semester

S.No.	Code	Course Title
1	KMBNHR01	TALENT MANAGEMENT
2	KMBNHR02	EMPLOYEE RELATIONS AND LABOUR LAWS

Elective Papers in IV Semester

S.No.	Code	Course Title
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3	KMBNHR03	HR ANALYTICS
4	KMBNHR04	PERFORMANCE AND REWARD MANAGMENT
5	KMBNHR05	INTERNATIONAL HRM

Specialization Group: **MARKETING**

Elective Papers in III Semester

S.No.	Code	Course Title
1	KMBNMK01	CONSUMER BEHAVIOUR AND MARKETING COMMUNICATION
2	KMBNMK02	MARKETING ANALYTICS

Elective Papers in IV Semester

S.No.	Code	Course Title
3	KMBNMK03	B2B AND SERVICES MARKETING
4	KMBNMK04	SALES AND RETAIL MANAGEMENT
5	KMBNMK05	SOCIAL MEDIA AND WEB ANALYTICS

Specialization Group: **FINANCE**

Elective Papers in III Semester

S.No.	Code	Course Title
1	KMBNFM01	INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT
2	KMBNFM02	FINANCIAL PLANNING AND TAX MANAGEMENT

Elective Papers in IV Semester

S.No.	Code	Course Title
3	KMBNFM03	FINANCIAL DERIVATIVES
4	KMBNFM04	FOREIGN EXCHANGE AND RISK MANAGEMENT
5	KMBNFM05	CORPORATE ACCOUNTING

Specialization Group: **INTERNATIONAL BUSINESS**

Elective Papers in III Semester

S.No.	Code	Course Title
1	KMBNIB01	INTERNATIONAL BUSINESS MANAGEMENT
2	KMBNIB02	EXPORT IMPORT DOCUMENTATION

Elective Papers in IV Semester

S.No.	Code	Course Title
3	KMBNIB03	INTERNATIONAL LOGISTICS
4	KMBNIB04	EXPORT IMPORT DOCUMENTATION
5	KMBNIB05	INTERNATIONAL TRADE LAWS

Specialization Group: INFORMATION TECHNOLOGY

Elective Papers in III Semester

S.No.	Code	Course Title
1	KMBNIT01	DATA ANAYTICS FOR BUSINESS DECISIONS
2	KMBNIT02	AI AND ML FOR BUSINESS

Elective Papers in IV Semester

S.No.	Code	Course Title
3	KMBNIT03	DATA BASE MANAGEMENT SYSTEM
4	KMBNIT04	CLOUD COMPUTING FOR BUSINESS
5	KMBNIT05	BUSINESS DATA MINING

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR
PRADESH, LUCKNOW**



Proposed Evaluation Scheme & Syllabus

For

MBA

(Logistics and Supply Chain Management)

II Year

(Draft, August 12, 2021)

AS PER AICTE MODEL CURRICULUM

(Effective from the Session: 2021-22)

Preamble

Summer Training Project Report

At the end of the second semester examination, it is mandatory for every student of MBA (Logistics and Supply Chain Management) to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

2. During the training, the student is expected to learn about the organization and analyse and suggest solutions to a live problem. The objective is to equip the students with the knowledge of actual functioning of an organization and problems faced by them for exploring feasible solutions.
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8. The parameters on which external evaluation would be carried out are as under:

Project Report Evaluation:

Evaluation Criteria	Understanding of Objectives with topic (20)	Understanding Of Reliance of topic (20)	Interpretation & Analysis (20)	Presentation (20)	Query handling (20)
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9. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.
10. The student shall prepare the Summer Training Project Report as per the format given in the Summer Training Manual as prescribed by the University

Semester IV

SNo	Codes	SUBJECT	PERIODS			INTERNAL EVALUATION SCHEME				ENDSEME STEREVALUATION		TOTAL	CREDI T
			L	T	P	CT	TA	PS	TOTAL	TE	PE		
1	KMLS 401	Emerging Technologies In Business	4	0	0	30	20	0	50	100	0	150	3
2	KMLS 402	Storekeeping and Warehouse Management	4	0	0	30	20	0	50	100	0	150	3
3	KMLS 403	Disaster , Risk & Insurance Management	4	0	0	30	20	0	50	100	0	150	3
4	KMLS 404	Analytics of Logistic & Supply Chain	4	0	0	30	20	0	50	100	0	150	3
5	KMLS 405	Public Private Partnership and Port Development	4	0	0	30	20	0	50	100	0	150	3
6	KMLS 406	Distribution Management For Global Supply Chain	4	0	0	30	20	0	50	100	0	150	3
7	KMLS 407	Legal Compliances In Logistic	4	0	0	30	20	0	50	100	0	150	3
8	KMLS 408	Research Project Report & Viva Voce		2	0	0	50	0	50		100	150	4
												1200	25