B. N. Mandal University, Laloonagar, Madhepura

Details of theory & Sessional Papers code of 4th Year B. Tech. Course

Branch: ELECTRICAL ENGINEERING

Sl No.	Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
01	Linear control theory	LCT	EE-401	2	1	3	70	30	Linear control theory-50
02	Advance electrical machine	AEM	EE-402	3	0	0	70	30	---------
03	Protection of power apparatus & system	PAPS PPAS	EE-403	3	0	3	70	30	Protection of power apparatus & system- 100
04	Power system design	PSD	EE-404	3	0	3	70	30	Power system design-100
05	EHV power transmission	EHVPT	EE-405	3	0	0	70	30	Elective-I
06	Industrial drives and control	IDC	EE-406	3	0	3	70	30	Elective-II
07	Power system dynamics and reliability	PSDR	EE-407	3	0	0	70	30	-------------
08	Engineering Economics and Management	EEM	EE-408	3	0	0	70	30	---------
09	Project	Project	EE-409	0	0	3	---	---	Project-100
10	Seminar	Seminar	EE-410	-	-	3	---	---	Seminar -50

Expert-I
(External)
Name:
Designation:
Address:

Expert-II
(Internal)
Name:
Designation:
Address:

Dean
Faculty of Science & Engineering
BNMU, Madhepura

Principal
MIT
Rambagh
purnea

Member Secretary
Syllabus committee
BNMU
Madhepura

Subject: Linear Control Theory   Branch Code: EE- 401   (EE/ECE)

L-T-P: 2-1-3

First Term

1. **Introduction:** the control system, servomechanism, servomotor, standard test signal.

   Lecture: 4

2. **Time response analysis:** time response of second order system, design consideration for higher order system stability relative stability

   Lecture: 6

3. **The root locus technique:** concept, consideration of root loci roots contour system with transformation log.

   Lecture: 8

Second-Term

4. **Frequency response analysis:** correlation between time and frequency response. bode plot, root locus and minimum phase system log magnetic vs phase plot, stability in frequency domain. polar plots.

   Lecture: 8

5. **Mathematics preliminaries:** Nyquest stability criteria, assessment of relation stability using Nyquest criteria.

   Lecture: 5

6. **Close loop frequency response.**

   Lecture: 3

7. **Compensation of control system:** Introduction type compensation approach to compensation.

   Lecture: 8

Text books:
   1. Modern control system by Nagrath & Gopal

Reference books:
   1. Modern control engineering byn K Ogata, Pearson Education.
   2. Control Engineering by kuo.

Linear Control Theory Lab:
   1. AC & DC position control system.
   2. AC & DC servomotors
   3. Stepper motor control using 8085µP
   4. Seven segment display from 0-9 using 8085µP.
   5. OFF/ON control using 8085µP.

SUBJECT : ADVANCE ELECTRICAL MACHINE   BRANCH CODE – EE402
(EE)

L–T–P:3-0-0

FIRST TERM

1. **Special Electrical Machines** : Hysteresis motor-constructional feature, principal of operations, performance, characteristic and application, stepper motor: types, constructional features, principle of operation & switching operation, performance, characteristic & application, universal motor : constructional feature, working principle, phasor diagram, performance and application.

Lecture : 12

2. **Repulsion motor:** Starting performance and application, double cage induction motor: constructional feature, principle of operation and application

Lecture : 05

3. **Introduction to generalized theory of electrical machines** : Synchronous machines and induction machines.

Lecture : 07

SECOND TERM

4. **Dynamics of Electrical machines:** general torque equation, inertia constant, analysis of synchronous machine under transient condition, stability, effect of damping.
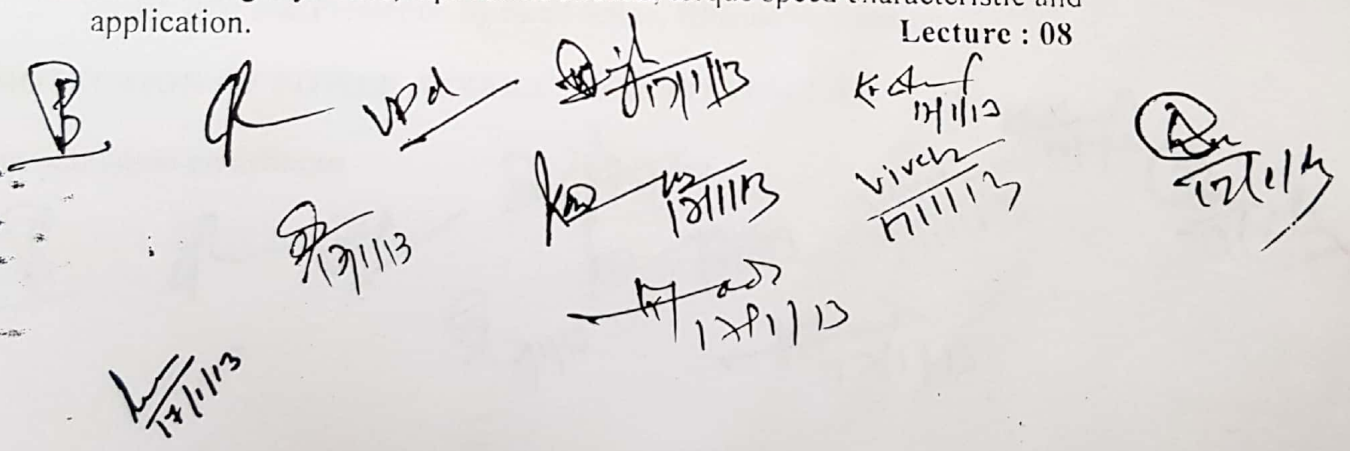
Lecture : 08

5. **State variable model of electrical machines:** Unbalanced operation of two and three-phase induction motors.

Lecture : 08

6. **New machines:** Brushless d.c. Machines, Microprocessor based speed control of motor using thyristers, equivalent circuits, torque speed characteristic and application.

Lecture : 08

SUBJECT :- PROTECTION OF POWER APPARATUS & SYSTEM
BRANCH CODE – EE403   (EE)
L–T-P:3-0-3

FIRST TERM

1. Name and cause of faults.   Lecture :4
2. Schemes of protection : Methods of fault discrimintation.   Lecture :5
3. Protective relays : Construction and operating principal of over current relays, directional relays, Distance relays, Differential relays.

            Lecture :5
4. Protection of feeders: Over current protection and distance protection.   Lecture :5
5. Protection of transformer and generator.   Lecture :5

SECOND TERM

6. Mechanism of arc interruption , Restriking voltage, Recovery voltage, RRRV, factors affecting the performance of circuit breaker, current chopping.
7. Circuit breaker : Construction and operating principle of air blast, oil, SF6 and vacuum circuit breaker.   Lecture :7
8. Protection against over voltage : cause of over voltage, lightning arrestors, surge absorber, insulation co-ordination.   Lecture :5
9. Grounding : Advantage, solid, resistance grounding, Peterson coil.   Lecture :7

Text Books:
1. Power System Protection & switch Gear by B.Ram & D.N. Vishwakarma, TMH
2. Power System Protection & switch Gear by R&C

Reference Books:
1. Art & science Protection Relaying by Moson
2. Switch gear and Protection by Sunil S.Rao, Khanna Publication

PROTECTION OF POWER APPARATUS & SYSTEM LAB

Practical based on syllabus

SUBJECT : - POWER SYSTEM DESIGN   **BRANCH CODE – EE404 (EE)**

L–T–P:3-0-3

FIRST TERM

1. **Per unit system representation** : reactance diagram, impedance diagram.
   Lecture: 5

2. **Load flow Analysis:** load flow problem, Y-bus, Formulation of problem, solution technique using Gauss seidel method.
   Lecture: 7

3. **Symmetrical short circuits Analysis:** Short circuit of a Synchronous machine on no load, Short circuit of loaded synchronous machine, Thevenin's equivalent circuit approach for short circuit analysis.
   Lecture: 7

4. **Symmetrical component:** Transformation, phase shift in star-delta transformer, sequence Impedance and sequence network of transmission line, Synchronous machine, Transformer and power system.
   Lecture: 8

SECOND TERM

5. **Unsymmetrical Short Circuits:** Symmetrical component analysis of unsymmetrical short circuits, single line to ground fault, Double line to ground fault and line to line fault
   Lecture: 10

6. **Power system stability problem:** Swing equation, System response to small disturbances, Power angle equation and diagram.
   Lecture: 9

7. **Transient stability:** Equal area criterion, Measures for improving transient stability.
   Lecture: 5

Text Books:
1. Power system Analysis by Stevenson and Grainger
2. Electrical Energy Systems Theory an Introduction, Olle I. Elgerd.

Reference Book:
1. Nagrath- Kothari, Modern power system Analysis.
2. C.L. Wadhwa, Electrical power systems
3. B.R.Gupta, power systems Analysis.

POWER SYSTEM DESIGN(LAB)
Practical based on syllabus.

SUBJECT: - ELECTIVE-I (EHV POWER TRANSMISSION)
BRANCH CODE – EE405   **(EE)**
L–T-P: 3-0-0

FIRST TERM

1. Maxwell's coefficients: Sequence inductance and capacitance, Charge Matrix, Effect of Ground wire.   **Lecture: 6**

2. Surface Voltage-gradient: on bundled conductors Mangoldt's formula, Gradient factors & their use, Ground level electrostatic field of EHV lines.   **Lecture: 6**

3. Power frequency: over voltage control, Series and shunt compensation, Generalized Constant of Compensated line, static Var Compensators (SVC/SVS).

Lecture: 7

4. Switching over voltage in EHV Systems.   **Lecture: 6**

SECOND TERM

5. Six-pulse Bridge circuit: Waveforms and relevant equations, Twelve-pulse converter, Advantage of higher pulse number, Bipolar to monopolar operation, Converter performance with phase control, Communication and effects of reactance. **Lecture: 8**

6. Introduction to HVDC system: Economical advantages, Technical advantages, Critical distance, Submarine transmission.   **Lecture: 5**

7. Inverter: Equivalent circuit of HVDC system, Schematics diagram, Reactive power consideration in HVDC system, Harmonics, Filters in HVDC System.   **Lecture: 7**

Text Books:

1. Extra high voltage AC Transmission Engineering (2nd Ed) by R.D. Begamudre, Wiley Eastern Ltd.
2. HVDC Power Transmission Systems by K. Padiyar, Wiley Eastern Ltd.

Reference Books:

1. EHV AC and HVDC Transmission Engineering and Practices by S.S. Rao, Khanna Publication.

INDUSTRIAL DRIVES AND CONTROL

BRANCH CODE – EE-406   L-T-P:3-0-3

FIRST TERM

1. **Introduction:** Electrical Drives & their advantages, parts of electrical drives, D.C. & A.C. drives.   Lecture : 4

2. **Dynamics of Electrical Drives:** Torque equations, Multiquadrant operation , load torque & their types, calculation of time and energy loss in transient operation, Steady state stability, load equalization.   Lecture : 10

3. **Selection of Motor & its power rating:** Types of motors & their enclosures, thermal model of motor for heating & cooling, classes of motor, duty cycle, rate of motor.

Lecture: 10

SECOND TERM

4. **Control of Electrical Drives :** Introduction, Mode of operation, speed controls and drive classification closed loop control of drives, speed and current sensing, manual, semi automatic and automatic control, magnetic and static control, power circuit & control circuit and their development, inter locking and sequential operation.   Lecture : 15

5. **D.C. Motor Drives :** Performance characteristics of DC Motors and their modifications, starting and design of starting circuit, braking, speed control, converter – controlled DC drives, chopper controlled DC drives.`   Lecture : 8

6. **Induction Motor Drives :** Performance characteristic of three phase induction motors and their modifications.   Lecture : 6

Text Books:

1. Fundamental of Electric Drives by G.K. Dubey. NPH
2. Power Semiconductor Controlled drives by G.K. Dubey. PHI
3. Power Electronics and AC Drives by B.K. Boss, PHI

Reference Books:

1. Solid State Drives by K. Malarvizhi, scitech publication.
2. A first course in Electric Drives by S.K.pillai. Wiley Eastern.

Industrial Drives & Control Lab:

Practical based on theory.

SUBJECT: - POWER SYSTEM DYNAMICS AND RELIABILITY
BRANCH CODE – EE407
(EE)
L–T-P: 3-0-0

FIRST TERM

1. **Classification of Power System Stability:** Introduction to Power System Stability classification, small signal and Transient stability, Rotor angle & Voltage Stability.   **Lecture: 5**
2. **Synchronous Machine Modeling:** Synchronous Machine, Basic Equations, Generator operated as part of large power grid.   **Lecture: 5**
3. **Small Signal (Steady State) Stability:** Small Signal (Steady State) Stability, Linearization, State matrix.   **Lecture: 5**
4. **Transient Stability Studies:** Transient Stability Studies, Network performance equations, alternate solution techniques- Runga Kutta and Trapezoidal, Methods of improvement of transient stability.   **Lecture: 7**

SECOND TERM

5. **The Basics of Power System Reliability:** Characteristics of component failure, the general reliability functions, the exponential distribution, mean time to failure   **Lecture: 7**

6. **Generation Reliability Model:** Two state Markov Model, Steady- state availability, Steady-state unavailability or forced outage rate (FOR) . Capacity outage probability table (COPT), Recursive techniques, Loss of load probability (LOLP) and loss of expectation calculation.   **Lecture: 10**

7. **Transmission system reliability evaluation and composite reliability evaluation:** Average interruption rate method, The frequency and duration method, Stormy and normal weather effect, The Markov process approach. Two plant single load composite system reliability analysis.   **Lecture: 5**

Text Books:
1. Power System Control & Stability by P. Kundur.
2. Power System Reliability Evaluation by Roy Bilingtor.

Reference Books:
1. Electrical Energy System Theory by O.I. Elgerd
2. Power System Analysis by Stevenson and Grainger
3. Power System Planning by R.L. Sullivan
4. Reliability Modeling in Electric Power System by J. Endrenyl.

BRANCH CODE-EEM-408

FIRST TERM

1.ENGINEERING ECONOMY:

(a)Simple and compound interest,annuities

(b)Basic methods for making economy studies-(i)Present worth method (ii)future worth method (iii)I.I.r methods

(c) Comparison of alternative –(i)present worth method

(ii) Future worth method   Lecture:12

2.Management & Organization:(a)Principle of Management (b)element of management,planning organization direction and control (c)Organizational structure-line,line and styaff,functional, divisional,project & matrix Organizational   Lecture:08

3.Personnel Management:(a)Function,Recruitment,selection,training promotion,discipline (b)job evolution (c)ment rating (d)wedge and incentive   Lecture:04

Second Term:

4.Marking Management: (a)Marking research and sale forecasting (b)sales management (c)advertisement and sales promotion   Lecture:08

5.ACCOUNTING:meaning,scope and role of accounting concept and convention,accounting as an information system,Recording of transaction in journal and ledgers,trial balance preparation of final account   Lecture:08

6.Entrepreneurship Development: Introduction to entrepreneurship ,rural interpreneurship,women entrepreneurship,factor effecting entrepreneurship growth   Lecture:08

Text books:

1.Engineering Economics by Degamo,Sullivan & Canada,.McMilan

2.Double entry book keeping by T.S.Grewal, S.Chand

3.Principle & practice of Managementby LM Prasad, S.Chand

4.Personnel Management by CB Memoria-Himalaya

5.Development entrepreneurship by Udai Parekh & T.Venkatshwara