GAUTAM BUDDHA UNIVERSITY

GAUTAM BUDH NAGAR-201310

SCHOOL OF ENGINEERING

SECOND YEAR SYLLABUS

(FIVE YEAR INTEGRATED DUAL DEGREE PROGRAMME)

DEPARTMENT OF ELECTRICAL ENGINEERING

School of Engineering

Gautam Buddha University
Gautam Budh Nagar-201310

5 Year Dual Degree Programme (Electrical Engineering)

SEMESTER-I				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	CY101/PH102	Engineering Chemistry/Engineering Physics	3-1-0	4
2	MA101	Mathematics - I	3-1-0	4
3	CE101	Engineering Mechanics	2-1-0	3
4	CS101	Computer Programming - I	2-0-0	2
5	EC101/EE102	Basic Electronics/Electrical Technology	2-0-0	2
6	HU101	English Proficiency	2-0-0	2
7	SS101	Human Values & Buddhist Ethics	2-0-0	2
		PRACTICALS		
8	CY103/PH104	Engineering Chemistry / Engineering Physics Lab	0-0-2	1
9	CE103	Engineering Graphics	0-0-3	2
10	CS181	Computer Programming Lab-I	0-0-3	2
11	EC181/EE104	Basic Electronics Lab/ Electrical Technology Lab	0-0-2	1
12	GP101	General Proficiency	-	1
		Total	**16-3-10**	**26**
		Total Contact Hours	29	

SEMESTER - II				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	PH102/CY101	Engineering Physics/ Engineering Chemistry	3-1-0	4
2	MA102	Mathematics - II	3-1-0	4
3	CE102	Concepts of Built Environment	2-1-0	3
4	CS102	Computer Programming - II	2-0-0	2
5	EE102/EC101	Electrical Technology/ Basic Electronics	2-0-0	2
6	HU102	Professional Communication	2-0-0	2
7	SS102	History of Science & Technology	2-0-0	2
		PRACTICALS		
8	PH104/CY103	Engineering Chemistry / Engineering Physics Lab	0-0-2	1
9	CE104	Built Environment Lab	0-0-3	2
10	EE104/EC181	Electrical Technology Lab/ Basic Electronics Lab	0-0-2	1
11	ME102	Workshop Practices	0-0-3	2
12	GP102	General Proficiency	-	1
		Total	**16-3-10**	**26**
		Total Contact Hours	29	

22/12/11

SEMESTER-III				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	MA201	Quantitative Techniques	3-1-0	4
2	EE201	Electrical Engineering Materials	2-0-0	2
3	EE203	Circuit Analysis	3-1-0	4
4	EE205	Electronic Devices & Circuits (EDC)	3-0-0	3
5	EE207	Electrical Machine-I	3-1-0	4
6	CS205	Data Structure and Algorithm	3-0-0	3
		PRACTICALS		
7	EE209	MATLAB programming Lab	0-0-3	2
8	EE211	Electrical Machine Lab - I	0-0-3	2
9	EE213	EDC Lab (Lab in ICT)	0-0-2	1
10	GP201	General Proficiency	-	1
		Total	**17-3-8**	**26**
		Total Contact Hour	28	

SEMESTER - IV				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	MA202	Numerical Methods of Analysis	3-1-0	4
2	EE202	Measurements and Instrumentation	2-0-0	2
3	EE204	Digital Electronics	3-0-0	3
4	EE206	Electromagnetic Field Theory	3-1-0	4
5	EE208	Generation of Electric Power	3-0-0	3
6	EE210	Electrical Machine -II	3-1-0	4
		PRACTICALS		
7	EE212	Digital Electronics Lab (Lab in ICT)	0-0-3	2
8	EE214	Electrical Machine - II	0-0-3	2
9	EE216	Measurements and Instrumentation Lab	0-0-2	1
10	GP202	General Proficiency	-	1
		Total	**17-3-8**	**26**
		Total Contact Hour	28	

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SEMESTER - V				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	EE301	Power System-I	3-1-0	4
2	EE303	Circuit Synthesis	3-0-0	3
3	EE305	Control Theory	3-1-0	4
4	EE307	Electrical Measurement and Instrumentation	3-0-0	3
5	EE309	Transmission & Distribution of Electric Power	3-0-0	3
6	ME311	Principles of Technology Management	2-0-0	2
		PRACTICALS		
7	EE313	Control Theory Lab	0-0-3	2
8	EE315	Electrical Measurement and Instrumentation Lab	0-0-3	2
9	EE317	MATLAB Programming Lab (CAD Lab)	0-0-3	2
10	GP301	General Proficiency		1
		Total	**17-2-9**	**26**
		Total Contact Hours	28	

SEMESTER - VI				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	EE302	Power Electronics & Drives	3-1-0	4
2	EE304	Power System -II	3-1-0	4
3	EE306	Communication Systems	2-1-0	3
4	EE308	Energy Auditing and Load Management	3-0-0	3
5	EE310	Micro Processor & Micro Controller	3-0-0	3
6	ME312	Entrepreneurship & Innovation	2-0-0	2
		PRACTICALS		
7	EE312	Power System Lab	0-0-3	2
8	EE314	Power Electronics & Drives Lab	0-0-3	2
9	EE316	Micro processor & Micro Controller Lab	0-0-3	2
10	GP302	General Proficiency		1
		Total	**16-3-9**	**26**
		Total Contact Hours	28	

SEMESTER - VII				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	SS401	Social Aspects of Engineering	2-1-0	3
2	EE401	Utilization of Electric Power	2-1-0	3
3	EE403	Switch Gear & Protection	3-0-0	3
4	EE405	Energy Management & SCADA Systems	3-0-0	3
5		Elective - I	3-0-0	3
6		Elective - II	2-1-0	3
		PRACTICALS		
7	EE441	Switch Gear & Protection Lab	0-0-3	2
8	EE443	Advance Power Electronics Lab	0-0-3	2
9	EE445	Seminar on Industrial Training	0-0-3	2
10	GP401	General Proficiency	-	1
		Total	**15-3-9**	**25**
		Total Contact Hours	27	

SEMESTER – VIII				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	EE402	High Voltage Engineering	3-0-0	3
2	EE404	Power System Planning & Reliability	3-1-0	4
3	EE406	Process Modelling and Control	3-0-0	3
4	ME540/ME406	Simulation and Modeling	3-1-0	4
5		Specialisation Elective-I	2-1-0	3
6		Specialisation Elective- II	3-0-0	3
		PRACTICALS		
7	EE432	Special Problem -I	0-0-3	2
8	EE434	Seminar	0-0-3	2
9	GP402	General Proficiency		1
		Total	**17-3-6**	**25**
		Total Contact Hours	26	

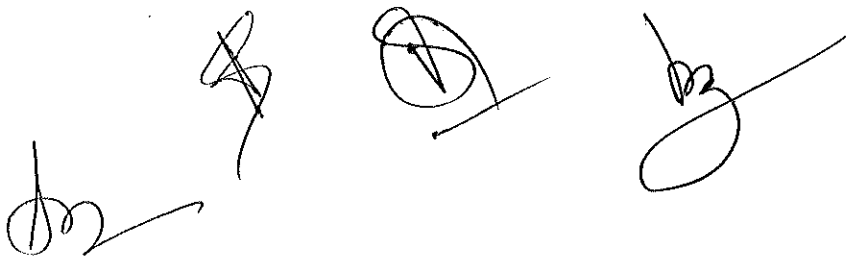
SUMMER SEMESTER (AFTER VIII SEMESTER)				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
1.		Summer Project	0-0-20	10
		Total	0-0-20	10
		Total Contact Hours	20	

SEMESTER – IX (Power System)				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	EE501	Power System Dynamics & Stability	3-0-0	3
2	EE503	High Voltage DC Transmission	2-1-0	3
3	EE505	Flexible AC Transmission Systems	3-1-0	4
4		Specialization Elective- III	3-1-0	4
5		Specialization Elective - IV	2-1-0	3
		PROJECTS		
6	EE502	Research Project (Preliminary)	1**-0-4	3
7	EE506	Power System Modelling & Simulation Lab	0-0-2	1
8	GP501	General Proficiency		1
		Total	**14-4-6**	**22**
		Total Contact Hours	24	

*** This will not be a usual lecture session, but this is one to one interaction of each student with the concerned faculty member*

SEMESTER – X				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
1	EE504	Research Project		21
2	GP502	General Proficiency	-	1
		Total		**22**

Grand Total Credits of Dual Degree = 260



SEMESTER – IX (Instrumentation & Control)				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
		THEORY		
1	EE541	PC/Micro-controller based Instrumentation	3-1-0	4
2	EE543	Digital Control	3-0-0	3
3	EE545	Environment Monitoring Instrumentation	3-1-0	4
4		Specialization Elective- III	2-1-0	3
5		Specialization Elective - IV	2-1-0	3
		PROJECTS		
6	EE508	Process Control Lab /Seminar-II	0-0-2	1
7	EE502	Research Project (Preliminary)	1**-0-4	3
8	GP501	General Proficiency		1
		Total	**14-4-6**	**22**
		Total Contact Hours	24	

*** This will not be a usual lecture session, but this is one to one interaction of each student with the concerned faculty member*

SEMESTER – X				
Sr. No.	**Subject Code**	**Courses**	**L-T-P**	**Credits**
1	EE504	Research Project		21
2	GP502	General Proficiency	-	1
		Total		**22**

Grand Total Credits of Dual Degree = 260

List of Electives for B.Tech

Elective-I & II

1. EE407: Reliability Analysis & Prediction
2. EE409: Introduction to MEMS
3. EE411: Embedded System
4. EE413: Failure Data Organization and Analysis
5. EE415: Restructured Power System
6. EE417: VHSIC Hardware Description Language
7. EE419: VLSI Design
8. EE421: Transient over voltages in Power Systems
9. EE423: Transducers in Instrumentation
10. EE425: Ultrasonic, Laser and Fiber Optic Based Instrumentation
11. EE427: Microelectronics Technology
12. EE431: Soft Computing Techniques
13. EE433: Power Conditioning
14. EE435: Renewable & Non-Conventional Energy Sources
15. EE437: Project Engineering & Management
16. EE439: Operation Research

List of Electives for M. Tech (Power System)

Specialization Elective-I & II

1. EE408: Optimal Power System Operation
2. EE410: Computer Aided Design of Electrical Machines
3. EE412: Reliability Centered Maintenance
4. EE414: Advanced Power System Protection
5. EE416: Advanced Distribution System
6. EE418: Organization & Finance in Power Sector
7. EE420: Calibration and Testing of Electrical Equipments
8. EE422: Instrumentation in Power System
9. EE424: Non Linear Control System
10. EE426: Hydraulic and Pneumatic Instrumentation
11. EE428: Advanced Control Theory

Specialization Elective –III

1. EE507: Power Converters & Applications
2. EE509: Probabilistic Risk Assessment
3. EE511: Computer Applications to Power System Analysis
4. EE513: High Voltage Engineering & Test Techniques
5. EE515: Robotic Technology
6. EE517: Data Mining and Pattern Recognition

Specialization Elective -IV

1. EE521: Operation and Control of Power Systems
2. EE523: Power Quality Monitoring and Conditioning
3. EE525: Parallel & Distributed Computing
4. EE527: Load and Energy Management
5. EE529: Digital Controllers in Power Electronics Applications

List of Electives for M. Tech (Instrumentation & Control)

Specialization Elective-I & II

1. EE408: Optimal Power System Operation
2. EE410: Computer Aided Design of Electrical Machines
3. EE412: Reliability Centered Maintenance
4. EE414: Linear Integrated Circuits
5. EE416: Advanced Distribution System
6. EE418: Organization & Finance in Power Sector
7. EE420: Calibration and Testing of Electrical Equipments
8. EE422: Instrumentation in Power System
9. EE424: Non Linear Control System
10. EE426: Hydraulic and Pneumatic Instrumentation
11. EE428: Advanced Control Theory

Specialization Elective -III

1. EE551: Parallel Process & Real Time Systems
2. EE553: Remote Sensing
3. EE555: Digital Signal & Image Processing
4. EE557: Virtual Instrumentation and its Engineering Applications
5. EE515: Robotic Technology
6. EE559: Nuclear Instrumentation
7. EE561: Optimal Control System

Specialization Elective -IV

1. EE571: Applied System Theory
2. EE573: Microprocessor Based System Design
3. EE575: Adaptive Control Systems
4. EE577: Digital Signal Processors
5. EE579: Digital Speech and Image Processing
6. EE591: Biomedical Instrumentation

EE102: Electrical Technology **L-T-P: 2-0-0** **Credits: 02**

Module I: Elements and Circuits

Types of electrical elements & sources, Kirchhoff's laws, Node voltage and mesh current methods, Delta-star and star-delta conversion and Network theorems.

Module II: Single-phase AC Circuits

Average and effective values of sinusoidal quantities, form, crest and ripple factor, solution of R.L.C series circuits, the *j* operator, complex representation of impedances, phasor diagram, power factor, power in complex notation, solution of parallel and series circuits.

Module III: Three-phase AC Circuits

Three phase voltages, line and phase quantities, balanced supply voltage and balanced load, problem of low power factor and methods for improvement.

Module IV: Magnetic Circuits and Transformer

Magnetic Circuits: B-H curve, solution of magnetic circuits, hysteresis and eddy current losses. Transformers: Construction, EMF equation, ratings, equivalent circuit, phasor diagram, regulation and efficiency calculations, open and short circuit tests.

Module V: Electrical Machines

Construction, principle, characteristics of DC machines, applications of DC machines.

Text Books:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition.
2. Basic Electrical Engineering, T. K. Nagsarkar & M.S. Sukhija, Oxford Publication.
3. Basic Electrical Engineering, V.N. Mittle and A. Mittal, TMH, Second Edition

Reference Books:

1. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH.
4. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

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Gautam Buddha University

School of Engineering

Course code - EE202

Course Name – Measurements and Instrumentation

Pedagogy

The pedagogy will be a mixed of lectures, experience sharing, real life case discussions, assignments and industry/ research based projects. The course is based on strategic issues with cases as the primary vehicle for learning. In addition to reading materials, additional reading and cases will be distributed in the class from time to time. Students are also expected to prepare and analyze all the cases as class participation is very important.

Course requirement

i) Since much of the course material requires class lectures and discussions, it is important that you are prepared for the class, present and defend your ideas. Preparation for the class includes having read the assignment material.

ii) There will be several home assignments related to the subject and a number of unannounced quizzes. Late submissions of assignments will not be accepted and there will be no makeup quizzes.

iii) Class participation will be based on the value you add to the class through your questions, statements and comments. The quality of questions, statements and comments is more important than the quantity of these.

Evaluation Scheme

TA

Quiz	: 10%
Assignments	: 10%
Class participations	: 5%

Examination

Mid Term	: 25%
End Term	: 50%

Measurements and Instrumentation

EE 202

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Learning Objective of the Subject/Course:- To impart a comprehensive knowledge of instrumentation and its application in various engineering streams. To enable the student to have idea of calibration and measurements of various types of quantities applications. To prepare the students for career in industry and academics and research.

MODULE I

Measurements and Measurement Systems Measurements, Significance of Measurements, Methods of Measurements, Types of Instruments, Classification of Instruments, Applications of Measurement Systems, Elements of Generalized Measurement systems, Input-Output Configurations of Measuring Instruments and Measuring Systems, Methods of Corrections for Interfering and Modifying Inputs.

MODULE II

Characteristics of Instruments

Measurement System Performance, Static Calibration, Static Characteristics, Accuracy, Precision, Resolution, Reproducibility, Linearity, Sensitivity. Errors in Measurement, Types of Errors: Gross error, Systematic errors, Environmental Errors, Observational and Residual Errors.

MODULE III

Transducers and Sensors

Introduction, Mechanical Spring Devices, Pressure Sensitive Primary Devices, Flow Rate Sensing Elements, Classification of Transducers on the basis of Principal of Transduction, Characteristics and Choice of Transducers. Inductive Transducer -Linear Variable Differential Transformer, Resistive Transducers; Potentiometers, Strain Gauges, Applications of Strain Gauges, Rosettes, Resistance Thermometers, Capacitive transducers, Piezoelectric Transducers, Photoelectric and Digital Displacement Transducers.

MODULE IV

Measurement of Non- Electrical Quantities

Displacement Measurement, Measurement of Strain, Pressure Measurement, Vacuum Measurement, Measurement of Velocity, Measurement of Torque, Measurement of Flow, Turbine Flow Meters, Electromagnetic Flow Meter, Measurement of Liquid Level, Measurement of Humidity.

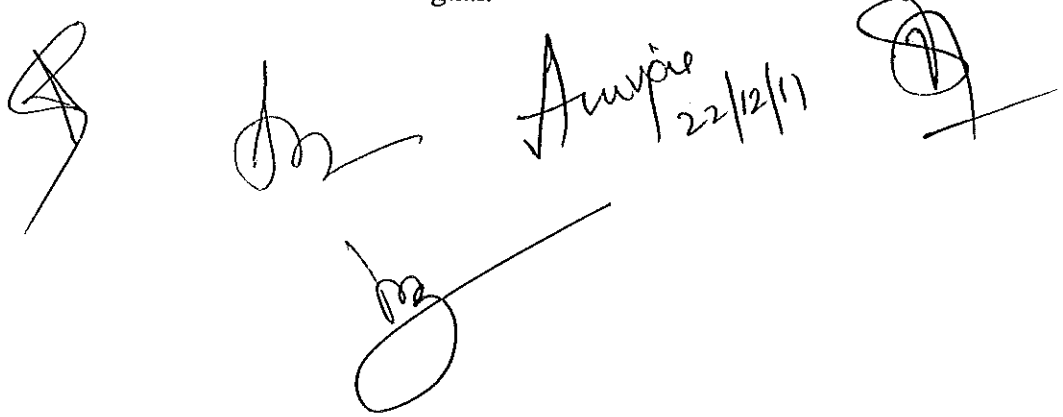
MODULE V

Bridge Theory

Wheatstone bridge, Low Resistance Measurement-KDB, AC bridge theory, Capacitance bridges, Inductance bridges.

Bio Medical Signals

Fundamentals of Medical Instrumentation, Sources of Biomedical Signals, Basic Medical Instrumentation System. Introduction to ECG & EEG signal.

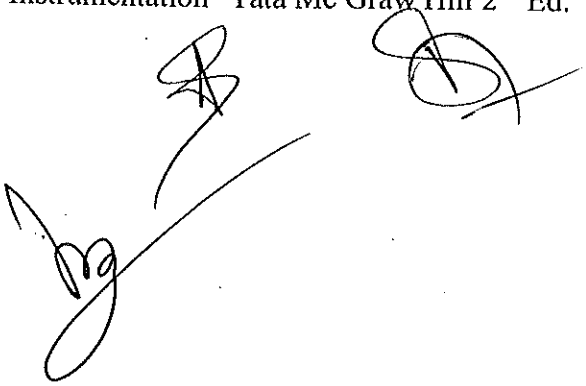


Text Book:

1. E O Doeblin, Measurement Systems Application & Design. 5th Ed. TMH.
2. A K Sawhney, "A Course in Electrical & Electronics Measurements & Instrumentation", Dhanpat Rai 2000 Reprint.

Reference Books:

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., Oxford University Press 2010, 2011 (Previously published by PHI).
2. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
3. Helfric & Cooper, "Modern Electronic Instrumentation & Measurement Techniques", PHI.
4. Golding & Widdies, "Electrical Measurements and Measuring Instruments" Wheeler.
5. Nakra & Chaudhary, "Instrumentation Measurement & Analysis" Tata Mc Graw Hill.
6. R S Khandpur, "Bio Medical Instrumentation" Tata Mc Graw Hill 2nd Ed.

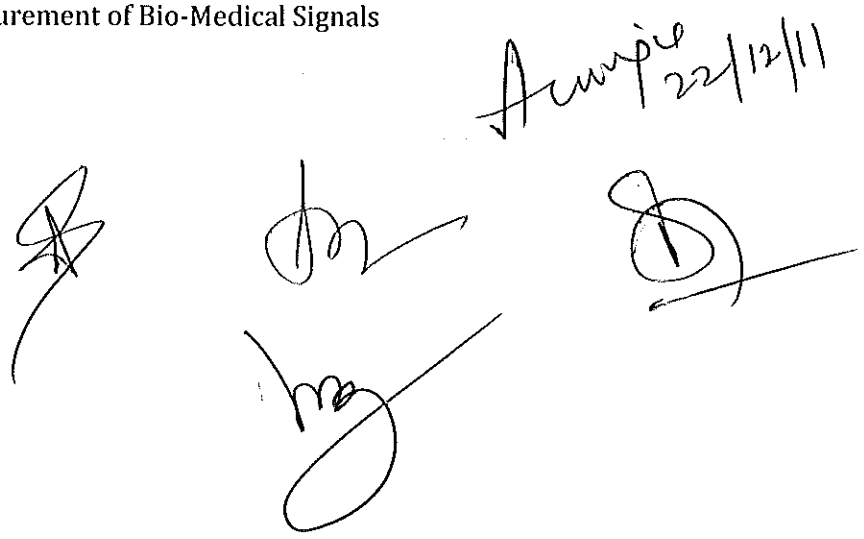


EE216: Measurements and Instrumentation **L-T-P- 0-0-2** **Credit: 1**

Measurements and Instrumentation Lab

List of Experiments

1. Measurement of Low Resistance By Kelvin's Double Bridge
2. Measurement of Self Inductance By Maxwell's Bridge
3. Measurement of Self Inductance By Hay's Bridge
4. Measurement of Capacitance By Schering Bridge
5. Measurement of Frequency By Wein's Bridge
6. Measurement of Capacitance By Wien's Bridge
7. Measurement Of Temperature Using Resistance Temperature Detector (RTD)
8. Study And Plot Of LDR Characteristics
9. To Verify The Characteristics Of LVDT
10. Measurement of Temperature Using Thermocouple
11. Measurement of Displacement Using Strain Gauge Type Displacement Transducer
12. Study & Measurement of Pressure Using Pressure Transducer
13. Measurement of Humidity Using Capacitance Transducer
14. Study & Measurement of Bio-Medical Signals



Gautam Buddha University

School of Engineering

Course code - EE204

Course Name – Digital Electronics

Pedagogy

The pedagogy will be a mixed of lectures, experience sharing, real life case discussions, assignments and industry/ research based projects. The course is based on strategic issues with cases as the primary vehicle for learning. In addition to reading materials, additional reading and cases will be distributed in the class from time to time. Students are also expected to prepare and analyze all the cases as class participation is very important.

Course requirement

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ii) There will be several home assignments related to the subject and a number of unannounced quizzes. Late submissions of assignments will not be accepted and there will be no makeup quizzes.

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Evaluation Scheme

TA

Qiuzzes	: 10%
Assignments	: 10%
Class participations	: 5%

Examination

Mid Term	: 25%
End Term	: 50%

Module 1: Number Systems and Codes: Radix and Radix conversions, sign, magnitude & complement notation. Weighted and non-weighted codes, BCD codes, self-complementing codes, cyclic codes, error detecting and correcting codes, ASCII & EBCDIC codes. Alphanumeric codes. Fixed point and floating point arithmetic. BCD arithmetic.

Module 2: Boolean algebra and Digital Logic Gates: Features of Boolean algebra, postulates of Boolean algebra, theorems of Boolean algebra. Fundamental logic gates, derived logic gates, logic diagrams and Boolean expressions. Converting logic diagrams to universal logic.

Positive, negative and mixed logic. **Minimization Techniques:** Minterm, Maxterm, Karnaugh's maps, simplification of logic functions with K-map, conversions of truth tables in

SOP & POS forms, incompletely specified functions, variable mapping, Quinn-Mcklusky Method.

Module 3: Switching Circuits and Logic Families: Diode, BJT, FET as switch. Different types of logic families: RTL, TTL, open collector TTL, three state output logic, TTL subfamilies, MOS, CMOS, ECL IIL.

Module 4: Combination Systems: Combinational logic circuit design, Half and full adder & subtractors. Binary serial and parallel adders, BCD adder. Binary multiplier, comparator, decoders, encoders, multiplexer, de-multiplexer, Code converters.

Module 5: Sequential Systems: Latches, Flip-Flop: R-S, D, J-K, T, Master slave. Flip-flop conversions.

Counters: Asynchronous & Synchronous counter. Counter design, counter applications. Registers: buffer & shift register.

Text Books

1. Digital Electronics by Morris Mano, Prentice Hall Publication
2. Digital Electronics by Malvino Leach, TMH

Reference Book

1. Digital Electronics by Floydd.

DIGITAL ELECTRONICS LAB

1) Study of following combinational circuits: Multiplexer, Demultimplexer and Encoder. Verify truth tables of various logic functions.
2) Study of various combinational circuits based on: AND/NAND Logic blocks and OR/NOR Logic blocks.
3) To study various waveforms at different points of a transistor bistable multivibrator and its frequency variation with different parameters.
4) To design a frequency divider using IC-555 timer.
5) To study various types of registers and counters.
6) To study Schmitt trigger circuit.
7) To study transistor astable multivibrator.
8) Experimental study of characteristics of CMOS integrated circuits.
9) Interfacing of CMOS to TTL and TTL to CMOS.
10) To study and perform BCD to binary conversion
11) To study and perform experiment -Voltage comparator circuit.
12) Design 2-bit binary up/down binary counter on breadboard.

Gautam Buddha University

School of Engineering

Course code - EE 206

Course Name - Electromagnetic Field Theory

Pedagogy

The pedagogy will be a mixed of lectures, experience sharing, real life case discussions, assignments and industry/ research based projects. The course is based on strategic issues with cases as the primary vehicle for learning. In addition to reading materials, additional reading and cases will be distributed in the class from time to time. Students are also expected to prepare and analyze all the cases as class participation is very important.

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iii) Class participation will be based on the value you add to the class through your questions, statements and comments. The quality of questions, statements and comments is more important than the quantity of these.

Evaluation Scheme

TA

Quiz : 10%
Assignments : 10%
Class participations : 5%

Examination

Mid Term : 25%

End Term : 50%

EE 206: Electromagnetic Field Theory **L-T-P: 3-1-0** **Credits: 04**

Module 1: Review of Vector algebra and Coordinate Systems

Vector operations, del, gradient, divergence and curl operator, Cartesian, cylindrical and spherical coordinate systems, Relations among these coordinate system

Module 2: Electrostatic Fields

Electric potential, Electric field intensity, Field due to line and surface charge, Electric dipole, Gauss law and its applications for spherical and cylindrical geometries, Laplace and Poission's equation in various coordinate systems, Capacitance and the effect of dielectric, Boundary conditions at electric interfaces. Method of images

Module 3: Magnetic Fields

Magnetic field due to electric current, Bio-Savert law, magnetic flux, flux density and magnetic field intensity, interaction of currents and fields, Amperes law, Magnetic vector potential, Boundary conditions at magnetic interfaces

Module 4: Electromagnetic Field

Faraday's law, self and mutual inductance of transmission lines and cables, Energy stored in Electric and Magnetic fields

Module 5: Time Varying Field

Continuity of charge, Displacement current, Maxwell's equation in integral and differential form for static and time varying fields

Applications

Poynting vector, Poynting's theorem, Power loss in a plane conductor
Polarization, Reflection and Refraction of plane waves at surface interface, surface impedance
TE, TM and TEM wave propagation
Circuit representation of parallel plane transmission lines, Transmission lines with losses, Line theory, Smith Chart.

Text Books

1. Mathew N.O. Sadiku, "Elements of Electromagnetics", Third Edison, Oxford University Press
2. W.H. Hayt, "Engineering Electromagnetics", Tata Mc Graw-Hill publications

Reference Books

1. D.K. Cheng, "Fields and wave electomagnetics", Second Edison, Addison-Wesley Press
2. Joseph Edminister, "Schaum's outline of Electromagnetics", Schaum's outline series
3. John D. Kraus, "Electromagnetics" McGraw Hill, 4th Edition
4. N. Narayana Rao, "Elements of Engg. Electro Magnetics", Prentice Hall of India, 3rd Edition.

Gautam Buddha University

School of Engineering

Course code - EE208

Course Name - Generation of Electric Power

Pedagogy

The pedagogy will be a mixed of lectures, experience sharing, real life case discussions, assignments and industry/ research based projects. The course is based on strategic issues with cases as the primary vehicle for learning. In addition to reading materials, additional reading and cases will be distributed in the class from time to time. Students are also expected to prepare and analyze all the cases as class participation is very important.

Course requirement

i) Since much of the course material requires class lectures and discussions, it is important that you are prepared for the class, present and defend your ideas. Preparation for the class includes having read the assignment material.

ii) There will be several home assignments related to the subject and a number of unannounced quizzes. Late submissions of assignments will not be accepted and there will be no makeup quizzes.

iii) Class participation will be based on the value you add to the class through your questions, statements and comments. The quality of questions, statements and comments is more important than the quantity of these.

Evaluation Scheme

TA

Quiz	: 10%
Assignments	: 10%
Class participations	: 5%

Examination

Mid Term	: 25%
End Term	: 50%

EE207: Generation of Electric Power **L-T-P: 3-0-0** **Credit: 3**

Module1: Conventional Energy Generation Methods: (i) Thermal Power plants: Basic schemes and working principle. **(ii) Gas Power Plants:** open cycle and closed cycle gas turbine plants, combined gas & steam plants – basic schemes. **(iii) Hydro Power Plants:** Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. **(iv) Nuclear Power Plants:** Nuclear fission and Nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants.

Module2: New Energy Sources: Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming). Renewable and non-renewable energy sources. Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal.

Module3: (i) Loads and Load curves: Types of load, chronological load curve, load duration curve,energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. **(ii) Power factor improvement**: Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers.

Module4: Power Plant Economics: (i) Capital cost of plants, annual fixed and operating costs of plants,generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. **(ii) Energy cost reduction:** off peak energy utilization, co-generation, and energy conservation.

Module5: (i) Tariffs: Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate,block meter rate. Two part tariff, power factor dependent tariffs, three-part tariff. Spot (time differentiated) pricing. **(ii) Selection of Power Plants:** Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generating units, types of reserve and size of plant. Selection and location of power plants.

Text Books

1. Rao & Uppal "Electrical Power System" Khanna Publishers.
2. B.R. Gupta, " Generation of Electrical Energy, S. Chand Publisher
3. S. N. Singh, "Electric Power Generation, Transmission and Distribution", PHI Publication

Reference Books

1. Philip Kiameh " Power Generation Handbook" TMH Publisher

Gautam Buddha University

School of Engineering

Course code - EE210

Course Name - Electrical Machine-II

Pedagogy

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Evaluation Scheme

TA

Quiz	: 10%
Assignments	: 10%
Class participations	: 5%

Examination

Mid Term	: 25%
End Term	: 50%

EE-210: ELECTRICAL MACHINE – II L-T-P: 3-1-0 Credits: 4

Module-I: Three-phase Induction Machines
Constructional features, types, Rotating magnetic field, Principle of operation, Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Time harmonics and space harmonics, Starting, Cogging & Crawling, Speed Control methods including emf injection in rotor circuit, Induction generator, applications.

Module-II: Single-phase Induction Machines
Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, shaded pole motor, Repulsion motor, Universal Motor, 2-phase servo motor construction and characteristics, applications.

Module-III: Synchronous Machines I
Constructional features of cylindrical and salient pole synchronous machines, EMF Equation, Armature reaction, Equivalent circuit and space and time phasor diagram, Open circuit and short circuit tests, Voltage Regulation using Synchronous Impedance method, MMF method, and Potier's triangle method, short circuit ratio.

Module-IV: Synchronous Machines II
Parallel operation of synchronous generators, synchronizing power and torque coefficients, Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.
Synchronous Motor: Starting and starting methods, speed control, V- Curves and inverted V-curves, Hunting , Damping, Synchronous condenser.

Module-V: Special Motors
Construction features, operating principle, characteristics and applications of Stepper motor, variable reluctance motor, permanent magnet motors, switched reluctance motors.

Text Books:

1. D.P.Kothari and I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Fitzerald, A.E.,Kingsley and S.D.Umans, "Electric Machinery", MC Graw Hill.

Reference Books:

1. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publications
2. P.C. Sen, "Principles of Electrical Machines and Power Electronics" John willey & Sons, 2001.
3. P.S.Bimbhra, "Electrical Machinery", Khanna Publications.
4. M.G.Say, "Alternating Current Machines", Pitman & Sons.

EE-214 ELECTRICAL MACHINE – II LAB L-T-P: 0-0-3 Credit: 2

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine its equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To study speed control of three phase induction motor by varying supply voltage.
4. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
5. To determine equivalent circuit of a single phase induction motor and draw speed-torque characteristics of single phase induction motor.
6. To determine speed-torque characteristics of a three phase induction motor by (i) keeping V/f ratio constant (ii) increasing frequency at the rated voltage.
7. To perform open circuit and short circuit tests on a three phase alternator and determine its equivalent circuit parameters.
8. To determine voltage regulation of a three phase alternator by EMF/MMF method.
9. To determine voltage regulation of a three phase alternator by ZPF method.
10. To determine V-curves and inverted V-curves of a three phase synchronous motor.
11. To determine X_d and X_q of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
12. Synchronization of an alternator:
    (a) Synchronization of a given alternator with infinite bus.
    (b) To study the effect of speed controller of Prime mover on real power sharing.
    (c) To study the effect of excitation on reactive power sharing.