Regent Education & Research Foundation

Group of Institution

Department of Basic Science & Humanities

Subject Name	: Mathematics IA
Subject Code	: BSM101
Name of the faculty	: Ms. Paramita Dutta
Name of the Program:	: B.Tech. in Computer Science & Engineering
Year and Semester	: 1st Year / 1st Semester
Academic Year and Semester	: 2023-24 / Odd Semester

Course Content:

Module No.	Description of Topic	Lectures Hours
1	**Calculus (Integration):** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	8
2	**Calculus (Diferentiation):** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.	6
3	**Matrices:** Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.	7
4	**Vector Spaces:** Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.	9
5	**Vector Spaces (Continued):** Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	10

Learning Resources

Text Books:

T1. K. PAL & K. DAS. Engineering Mathematics , Volume – I

Reference Books:

R1. Kar & Karmakar, Engineering Mathematics-I, McGraw Hill India.

R2. Reena Garg, Engineering Mathematics-I, Khanna Publishers.

R3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers

WEB RESOURCES:

(i) http: //www.tsp.gatech.edu/optimal/index.html.

(ii) http: //www.nptel.ac.

(iii) https://www.en.wikipedia.org.

Module Wise Lesson Plan

Sl No.	Topic name	Preferred book	No. Of periods	Cumulative no. Of periods	CO Aimed	Delivery method
	UNIT I					
1	Evaluation of definite and improper integrals	R1	1	1	BSM101.1	Chalk & Talk
2	Evaluation of definite and improper integrals	R1,R2	1	2	BSM101.1	Chalk & Talk
3	Beta and Gamma functions and their properties	R2	2	4	BSM101.1	Chalk & Talk
4	Beta and Gamma functions and their properties	R1	1	5	BSM101.1	Smart Board
6	Applications of definite integrals to evaluate surface areas and volumes of revolutions.	R1	1	6	BSM101.1	Chalk & Talk
7	Applications of definite integrals to evaluate surface areas and volumes of revolutions.	R1	1	7	BSM101.1	Peer teaching
8	Tutorial		1	8	BSM101.1	Chalk & Talk
	UNIT II					
9	Rolle's Theorem & its application.	R1	1	9	BSM101.2	Chalk & Talk
10	Mean value theorems& its application.	R2	1	10	BSM101.2	Chalk & Talk
11	Taylor's and Maclaurin's theorems with remainders	R1	1	11	BSM101.2	Chalk & Talk, Group-Learning
12	Taylor's and Maclaurin's theorems with remainders	R1	1	12	BSM101.2	Peer teaching
13	Indeterminate forms and L'Hospital's rule; Maxima and minima	R1	1	13	BSM101.2	Chalk & Talk
14	Indeterminate forms and L'Hospital's rule; Maxima and minima	R1	1	14	BSM101.2	Smart board, PPT Presenta

						tion
15	Assesment by Assignment		1	15	BSM101.2	Assignment
UNIT III						
16	Matrices, Vectors: addition and scalar multiplication	R1	1	19	BSM101.3	Chalk & Talk
17	matrix multiplication	R2	1	20	BSM101.3	Learning through problem -solving
18	Linear systems of equations	R1,R2	1	21	BSM101.3	Chalk & Talk
19	linear Independence, rank of a matrix	R1	1	22	BSM101.3	Chalk & Talk
20	Determinants, Cramer's Rule, inverse of a matrix,	R1	1	23	BSM101.3	Chalk & Talk
21	Gauss elimination and Gauss-Jordan elimination.	R1	1	24	BSM101.3	Learning through problem -solving
22	Assesment by Quiz with MCQ	R1	1	25	BSM101.3	MCQ
UNIT IV						
23	Vector Space	R1	1	26	BSM101.4	Smart Board
24	linear dependence of vectors	R1	1	27	BSM101.4	Chalk & Talk
25	Basis, Dimension	R1	1	28	BSM101.4	Project Based Learning
26	Linear transformations (maps), Range and Kernel of a linear map,	R1	1	29	BSM101.4	Project Based Learning
27	Rank and Nullity		1	30	BSM101.4	Project Based Learning
28	Inverse of a linear transformation.	R1	1	31	BSM101.4	Chalk & Talk
29	. Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.		1	32	BSM101.4	Chalk & Talk

30	Assesment by Assignment	R1	1	33	BSM101.4	Assignment
UNIT V						
31	Eigenvalues, Eigenvectors	R1	1	34	BSM101.5	Chalk & Talk
32	Symmetric, Skew-symmetric, and Orthogonal Matrices.	R1	1	35	BSM101.5	Learning through problem -solving
33	Symmetric, Skew-symmetric, and Orthogonal Matrices	R1	1	36	BSM101.5	Chalk & Talk
34	Eigen bases.	R1	1	37	BSM101.5	Chalk & Talk
35	Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization	R1	1	38	BSM101.5	Chalk & Talk
36	Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization	R1	1	39	BSM101.5	Learning through problem -solving
37	Tutorial	R1	1	40	BSM101.5	Tutorial

Note:- Delivery method could be chalk & talk, tutorial session, seminar, digital demonstration, assignments, group learning, peer teaching.

University Syllabus

Course Name : Electrical & Electronics Measurement

Course Code : PC-EEE-403

Credit Points : 3

Prerequisites:

- Basic Electrical Engineering (ES-EE-101)
- Electric Circuit Theory (PC-EEE-301)

Objectives:

1. To learn methods of measurement, errors in measurement and its classification.
2. To learn the principle of operation of analog and digital meters.
3. To learn the basic principle of operation of instrument transformers.
4. To learn the principle of operation of cathode ray oscilloscope and different sensors and transducers.
5. To learn the principle of measurement of power, energy and different electrical parameters.
6. To acquire problem solving skills to solve problems on the topics studied.

Course Content:

UNIT	CONTENT	HOURS
1	Measurements,Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments. Analog meters,General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments,Principle of operation of the Electrostatic,Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.	**7**
2	Instrument transformer,Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors.Measurement of Power,Principle of operation of Electrodynamic & Induction type wattmeter, Wattmeter errors Measurement of Energy.Construction, theory and application of AC energy meter, testing of energy meters.	**9**
3	Measurement of resistance,Measurement of medium, low and high resistances, Megger, Potentiometer,Principle of operation and application of Crompton's DC,potentiometer, Polar and Co-ordinate type AC potentiometer,applications AC Bridges,Measurement of Inductance, Capacitance and frequency by AC bridges	**8**

4	Cathode ray oscilloscope (CRO),Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO,Electronic Instruments,Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator, Digital Storage oscilloscope.	**7**
5	Sensors & Transducers,Introduction to sensors & Transducers, Strain gauge, LVDT,Temperature transducers, Flow measurement using magnetic flow measurement.	**4**

Recommended books for reference:

TEXT BOOKS

Text Books:

1. A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai& sons.
2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing
3. Sensors & Transducers, D. Patranabis, PHI, 2nd edition.

REFERENCES

1. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.
2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.
3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric& W.C. Copper,Wheeler Publication
4. Instrument transducers, H.K.P. Neubert, Oxford University press.
5. All-in One Electronics Simplified, A.K. Maini, Khanna Book Publishing Co. (2018)

OTHER REFERENCES

1. Internet sources helped us to solve advanced problems & theory.

Learning Outcomes/ Course Outcomes:

Upon completion of this module, students will be able to:

Course name	CO	Description
Electrical & Electronics Measurement (PC-EEE-403)	PC-EEE-403.1	explain the terms accuracy, precision, resolution, speed of response, errors in measurement, loading effect
	PC-EEE-403.2	describe methods of measurement of power, energy by instruments and resistance, capacitance and inductance by bridges and potentiometer
	PC-EEE-403.3	explain the principle of operation of analog meters, instrument transformer, digital multimeter, digital voltmeter, digital frequency meter, signal generator, strain gauge, LVDT and temperature transducers
	PC-EEE-403.4	explain the different building block, principle of operation of oscilloscope and measurement techniques of voltage, current, frequency and phase by oscilloscope
	PC-EEE-403.5	explain the different building block, principle of operation of oscilloscope and measurement techniques of voltage, current, frequency and phase by oscilloscope
	PC-EEE-403.6	specify applications of analog and digital measuring instruments, sensors and transducers

PO mapping with course outcome:

Course Outcome mapping to Program Outcome												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PC-EEE-403.1	2	2		2	1							
PC-EEE-403.2	1	2		2								
PC-EEE-403.3	2	2	3									
PC-EEE-403.4	2	2	1	3	1	2	2					
PC-EEE-403.5	1	2	2	3								
PC-EEE-403.6	2		2	2								

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Program Specific Outcome (PSO):

Course name	PSO	Description
Electrical & Electronics Measurement (PC-EEE-403)	**PSO1**	Demonstrate and analyze the execution of Electrical Machines, Control and Instrumented frameworks and Control and Control Electronic frameworks.
	PSO2	Plan the equipment and software prerequisites for the advancement of Electrical drives and Industrial Automation frameworks.
	PSO3	Solve complex electrical engineering challenges in a socially acceptable manner by utilizing contemporary and suitable methods that promote sustainable growth.
	PSO4	Apply the understanding of management concepts and ethical standards needed to collaborate with others in a team.

Course Outcome Mapping to Program Specific Outcome				
CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**
PC-EEE-403.1	3	3	1	2`
PC-EEE-403.2	3	2	3	3
PC-EEE-403.3	3	2	2	2
PC-EEE-403.4	3	3	2	1
PC-EEE-403.5	3	2	1	2
PC-EEE-403.6	3	1	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Module Wise Lesson Plan:-

Sl. No.	TOPIC NAME	Preferred Books	No. of Periods	Cumulative No. of Periods	CO Aimed	Delivery methods
UNIT- I						
1	Measurements, Method of measurement, Measurement system,	T1	1	1	1	Chalk and talk
2	Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response	T1	1	2	1	Chalk and talk
3	Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments	T1	1	3	1	ICT based classroom
4	Analog meters, General features, Construction, Principle of operation and torque equation of Moving coil	T1	1	4	1	Chalk and talk
5	Moving iron, Electrodynamometer	T1	1	5	1	Chalk and talk
6	Induction instruments	T1	1	6	1	Chalk and talk
7	Principle of operation of the Electrostatic, Thermoelectric	T1	1	7	1	Chalk and talk
8	Rectifier type instruments	T1	1	8	1	Chalk and talk
9	Extension of instrument ranges and multipliers.	T1	1	9	1	Chalk and talk
UNIT- II						
10	Instrument transformer	R1	1	10	3	Chalk and talk
11	Disadvantage of shunt and	R1	1	11	3	Chalk and

	multipliers, Advantage of Instrument transformers,					talk
12	Principle of operation of Current & Potential transformer	R1	1	12	3	Chalk and talk
13	.Measurement of Power	R1	1	13	5	ICT based classroom
UNIT- III						
14	Principle of operation of Electrodynamic & Induction type wattmeter	R1	1	14	5	Chalk and talk
15	Wattmeter errors, Measurement of Energy	R1	1	15	5	Chalk and talk
16	theory and application of AC energy meter	R1	1	16	5	Chalk and talk
17	testing of energy meters, Related Numerical	R1	1	17	5	Chalk and talk
18	Measurement of resistance	R1	1	18	5	Chalk and talk
19	Measurement of medium resistance	T1	1	19	5	Chalk and talk
20	Measurement of low, high resistance	T1	1	20	5	Peer teaching
21	Megger Potentiometer	T1	1	21	2	ICT based classroom
22	Principle of operation and application of Crompton's DC potentiometer	T1	1	22	2	Chalk and talk
23	Polar and Co-ordinate type AC potentiometer	T1	1	23	2	Chalk and talk
24	applications AC Bridges	T1	1	24	5	Chalk and talk
25	Measurement of Inductance	T1	1	25	5	Chalk and talk

26	Capacitance and frequency by AC bridges	T1	1	26	5	Chalk and talk
27	Related Numerical	T1	1	27		Chalk and talk
UNIT- IV						
28	Cathode ray oscilloscope (CRO),	R1	1	28	4	ICT based classroom
29	Measurement of voltage, current, frequency & phase by oscilloscope	R1	1	29	4	Chalk and talk
30	Frequency limitation of CRO, Sampling and storage oscilloscope	R1	1	30	4	Chalk and talk
31	Double beam CRO	R1	1	31	4	ICT based classroom
32	Electronic Instruments,Advantages of digital meter over analog meters	R1	1	32	3	Chalk and talk
33	Digital voltmeter, Resolution and sensitivity of digital meters	R1	1	33	3	Chalk and talk
34	Digital multimeter, Digital frequency meter	R1	1	34	3	Chalk and talk
35	Signal generator, Digital Storage oscilloscope.	R1	1	35	3	Chalk and talk
36	Related Numerical	R1	1	36	3	Chalk and talk
UNIT- V						
37	Sensors & Transducers	T1	1	37	3	Chalk and talk
38	Strain gauge	T1	1	38	3	ICT based classroom
39	LVDT,Temperature transducers	T1	1	39	3	Peer teaching

40	Flow measurement using magnetic flow measurement.	T1	1	40	3	Chalk and talk

University Syllabus

Course Name : POWER GENERATION ECONOMICS

Course Code : PE-EE 701C

Credit Points : 3

Prerequisites:

Electric Power system-I (PC-EE-502)
Electric Power system-II (PC-EE-601)

Objectives:

1. To understand the basics of economics of Power generation.
2. To understand different methods of Tariff.
3. To understand the optimization with unit commitment in power system.
4. To understand the principle of economic load dispatch.
5. To learn the principle of measurement of power, energy and different electrical parameters.
6. To understand the method of state estimation and load forecasting in a power system.

Course Content:

UNIT	CONTENT	HOURS
1	Economics of Generation: Cost of power generation- Thermal, Hydro and Nuclear. Types of Consumers in a distribution system- Domestic, Commercial, Industrial etc. Concept of load factor, plant capacity factor, plant use factor, diversity factor, demand factor. Choice of size and number of generation units.	**8**
2	Tariff: Block rate, flat rate, two part, maximum demand, Power factor and three part tariffs. Subsidization and Cross subsidization. Availability tariff of generation companies. Pool tariff of transmission companies. Availability based tariff (ABT).	**7**
3	Unit Commitment: Constraints in Unit Commitment, Spinning reserve, Thermal unit constraints, Hydro constraints, Must run, Fuel constraints. Unit commitment solution methods,	**8**
4	Economic Dispatch: Transmission loss formulae and its application in economic load scheduling. Computational methods in economic load scheduling. Active and reactive power optimization	**8**
5	State Estimation and load forecasting in power system: Introduction, state estimation methods, concept of load forecasting, load forecasting technique and application in power system.	**7**

Recommended books for reference:

TEXT BOOKS

Text Books:

1. Economic operation of Power System, L.K. Kirchmayar Wiely India Pvt. Ltd, 2009
2. Power system Analysis, operation & control, A. Chakrabarty & S. Haldar, PHI, 2010.
3. Modern power system analysis, D.P. Kothari & I.J. Nagtrath, Tata McGraw Hill, 2007.

REFERENCES

1. Power generation operation & control, A.J. Wood & B.F. Wollenberg, G.B. Sheble, Wiley, 2013
2. Operation and control in power system, P.S.R. Murthy, BSP Publication. 2009

Learning Outcomes/ Course Outcomes:

Upon completion of this module, students will be able to:

Course name	CO	Description
Power Generation & Economics (PE-EE-701C)	PE-EE-701C.1	explain the different terms e.g. load factor etc for economics of generation.
	PE-EE-701C.2	apply different types of tariff for electricity pricing.
	PE-EE-701C.3	optimize the operation of power system with unit commitment.
	PE-EE-701C.4	Determine generation levels such that the total cost of generation becomes minimum for a defined level of load.
	PE-EE-701C.5	determine the state of the system given by the voltage magnitudes and phase angles at all buses,
	PE-EE-701C.6	predict the power or energy needed to balance the supply and load demand at all the times.

PO mapping with course outcome:

Course Outcome mapping to Program Outcome												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PE-EE-701C.1	2	2		2	1							
PE-EE-701C.2	1	2		2								
PE-EE-701C.3	2	2	3									
PE-EE-701C403.4	2	2	1	3	1	2	2					
PE-EE-701C.5	1	2	2	3								
PE-EE-701C.6	2		2	2								

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Program Specific Outcome (PSO):

Course name	PSO	Description
Power Generation Economics (PE-EE-701C)	**PSO1**	An ability to indicate, plan, analyze the concepts and applications of planning, operation, communication and control within the field of electrical and electronics engineering.
	PSO2	An ability to use contemporary design tools to assess, create, and execute solutions for a range of applications while being aware of technology improvements.
	PSO3	An ability to use electrical and electronics engineering concepts to create future plans and roadmaps with a focus on the effects on society and the environment.

CO	PSO1	PSO2	PSO3
PE-EE-701C.1	3	3	2
PE-EE-701C.2	2	1	1
PE-EE-701C.3	2	2	2
PE-EE-701C.4	3	3	3
PE-EE-701C.5	1	2	1
PE-EE-701C.6	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Module Wise Lesson Plan:-

Sl. No.	TOPIC NAME	Preferred Books	No. of Periods	Cumulative No. of Periods	CO Aimed	Delivery methods
UNIT- I						
1	Cost of power generation- Thermal, Hydro and Nuclear.	R1	1	1	1	Chalk and talk
2	Types of Consumers in a distribution system- Domestic, Commercial, Industrial etc	R1	2	3	1	Chalk and talk
3	Concept of load factor, plant capacity factor, plant use factor, diversity factor, demand factor	R1	2	5	1	Chalk and talk
4	Numericals from load factor, demand factor	R1	2	7	1	Chalk and talk
5	Choice of size and number of generation units.	R1	1	8	1	Chalk and talk
UNIT- II						
6	Block rate, flat rate, two part, maximum demand, Power factor and three part tariffs.	R1	2	10	2	ICT based classroom
7	Subsidization and Cross subsidization. Availability tariff of generation companies.	R1	2	12	2	Chalk and talk
8	Pool tariff of Transmission companies. Availability based tariff (ABT).	R1	1	13	2	Peer teaching
UNIT- III						
9	Constraints in Unit Commitment	R1	2	15	3	ICT based classroom
10	Spinning reserve, Thermal unit constraints, Hydro constraints, Must run, Fuel constraints.	R1	2	17	3	Chalk and talk
11	Unit commitment solution	R1	2	18	3	Chalk and

	methods,					talk
12	Unit commitment solution methods,	R1	2	20	3	Chalk and talk
13	Unit commitment solution methods,	R1	2	22	3	Chalk and talk
UNIT- IV						
14	Transmission loss formulae and its application in economic load scheduling	R1	2	24	4	ICT based classroom
15	Transmission loss formulae and its application in economic load scheduling	R1	2	26	4	Chalk and talk
16	Computational methods in economic load scheduling.	R1	2	28	4	Chalk and talk
17	Computational methods in economic load scheduling.	R1	2	30	4	Chalk and talk
18	Active and reactive power optimization	R1	1	31	4	Chalk and talk
19	Active and reactive power optimization	R1	1	32	4	ICT based classroom
UNIT- V						
20	Introduction, state estimation methods	T2	1	33	5	Chalk and talk
21	state estimation methods	T2	2	35	5	Chalk and talk
22	concept of load forecasting	T2	1	36	5	ICT based classroom
23	load forecasting technique and application in power system..	T2	2	38	5	Chalk and talk

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