SEMESTER WISE COURSE STRUCTURE

AND

SUBJECT WISE COURSE CONTENT

FOR

BACHELOR OF ENGINEERING PROGRAMME

(3RD to 8th SEMESTER)

IN

ELECTRICAL ENGINEERING

APPLICABLE FOR BATCH 2015 AND ONWARDS

APPROVED BY BOARD OF STUDIES
On *27th of August, 2014*

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR
HAZRATBAL, SRINAGAR, KASHMIR – 190 006

SEMESTER WISE COURSE STRUCTURE

AND

SUBJECT WISE COURSE CONTENT

3rd to 8th Semester

[BATCH 2015 ONWARDS]

Department of Electrical Engineering

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 3rd

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-301	Basic Electrical Engineering	2	1		3		3
	ELE-301P	Basic Electrical Engineering LAB	-	-	2		1	1
2	ECE-301	Network Analysis and Synthesis	3	1	0	4		4
3	ECE-302	Electronics-I	2	1		3		3
	ECE-302P	Electronics-I LAB	-	-	2		1	1
4	PHY-303	Electro Magnetic Fields & Waves	2	1	0	3		3
5	MET-302	Electrical Engineering Materials	2	1	0	3		3
6	MTH-305	Mathematics-III	2	1	0	3		3
7	MECH-ELE	Thermal Engineering	3	1	0	4		4
		Total	16	7	4	23	2	25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE THIRD (3RD) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-301	Principles of Electrical Engineering (For ECE Department)	2	1		3		3
	ELE-301P	Principles of Electrical Engineering LAB (For ECE Department)			2		1	1
2	ELE-302	Electrical Engineering Technology (For Civil Engineering Department)	2	1		3		3
	ELE-302P	Electrical Engineering Technology LAB (For Civil Engineering Department)			2		1	1
3	ELE-303	Electrical Engineering Technology (For Chemical Engineering Department)	2	1		3		3
	ELE-303P	Electrical Engineering Technology LAB (For Chemical Engineering Department)			2		1	1
4	ELE-304	Electrical Engineering Technology (For Metallurgical Engg. Department)	2	1		3		3
	ELE-304P	Electrical Engineering Technology LAB (For Metallurgical Engg. Department)			2		1	1
5	ELE-305	Circuit Analysis (For Computer Sciences and Engg)	2	1		3		3
	ELE-305P	Circuit Analysis LAB (For Computer Sciences and Engg)			2		1	1
6	ELE-305	Circuit Analysis (For Information Technology)	2	1		3		3
	ELE-305P	Circuit Analysis LAB (For Information Technology)			2		1	1

L- Lecture T- Tutorial P- Practical TH- Theory

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 4th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-401	Electric Machines-I	3	1	0	4	-	4
	ELE-401P	Electric Machines-I Lab.	0	0	2	-	1	1
2	ELE-402	Control Systems-I	3	1	0	4	-	4
3	ELE-403	Electrical Measurements and Measuring Instruments	3	1	0	4	-	4
	ELE-403P	Electrical Measurements and Measuring Instruments Lab	0	0	2	-	1	1
4	ECE-402	Electronics - II	3	1	0	4	-	4
	ECE-402P	Electronics – II Lab.			2	-	1	1
5	CIV-401	Hydraulics and Hydraulic Machines	2	1	0	3	-	3
6	MTH-402	Mathematics-IV	2	1	0	3	-	3

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE FOURTH (4TH) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-405	Electrical Machines (For ECE Department)	2	1		3		3
2	ELE-405P	Electrical Machines Lab. (For ECE Department)			2		1	1
3	ELE-406	Electrical Engineering Technology (For Mechanical Engineering Department)	2	1		3		3
4	ELE-406P	Electrical Engineering Technology Lab. (For Mechanical Engineering Department)			2		1	1
5	ELE-407	Control Systems (For ECE Department)	2	1		3		3
6	ELE-407P	Control Systems Lab. (For ECE Department)			2		1	1
7	ELE-408	Control Systems (For Information Technology)	2	1		3		3
8	ELE-408P	Control Systems (For CSE)	2	1		3		3

L- Lecture T- Tutorial P- Practical TH- Theory

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 5th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-501	Power Systems - I	2	1	0	3	-	3
	ELE-501P	Power Systems – I Lab	0	0	2	0	1	1
2	ELE-502	Electric Machines-II	3	1	0	4	-	4
	ELE-502P	Electric Machines-II Lab	0	0	2	-	1	1
3	ELE-503	Control System-II	2	1	0	3	-	3
	ELE-503P	Control System-II & VI Lab.	0	0	2	-	1	1
4	ELE-504	Computer Aided Simulation of Electrical Systems	0	0	3	-	2	2
5	ECE-508	Communication Systems	2	1	0	3	-	3
6	ECE-509	Digital Electronics & Logic Design	2	1	0	3	-	3
	ECE-509P	Digital Electronics & Logic Design Lab	0	0	2	-	1	1
7	MTH-503	Mathematics-V	2	1	0	3	-	3
		Total	14	6	9	22	3	25

L- Lecture T- Tutorial P- Practical TH- Theory

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 6th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-601	Power Systems-II	3	1	0	4	-	4
	ELE-601P	Power Systems-II LAB	0	0	2	-	1	1
2	ELE-602	Power Electronics	3	1	0	4	-	4
	ELE-602P	Power Electronics LAB	0	0	2	-	1	1
3	ELE-603	Electric Machines Design	3	1	0	4	-	4
4	ELE-604	Tour & Training	0	0	0	2	-	2
5	ELE-605	Digital Signal Processing	3	1	0	4	-	4
6	ELE-606	Microprocessors	3	1	0	4	-	4
	ELE-606P	Microprocessors LAB	0	0	2	-	1	1
Total Credits								25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE SIXTH (6th) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-607	Power Electronics (For ECE Department)	2	1	0	3	0	3
	ELE-607P	Power Electronics Lab. (For ECE Department)	0	0	2	0	1	1

L- Lecture T- Tutorial P- Practical TH- Theory

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 7th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-701	Power System Protection	2	1		3		3
2	ELE-701 P	Power System Protection LAB.			2		1	1
3	ELE-702	Advanced Power Electronics	3	1	0	4		4
4	ELE-703	Power Systems-III	3	1	0	4		4
5	ECE-708	Electronic Measurements & Instrumentation	2	1		3		3
6	ECE-708P	Electronic Measurements & Instrumentation LAB			2		1	1
7	ELE-704	Power Station Practice	2	1	0	3		3
8	ELE-1-14	Elective-I	2	1	0	3		3
9	ELE-706P	Project Preliminary Work/ Seminar	0	0	3		3	3
Total credits								25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE SEVENTH (7th) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-705	Electrical Power Systems (For ECE Department)	2	1		3		3
2	ELE-705P	Electrical Power Systems Lab. (For ECE Department)	0	0	2		1	1

L- Lecture T- Tutorial P- Practical TH- Theory

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 8th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	HSS-701	General Management & Economics	2	1	0	4		03
2	ELE-1-14 / MTH-705	Elective-II	2	1	0	3		03
3	ELE-803	High Voltage Engineering	2	1	0	3		03
4	ELE-803P	High Voltage Engineering Lab.	0	0	2	0	1	01
5	ELE-802	Project	0	0	18	12		12
6	ELE-1-14	Elective-III	2	1	0	3		03
Total Credits								25

L- Lecture T- Tutorial P- Practical TH- Theory

ANNEXURE I

Electives for 7th & 8th Semesters (Electrical)

BATCH 2015 ONWARDS

Electives –I, II, III

3 Credits each

1.	Distribution System Automation	ELE-1/E
2.	Industrial Process Instrumentation & Telemetry	ELE-2/E
3.	Selected Topics in Advanced Control	ELE-3/E
4.	Mechatronics	ELE-4/E
5.	Advanced Power Systems Control	ELE-5/E
6.	Power Systems Transients	ELE-6/E
7.	System Planning & Load Forecasting	ELE-7/E
8.	EHV AC & DC Transmission	ELE-8/E
9.	Maintenance & Design of Electrical Sub Stations	ELE-9/E
10.	Power System Reliability	ELE-10/E
11.	Utilization & Traction	ELE-11/E
12.	Microcontroller & their Applications + LAB	ELE-12/E
13.	Electric Drives + LAB	ELE-13/E
14.	Renewable Sources of Electrical Energy	ELE-14/E
15.	Optimization Techniques	MTH-705

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 3rd

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-301	Basic Electrical Engineering	2	1		3		3
	ELE-301P	Basic Electrical Engineering LAB	-	-	2		1	1
2	ECE-301	Network Analysis and Synthesis	3	1	0	4		4
3	ECE-302	Electronics-I	2	1		3		3
	ECE-302P	Electronics-I LAB	-	-	2		1	1
4	PHY-303	Electro Magnetic Fields & Waves	2	1	0	3		3
5	MET-302	Electrical Engineering Materials	2	1	0	3		3
6	MTH-305	Mathematics-III	2	1	0	3		3
7	MECH-ELE	Thermal Engineering	3	1	0	4		4
		Total	16	7	4	23	2	25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE THIRD (3RD) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-301	Principles of Electrical Engineering (For ECE Department)	2	1		3		3
	ELE-301P	Principles of Electrical Engineering LAB (For ECE Department)			2		1	1
2	ELE-302	Electrical Engineering Technology (For Civil Engineering Department)	2	1		3		3
	ELE-302P	Electrical Engineering Technology LAB (For Civil Engineering Department)			2		1	1
3	ELE-303	Electrical Engineering Technology (For Chemical Engineering Department)	2	1		3		3
	ELE-303P	Electrical Engineering Technology LAB (For Chemical Engineering Department)			2		1	1
4	ELE-304	Electrical Engineering Technology (For Metallurgical Engg. Department)	2	1		3		3
	ELE-304P	Electrical Engineering Technology LAB (For Metallurgical Engg. Department)			2		1	1
5	ELE-305	Circuit Analysis (For Computer Sciences and Engg)	2	1		3		3
	ELE-305P	Circuit Analysis LAB (For Computer Sciences and Engg)			2		1	1
6	ELE-305	Circuit Analysis (For Information Technology)	2	1		3		3
	ELE-305P	Circuit Analysis LAB (For Information Technology)			2		1	1

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-301 Course Title **Basic Electrical Engineering**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 03 | 3rd Semester | Autumn | √ | Spring | |

6 Course Outcomes

CO1: Analyze the behavior of different electric circuit parameters and have a thorough understanding of different types of energy sources.

CO2: Analyze the different configurations of DC circuits using basic circuit laws like KVL, KCL and tools like mesh analysis and nodal analysis.

CO3: Apply network analysis theorems like Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem to DC circuits and networks.

CO4: Use phasor representation for steady state analysis of sinusoidally excited AC circuits and apply different network techniques for their analysis

CO5 Understand the concept of active, reactive power and power factor correction in AC circuits, and analyze various configurations of 3-phase AC circuits

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**REVIEW OF ELECTRIC CIRCUIT LAWS:** Review of electric circuit concepts, terminology, basic laws, and electric circuit parameters	03
2.	**ENERGY SOURCES:** Ideal and practical voltage and current sources and their transformation, Dependant Sources.	02
3.	**D.C. CIRCUIT ANALYSIS:** Power and energy relations, Analysis of series parallel D.C. Circuits, Loop and nodal methods of analysis, Delta- star (Δ-Y) transformation, Super-position theorem, Thevenin's and Norton's theorems, Maximum power transfer theorem.	14
4.	**A.C. CIRCUIT ANALYSIS:** Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits, Concepts of active & reactive powers.	16
5.	**STEADY STATE A.C. THREE- PHASE CIRCUITS:** Characteristics of 3 phase systems, Current and voltage relationships in Y-Δ & Δ-Y configurations, Balanced / un-balanced systems.	05
6.	**MAGNETIC CIRCUITS (INTRODUCTION)** Mutual inductance, theory of magnetic circuits, electro- magnetism	02
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander & Sadiku	McGraw- Hill
2	Basic Engineering Circuit Analysis	Irwin & Nelms	Wiley
3	Electric Engineering Fundamentals	Vincent Del Toro	PHI
4	Electric Circuits Fundamentals	Franco	Oxford University Press
5	Basic Electric Circuit Analysis	Johnson, Hilburn, Johnson	Wiley

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-301P	Course Title	**Basic Electrical Engineering LAB**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Course Outcomes**

CO1: Connection of Ammeters, Voltmeters, Wattmeter's and multi-meters in DC and AC circuits and selection of their ranges.
CO2: To verify the KVL, KCL, and star/delta transformation
CO3: To verify superposition and maximum power transfer theorem on DC circuits
CO4: To measure electric power and power factor in single-phase AC circuits

7. Lab. Experiments:

S.No	Experiments
1	To study the colour coding of resistors
2	Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.
3	Use of LCRQ meter.
4	To study the series / parallel operation of resistors and verifying their effective values by LCRQ meter.
5	To verify the KVL and KCL in DC circuits.
6	To verify the star delta transformation of networks.
7	To verify the superposition theorem.
8	To verify the maximum power transfer theorem
9	Basic R, L, C circuits excited from A.C
10	To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
11	To measure the power and power factor in three phase AC circuits.
12	To study the series resonance.
13	To study the parallel resonance.
14	To study the handling of CRO and use it for the study of different voltage waveforms.
15	Computer Aided Circuit Analysis (3 experiments)

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ECE-301	Course Title	Network Analysis & Synthesis							
2	Contact Hours		L	3	T	1	P	0			
3	Examination Duration (Hrs):		Theory	02	Practical	00					
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	04	3rd Semester	Autumn	√	Spring					

6 **Course Outcomes**

CO1: Comprehensive understanding of electrical circuits and network theorems.
CO2: Analysis of transient and steady state response of circuits in time domain
CO3: Analysis of two port networks in s-domain and synthesis of networks.
CO4: Understanding frequency response and passive filters.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Development of the circuit Concept:** Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts, approximate realization of a physical system as a circuit	3
2.	**Conventions for describing networks:** Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology	3
3.	**First order differential equation:** Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks	6
4	**Laplace Transformations:** Solution of Network problems with Laplace transformation, Heavisides expansion theorem	4
5	**Wave form analysis and synthesis:** The unit step, ramp and impulse functions and their Laplace transforms, Initial and final value theorems, convolution integral, convolution as summation	4
6	**Network theorems and impedance functions:** Complex frequency, transform impedance and transform circuits, series and parallel combinations of elements, Fosters reactance theorem and reciprocity theorem	5
7	**Network Functions- poles and zeros:** Ports or terminal pairs, Network functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on pole and zero locations for driving point and transfer functions. Time domain behaviour from pole zero plot	5
8	**Two port parameters:** Relationship of two port parameters, Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, Parallel connection of two port Networks, Characteristics impedance of two port networks.	6
9	**Filters :** Filter fundamentals – pass and stop band, filter classification, constant K & m derived filters, Behaviour of characteristic impedance over pass & stop bands, design of filters.	6
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Network Analysis	Van Valkenberg	Prentice Hall of India
2	Network Analysis and Synthesis	F. F. Kuo	John Wiley & Sons

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ECE-302	Course Title	**Electronics-I**							
2	Contact Hours		L	2	T	1	P	0			
3	Examination Duration (Hrs):		Theory	02	Practical	00					
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	03	3rd Semester	Autumn	√	Spring					

6 **Course Outcomes**

CO 302.1	Familiarization with basic semiconductors
CO 302.2	Understanding the behavior of different types of diodes at circuit level.
CO 302.3	Analyze and study the behavior of different types of transistors such as bipolar junction transistors, JFET'S, MOSFET'S and amplifiers.
C0 302.4	Study of Cathode ray oscilloscope.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction to Semiconductors:** p and n types, transport mechanism of charge carriers, electric properties, Hall effect etc. Electronic Devices, their characteristics and applications.	8
2.	**pn junction- diode:** Current components in P- n junction, characteristics- piece –wise linear approximation, temperature dependence, Diode capacitance and switching times, diode circuits – half wave, full- wave rectifiers, clipping circuits etc; basic operation of zener and schottky diodes and photodiodes, tunnel diode.	8
3.	**UJT's & BJT's:** Types, operation and characteristics, Ebers- Moll model, CE, CB and CC configurations- input, output characteristics and graphical analysis of basic amplifier circuits, biasing and Bias stability, Low frequency, h- parameter model, Analysis and Design of transistor amplifier circuits using h parameters. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies, Multistage amplifiers, Phototransistors. Transistor as a switch. SCR's and Thyristors	15
4	**JFET's:** Operation and characteristics, models, application as low and high frequency amplifiers, switching circuits, MOSFETS -–types, operation and characteristics	8
5	Cathode- ray Oscilloscope- basic operation and measurement, applications	3
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Integrated Electronics	Millman and Halkias	
2	Electronic Devices & Circuits	Bolysted	Pearson Education
3	Electronic Devices & Circuits	Bogarat	Pearson Printice Hall
4.	Electronic Devices & Circuits	Godsi & Bakhshi	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ECE-302P	Course Title	**Electronics-I LAB**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Objective:**

To acquire knowledge and become familiar with the different techniques to solve the different complex Electrical, Electronics Circuits & Electrical Machines.

7. Lab. Experiments:

S.No	Experiments
1	To obtain diode characteristics.
2	(a) To assemble a half wave and a full wave rectifier ad to study their performance. (b) To suppress the nipple using RC filter.
3	To obtain Zener diode characteristics and to use Zener diode as a voltage regulator.
4	To assemble and observe the performance of clipping and clamping ckts.
5	To obtain transistor characteristics in the following configurations. i) Common base ii) Common emitter
6	To assemble a CE amplifier and observe its performance.
7	To obtain frequency response of a RC coupled CE amplifier.
8	To assemble an emitter follower circuits and observe its performance.
9	To obtain JFET characteristics and to observe performance of a source follower.
10	To illustrate use of FET as a voltage variable resistor.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code PHY-303 Course Title **Electro Magnetic Fields & Waves**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 3rd Semester | Autumn | √ | Spring | |

6 **Course Outcomes**

CO1: Students will remember the concepts of vector calculus and will be able to apply in Electrodynamics.

CO2: Students will understand special techniques and will be able to evaluate the potential problems.

CO3: Students will understand the concepts of the Magnetostatic Fields

CO4: Students will understand the concept of the Electromagnetic wave in different modes and their origin.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1	**Electrostatics** Curvilinear Coordinates, The Dirac-Delta Function, Helmholtz Theorem, Scalar and Vector Potentials, The Electrostatics field, Divergence and Curl of electrostatics fields, Applications of Gauss law, Introduction to potential, Poisson equation and Laplace equation, The potential of a localized charge distribution, Electrostatic boundary conditions, Work and Energy in electrostatics, Basic properties of conductor, The surface charge on a conductor.	06
2	**Special Techniques for Calculating Potentials** Laplace equation in one, two & three Dimensions, Boundary conditions and uniqueness theorem, Conductors and the 2nd uniqueness theorem, The classic image problem, The induced surface charge, Force and energy other image problems, Separation of variables, Approximate Potentials at large distance, the monopole and dipole terms, The Electric field of a dipole.	08
3	**Magnetostatic Fields** The Lorentz force law, The Biot-Savarts law, Divergence and curl of B, Magnetic Vector potential, Magnetostatic Boundary conditions, Multipole expansion of the Vector Potential, Magnetization, Torque and force on magnetic dipoles, Effect of magnetic field on atomic orbits, Amperes law in magnetized material, Magnetic Susceptibility and permeability.	08
4	**Electromagnetic Waves** Electromagnetic wave in one Dimension, Sinusoidal waves, Polorization, Boundary condition, Reflection and transmission, Energy and momentum of electromagnetic waves, Propagation through linear media, Reflection and refraction at oblique incidence, electromagnetic waves in conductors, Rectangular Wave guides, TE and TM modes.	10
5	**Electrodynamics** Electrodynamics before Maxwell, Maxwell's equations and magnetic charge, Maxwell's equation inside matter, Boundary conditions, Scaler and vector potentials, Gauge Transformations, Coloub Gauge and Lorentz Gauge, Lorentz Gauge, Lorentz force law in potencial form, Newton's third law in electrodynamics, Poynting theorem, Maxwell's Stress tensor, Conservation of momentum, Electromagnetic waves in non-conducting media, Monochromatic plane waves in conducting media.	10
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Introduction to electro-dynamics	David J. Griffiths	[PHI-Pvt Ltd, New Delhi –India
2	Electrodynamics	J.D. Jacson	Pearson
3	Mathematical method for Physicists	Arfken Weber	Harcourt (INDIA)
4	Classical Theory & Fields	L.D. Landau, E.M. Lypshitz	Pergman

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	MET-302	Course Title	**Electrical Engineering. Materials**							
2	Contact Hours		L	2	T	1	P	0			
3	Examination Duration (Hrs):		Theory	02	Practical	00					
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	03	3rd Semester	Autumn	√	Spring					

6 **Course Outcomes**

CO1: Understand about the crystal structures of different metals and alloys
CO2: Understand the basics of electrical conduction in metal and alloys
CO3: Understand the semiconductor materials and dielectric behaviour of materials
CO4: Discuss about basic principles of magnetic materials and superconductive materials
CO5: Understand about optical properties in metals and non-metals

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Crystalline nature of solids, Transformation in alloys. Electrical conduction in metals and alloys. Applications of conductors. Some important resistor alloys. Dielectrical materials and their electrical properties. Semiconductors, their properties and applications.	14
2.	Magnetic properties of solids - types of magnetism, magnetic domain, soft magnetic materials - their characteristics, applications of iron-silicon, iron-nickel and iron-cobalt alloys. Hard magnetic materials, their properties and applications. Some important carbon steels and precipitation hardening type magnet alloys and their applications.	20
3.	Optical properties of materials. Super- conducting theory and materials.	08
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Introduction to solid state Physics	C. Kittel	Wiley
2	Solid State Physics	Dekker	Prentice Hall
3	Physical Metallurgy Principles	Reedhill	Affiliated East West Press Pvt. Ltd.
4	Theoretical Structural Metallurgy	Cottrell	Arnold
5	Electricity and Magnetism	H.E. Duckworth	Holt, Renihart Winston
6	The Structure and Properties of Materials Vol.4	Rose, Shepperd, Wulf.	John Wiley (New York)

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	MTH-305	Course Title	**Mathematics-III**							
2	Contact Hours		L	2	T	1	P	0			
3	Examination Duration (Hrs):		Theory	02	Practical	00					
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	03	3rd Semester	Autumn	√	Spring					

6 **Course Outcomes**

CO1: Apply various methods for evaluation Laplace and inverse Laplace transforms of various functions
CO2: Apply Laplace transform for solving ordinary differential equations
CO3: Evaluate Fourier transforms of various functions and using Fourier transforms for solving partial differential equations
CO4: Develop the concept of Z-transforms, evaluate z-transforms of various functions and apply these concepts for solving difference equations

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Laplace Transforms:** Laplace transform, shifting theorem, Laplace Transforms of different functions, Heaviside's unit function. Dirac Delta function its Laplace Transforms. Heaviside's Expansion theorem. Inverse Laplace Transforms. Initial and Final value theorems, Convolution theorem and applications, use of Laplace Transforms in the solution of linear Differential equations.	22
2.	**Fourier Transform**: Fourier series, Harmonic analysis, Definition of Fourier transform. Fourier sine and cosine transform. Fourier integral formula, Applications to solutions of boundary value problems.	06
3.	**Z- Transform :** Definition, Linearity property, Z- transform of elementary functions, shifting theorems. Initial and Final value theorem. Convolution theorem. Inversion of Z-transforms.	10
	Total Contact Hours	38

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Laplace Transforms (Schaum Series)	Spiegel.	McGraw Hill
2	The use of Integral Transform	Ian.N.Snedden	Tata McGraw Hill.
3	Integral Transform	Loknath Debnath	New York, Press
	Advanced Engineering Mathematics	R.K. Jain & S.R.K. Lyengar	Narosa

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code MECH-ELE Course Title **Thermal Engineering**

2 Contact Hours L 3 T 1 P 0

3 Examination Duration (Hrs): Theory 02 Practical 00

4 Relative Weight age M-I 20 M-II 20 ASM 10 ME 50 PRE 00

5 Credits: 04 3rd Semester Autumn √ Spring

6 Course Outcomes

CO1	. Develop the concept of basic law of thermodynamics
CO2	Apply the concept Rankine cycle on the steam turbine
CO3	Develop the basic knowledge of IC engine operation and its parts
CO4	Apply the Basic concept of gas turbine

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**THERMODYNAMICS:** System and Surroundings, Zeroth Law, Temperature Scales, Equation of the state, First law, Steady flow, Isochoric, Isobaric, isothermal, adiabatic and polytrophic processes. Properties of steam, Second law, Entropy change, Reversible Irreversible processes, Carnot's Cycle, Rankine Cycle, Modified Rankine Cycle, Flow through nozzle.	16
2.	**STEAM TURBINE**: Impulse turbine, velocity and pressure compounding , work output, Losses and efficiency, Reaction turbine, work output, losses and efficiency, degree of reaction, Modern steam power cycles, Regenerative and Reheat cycles, Governing of steam Turbines, Fields of Application.	10
3.	**I.C. ENGINES:** Otto, Diesel and Dual cycles, Magneto and battery ignition, detonation and pre-ignition, Octane Number, Draught, Diesel knock, Cetane Number, various I.C engines fuels, Carburation and Injection , Lubrication, Cooling, Governing of I.C Engines, Fields of Application.	08
4	**GAS TURBINES:** Present status and future trends, Basic types and Cycles, Thermal refinements, jet propulsion, fields of Application.	08
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Steam Turbine Performance and Economics	Bartlett	McGraw Hill
2	Steam Turbine Theory and Practice	Kearton Pitman	CBS Publishers
3	Theory and Design of steam and Gas turbine	Loe	McGraw Hill
	Gas Turbines Theory and Practice	Cohn and Rogers	Pearson
	Turbo machines	Yahya	McGraw Hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-301			Course Title	**Principles of Electrical Engineering. [ECE]**						
2	Contact Hours				L	2	T	1	P	0		
3	Examination Duration (Hrs):				Theory	02	Practical	00				
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00	
5	Credits:	03		3rd Semester		Autumn	√	Spring				

6 Course Outcomes

CO1: Analyze the behavior of different electric circuit parameters and have a thorough understanding of different types of energy sources.

CO2: Analyze the different configurations of DC circuits using basic circuit laws like KVL, KCL and tools like mesh analysis and nodal analysis.

CO3: Apply network analysis theorems like Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem to DC circuits and networks.

CO4: Use phasor representation for steady state analysis of sinusoidally excited AC circuits and apply different network techniques for their analysis

CO5 Understand the concept of active, reactive power and power factor correction in AC circuits, and analyze various configurations of 3-phase AC circuits

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**REVIEW OF ELECTRIC CIRCUIT LAWS:** Review of electric circuit concepts, terminology, basic laws, and electric circuit parameters	03
2.	**ENERGY SOURCES:** Ideal and practical voltage and current sources and their transformation, Dependent Sources	02
3.	**D.C. CIRCUIT ANALYSIS:** Power and energy relations, Analysis of series parallel D.C. Circuits, Loop and nodal methods of analysis, Delta- star (Δ-Y) transformation, Super-position theorem, Thevenin's and Norton's theorems, Maximum power transfer theorem.	14
4.	**A.C. CIRCUIT ANALYSIS:** Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits, Concepts of active & reactive powers.	16
5.	**STEADY STATE A.C. THREE- PHASE CIRCUITS:** Characteristics of 3 phase systems, Current and voltage relationships in Y-Δ & Δ-Y configurations, Balanced / unbalanced systems.	05
6.	**MAGNETIC CIRCUITS (INTRODUCTION)** Mutual inductance, theory of magnetic circuits, electro- magnetism	02
	Total Contact Hours	42

8. Suggested Books:

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander Sadiko	McGraw- Hill,
2	Basic Engineering Circuit Analysis	Irwin	John Wiley
3	Electric Circuits Fundamentals	Franco	Harcourt Brace College (O.U.P)
4	Electric Circuit Analysis	Johnson, Johnson and Hilburn	John Wiley

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-301P		Course Title	**Principles of Electrical Engineering Lab [ECE]**					
2	Contact Hours			L	0	T	0	P	1	
3	Examination Duration (Hrs):			Theory	00			Practical	02	
4	Relative Weight age			MSLE	25			I	25	
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Course Outcomes**

CO1: Connection of Ammeters, Voltmeters, Wattmeter's and multi-meters in DC and AC circuits and selection of their ranges.
CO2: To verify the KVL, KCL, and star/delta transformation
CO3: To verify superposition and maximum power transfer theorem on DC circuits
CO4: To measure electric power and power factor in single-phase AC circuits

7. Lab. Experiments:

S.No	Experiments
1	To study the colour coding of resistors
2	Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.
3	Use of LCR Q-meter.
4	To study the series / parallel operation of resistors and verifying their effective values by LCR Q -meter.
5	To verify the KVL and KCL in DC circuits.
6	To verify the star delta transformation of networks.
7	To verify the superposition theorem.
8	To verify the maximum power transfer theorem
9	Basic R, L, C circuits excited from A.C
10	To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
11	To measure the power and power factor in three phase AC circuits.
12	To study the series resonance.
13	To study the parallel resonance.
14	To study the handling of CRO and use it for the study of different voltage waveforms.
15	Computer Aided Circuit Analysis (3 experiments)

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-302			Course Title	**Electrical Engineering Technology. [Civil]**						
2	Contact Hours				L	2	T	1	P	0		
3	Examination Duration (Hrs):				Theory	02			Practical	00		
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00	
5	Credits:	03		3rd Semester		Autumn	√	Spring				

6 Course Outcomes

CO1 To analyze and evaluate the electrical circuits, apply basic laws in circuit theory and to determine electric circuit parameters

CO2 To study and analyses of AC and DC series-parallel circuit, various network theorems, and basics of phasor and power of electrical circuit.

CO3 To analyses the characteristics of 3 phase systems, current and voltage relations in star/delta configuration's, Balanced/unbalanced systems.

CO4 To study and analyze the basics about electrical installation including switches, MCB, transformer, overhead and underground cables, and their specifications

CO5 To study and analyze of fundamental/basic operation, construction and working AC machines.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Electrical Circuit Laws** Basic Electric Circuit terminology, Ohm's Law, Kirchoffs Laws, circuit parameters series and parallel combinations of circuit elements, voltage and current sources.	06
2.	**D.C and A.C circuit Analysis.** Power and energy relations, analysis of series & parallel D.C circuits, loop and nodal methods, Delta Star (Δ-Y) transformation, superposition theorem, Thevenin's and Norton's theorems, maximum power transfer theorem. Basic terminology and definitions, phasor and complex number representation, solutions of sinusoidal excited RLC circuits, power and energy relation in A.C circuits, resonance in series and parallel circuits, concept of active and reactive power.	10
3.	**Steady State Three Phase AC Circuits.** Characteristics of 3-phase systems, concept of 3-phase voltage, Y-circuits, Δ-circuits, Y- Δ and Δ-Y current and voltage relations in 3 phase circuits, balanced / unbalanced systems.	10
4.	**Electrical Installation Practice:** Symbols of various electrical apparatus viz. switches / MCB's transformers / generators etc. Specification of overhead line conductor and underground cables layout of electrification schemes of buildings etc.	10
5.	**Electric Machines & Transformers.** Gen-principle of operation, construction and working of i) dc machines ii) A.C machines iii) Single phase transformers.	06
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander and Sadiku	McGraw- Hill,
2	Basic Engineering Circuit Analysis	J. Irwin, R.Delms	John Wiley
3	Electric Circuits Fundamentals	Franco	Harcourt Brace College (O.U.P)
4	Electric Circuit Analysis	Johnson, Johnson and Hilburn	John Wiley
5	Electric Machines	Nagarath, I.J. & Kothari,	Tata McGraw-Hill Company,
6	Engineering Circuit Analysis	Hayt & Kimmerly	Tata McGraw-Hill Company

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-302P	Course Title	**Electrical Engineering Technology Lab [Civil]**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Objective:**
To acquire knowledge and become familiar with the different techniques to solve the different complex Electrical, Electronics Circuits & Electrical Machines.

7. Lab. Experiments:

S.No	Experiments
1	To study the colour coding of resistors
2	Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.
3	Use of LCR Q-meter.
4	To study the series / parallel operation of resistors and verifying their effective values by LCR Q-meter.
5	To verify the KVL and KCL in DC circuits.
6	To verify the star delta transformation of networks.
7	To verify the superposition theorem.
8	To verify the maximum power transfer theorem
9	Basic R, L, C circuits excited from A.C
10	To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
11	To measure the power and power factor in three phase AC circuits.
12	To study the series resonance.
13	To study the parallel resonance.
14	To study the handling of CRO and use it for the study of different voltage waveforms.
15	Computer Aided Circuit Analysis (3 experiments)

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-303	Course Title	**Electrical Engineering. Technology [Chemical]**								
2	Contact Hours		L	2	T	1	P	0				
3	Examination Duration (Hrs):		Theory	02	Practical	00						
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00	
5	Credits:	03	3rd Semester	Autumn	√	Spring						

6 Course Outcomes

CO1 To analyze and evaluate the electrical circuits, apply basic laws in circuit theory and to determine electric circuit parameters

CO2 To study and analyses of AC and DC series-parallel circuit, various network theorems, and basics of phasor and power of electrical circuit.

CO3 To analyses the characteristics of 3 phase systems, current and voltage relations in star/delta configuration's, Balanced/unbalanced systems.

CO4 To study and analyze the basics about electrical installation including switches, MCB, transformer, overhead and underground cables, and their specifications

CO5 To study and analyze of fundamental/basic operation, construction and working AC machines.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Network Analysis and Theorems:** Basic circuit theory, resistance, inductance and capacitance, Ohm's law, KCL, KVL, power and energy relations, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	12
2.	**Sinusoidally Excited Circuits:** Basic definition of A.C. circuits, Phasor algebra and complex number representation, solution of sinusoidally excited R, L, C circuits.	06
3.	**Three-Phase Circuits:** The concept of 3-phase voltage, current and voltage relations in Y and D circuits, and basic characteristics of three phase circuits.	06
4.	**D.C. Generators and Motors:** Construction, principles of operation, types of D.C. generators and motors, and their applications.	05
5.	**Three-Phase Alternators:** Construction, principles of operation, phasor diagram, voltage regulation, types and application.	05
6	**Synchronous Motors:** Principle of operation, synchronous capacitors, application.	04
7	**Induction Motors:** Types, construction, principle of operation, characteristic and application. Electric Arc Furnace and its Accessories.	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander and Sadiku	McGraw- Hill,
2	Basic Engineering Circuit Analysis	J. Irwin, R.Delms	John Wiley
3	Electric Circuits Fundamentals	Franco	Harcourt Brace College (O.U.P)
4	Electric Circuit Analysis	Johnson, Johnson and Hilburn	John Wiley

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-303P	Course Title	**Electrical Engineering Technology LAB [Chemical]**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Objective:**
To acquire knowledge and become familiar with the different techniques to solve the different complex Electrical, Electronics Circuits & Electrical Machines.

7. Lab. Experiments:

S.No	Experiments
1	Verification of KCL & KVL and hence determination of equivalent resistance of a parallel circuit.
2	Verification of superposition theorem.
3	Verification of Thevenin's theorem.
4	Obtaining resonance in RLC circuits.
5	Measurement of power and power factor of a three-phase load.
6	To study the constructional details of single-phase transformer
7	To study the constructional details of D.C. machines.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-304	Course Title	**Electrical Engineering Technology [M&MED]**							
2	Contact Hours		L	2	T	1	P	0			
3	Examination Duration (Hrs):		Theory	02	Practical	00					
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	03	3rd Semester	Autumn	√	Spring					

6 Course Outcomes

CO1 To analyze and evaluate the electrical circuits, apply basic laws in circuit theory and to determine electric circuit parameters

CO2 To study and analyses of AC and DC series-parallel circuit, various network theorems, and basics of phasor and power of electrical circuit.

CO3 To analyses the characteristics of 3 phase systems, current and voltage relations in star/delta configuration's, Balanced/unbalanced systems.

CO4 To study and analyze the basics about electrical installation including switches, MCB, transformer, overhead and underground cables, and their specifications

CO5 To study and analyze of fundamental/basic operation, construction and working AC machines.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Electric circuits laws and D.C. circuits – super position principle. Thevenin's theorem. Maximum power transfer theorem.	18
2.	A.C circuits, basic definitions. Solution of RLC circuits.	12
3.	Three phase balanced star and delta connection circuits.	04
4..	D.C generators and motors and their characteristics, three phase alternators, synchronous and induction motors.	08
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander and Sadiku	McGraw- Hill,
2	Basic Engineering Circuit Analysis	J. Irwin, R.Delms	John Wiley
3	Electric Circuits Fundamentals	Franco	Harcourt Brace College (O.U.P)
4	Electric Circuit Analysis	Johnson, Johnson and Hilburn	John Wiley
5.	Electric Machines	Fitzgerald, A. E., Kingsley, C. J. and Umans, S.D.,	McGraw- Hill,

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-304P	Course Title	**Basic Electrical Engineering Lab [M&MED]**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Objective:**
To acquire knowledge and become familiar with the different techniques to solve the different complex Electrical, Electronics Circuits & Electrical Machines.

7. Lab. Experiments:

S.No	Experiments
1	Verification of KCL & KVL
2	Verification of superposition theorem.
3	Verification of Thevenin's theorem.
4	Obtaining resonance in RLC circuits.
5	Measurement of Max Power Transfer Theorem
6	To study the constructional details of single-phase transformer.
7	Measurement of Power and Power factor 3 load
8	Constructional details of a single phase transformer.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-305	Course Title	**Circuit Analysis [CSE / IT]**								
2	Contact Hours		L	2	T	1	P	0				
3	Examination Duration (Hrs):		Theory	02	Practical	00						
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00	
5	Credits:	03	3rd Semester	Autumn	√	Spring						

6 Course Outcomes

CO1: Analyze the behavior of different electric circuit parameters and have a thorough understanding of different types of energy sources.

CO2: Analyze the different configurations of DC circuits using basic circuit laws like KVL, KCL and tools like mesh analysis and nodal analysis.

CO3: Apply network analysis theorems like Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem to DC circuits and networks.

CO4: Use phasor representation for steady state analysis of sinusoidally excited AC circuits and apply different network techniques for their analysis

CO5 Understand the concept of active, reactive power and power factor correction in AC circuits, and analyze various configurations of 3-phase AC circuits

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**REVIEW OF ELECTRIC CIRCUIT LAWS:** Review of electric circuit concepts, terminology, basic laws, and electric circuit parameters	06
2.	**ENERGY SOURCES:** Ideal and practical voltage and current sources and their transformation, Dependant Sources	04
3.	**D.C. CIRCUIT ANALYSIS:** Power and energy relations, Analysis of series parallel D.C. Circuits, Loop and nodal methods of analysis, Delta- star (Δ-Y) transformation, Super-position theorem, Thevenin's and Norton's theorems, Maximum power transfer theorem.	12
4.	**A.C. CIRCUIT ANALYSIS:** Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits, Concepts of active & reactive powers.	12
5.	**STEADY STATE A.C. THREE- PHASE CIRCUITS:** Characteristics of 3 phase systems, Current and voltage relationships in Y-Δ & Δ-Y configurations, Balanced / un-balanced systems.	08
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander and Sadiku	McGraw- Hill,
2	Basic Engineering Circuit Analysis	J. Irwin, R.Delms	John Wiley
3	Electric Circuits Fundamentals	Franco	Harcourt Brace College (O.U.P)
4	Electric Circuit Analysis	Johnson, Johnson and Hilburn	John Wiley

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-305P	Course Title	**Circuit Analysis LAB [CSE/IT]**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	3rd Semester	Autumn	√	Spring				

6 **Objective:**
To acquire knowledge and become familiar with the different techniques to solve the different complex Electrical, Electronics Circuits,

7. Lab. Experiments:

S.No	Experiments
1	Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.
2	To verify the KVL and KCL in DC circuits.
3	To verify the star delta transformation of networks.
4	To verify the superposition theorem.
5	To verify the maximum power transfer theorem
6	Basic R, L, C circuits excited from A.C
7	To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
8	To measure the power and power factor in three phase AC circuits.
9	To study the series resonance.
10	To study the parallel resonance.

ABBREVATIONS

L	=	LECTURES
T	=	TUTORIALS
P	=	PRACTICALS
TH	=	THEORY
M-I	=	1ST MINOR EXAMINATION
M-II	=	2ND MINOR EXAMINATION
ASM	=	ASSIGNMENTS
ME	=	MAJOR EXAMINATION
PRE	=	PRESENTATION
MSLE	=	MID SEMESTER LABORATORY EXAMINATION
ELSE	=	END SEMESTER LABORATORY EXAMINATION
GD	=	GROUP DISCUSSION
WUP	=	WRITE UP
SYNP	=	SYNOPSIS
PR	=	PROJECT REPORT
EE	=	EXTERNAL EXAMINER
VV	=	VIVA VOCE
IASMT=	INTERNAL ASSESSMENT	
REPT	=	TRAINING REPORT

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 4th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-401	Electric Machines-I	3	1	0	4	-	4
	ELE-401P	Electric Machines-I Lab.	0	0	2	-	1	1
2	ELE-402	Control Systems-I	3	1	0	4	-	4
3	ELE-403	Electrical Measurements and Measuring Instruments	3	1	0	4	-	4
	ELE-403P	Electrical Measurements and Measuring Instruments Lab	0	0	2	-	1	1
4	ECE-402	Electronics - II	3	1	0	4	-	4
	ECE-402P	Electronics – II Lab.			2	-	1	1
5	CIV-401	Hydraulics and Hydraulic Machines	2	1	0	3	-	3
6	MTH-402	Mathematics-IV	2	1	0	3	-	3

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE FOURTH (4th) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			CREDITS		
			L	T	P	TH	P	Total
1	ELE-405	Electrical Machines (For ECE Department)	2	1		3		3
2	ELE-405P	Electrical Machines Lab. (For ECE Department)			2		1	1
3	ELE-406	Electrical Engineering Technology (For Mechanical Engineering Department)	2	1		3		3
4	ELE-406P	Electrical Engineering Technology Lab. (For Mechanical Engineering Department)			2		1	1
5	ELE-407	Control Systems (For ECE Department)	2	1		3		3
6	ELE-407P	Control Systems Lab. (For ECE Department)			2		1	1
7	ELE-408	Control Systems (For Information Technology)	2	1		3		3
8	ELE-408P	Control Systems (For CSE)	2	1		3		3

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE—**401** Course Title **ELECTRICAL MACHINES-I**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 4th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Apply the basic principles of electromechanical energy conversion to Electrical Machines
CO2: Analyze operating characteristics of various types of DC Generators.
CO3: Identify various speed control methods of DC Motor and evaluate this performance.
CO4: Analyze the performance of Transformers and selecting it for particular application

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Transformers** Single Phase Transformers: Introduction, classification, construction, electromotive force (m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltag regulation, Transformer tests (polarity test, open circuit test and short circuit test), All day efficiency, Frequency response, Parallel operation, Auto-transformers, Excitation phenomenon in transformers Three Phase Transformers: Construction, Connections, Open delta, Ratings, Phase Conversions Special Purpose Transformers: Impedance matching transformers, Isolation transformers constant current and constant voltage Transformers, Instrument Transformers (Introductio	17
2.	**Principles of Electromechanical Energy Conversion** Energy conversion via electric and magnetic fields, Field energy and mechanical force, energy balance, co energy	05
3.	**Direct current Machines: Generators and Motors.** General introduction, principles of operation of D.C machines, construction of D.C machines (Generators and motors), e.m.f and torque equations, power stages and efficiency, commutation and armature reaction, characteristics of D.C Generators, parallel operation, torque and speed of D.C Motors, characteristics of various types of D.C motors speed control of D.C motors, starting and electric braking.	17
4.	**Selection of D. C. Motors for various Applications** Electric drives, characteristics of electric drives, selection of D. C. motors for domestic, commercial and industrial applications	03
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill
2	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education
3	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill
4	Electric Machinery and Transformer	Guru, Hiziroglu	Oxford University press
5	Electric Machinery	P.S.Bimbhra	Khanna Publishers
6	Basic Electric Machines	Vincent Deltoro	Prentice Hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE—**401-P**	Course Title	**ELECTRICAL MACHINES-I Lab**					
2	Contact Hours		L	0	T	0	P	1	
3	Examination Duration (Hrs):		Theory	00	Practical	02			
4	Relative Weight age		MSLE	25	ESLE	25			
5	Credits:	01	4th Semester	Autumn		Spring	√		

6 **Course Outcomes**

CO1: To understand the performance of single Phase Transformer on different load conditions
CO2: To understand the performance of Three Phase Transformer on different load conditions
CO3: To determine the internal and external characteristics of the different types of dc generator by conducting load test
CO4: To determine the magnetization characteristics of the given dc shunt generator and to determine its critical field resistance and critical speed

7. Lab. Experiments:

S.No	Experiments
1	To perform open circuit and short circuit tests on a single-phase transformer
2	To perform polarity test on a single phase transformer
3	To determine the efficiency and voltage regulation of a single phase transformer
4	To perform Sumpner's test on two identical transformers
5	To study three phase connections on a bank of three single phase transformers
6	To study various parts of a dc machine and draw sketches of the same
7	To plot the saturation curve of a dc machine
8	To plot the external characteristics of a separately excited dc generator.
9	To study the voltage build up of a dc shunt generator
10	To plot the external characteristic of a dc shunt generator and compare the characteristics with that of a separately excited generator
11	To plot the external characteristics of a dc series generator.
12	To plot the external characteristic of a dc compound generator and compare the characteristics when run as a shunt generator, an over compound generator, a flat compound generator, an under compound generator and differentially compounded generator.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-**–402** Course Title **CONTROL SYSTEMS -I**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 4th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Introduction to continuous control systems open/closed loop, Automatic/manual.
CO2: Mathematical modelling transfer functions, block diagrams and signal flow graphs.
CO3: To determine the time response analysis of first and second order systems to various standard test inputs.
CO4: Stability studies of control systems, absolute and relative stability analysis.
CO5: Study of PID controllers, lead-lag Compensators, Introduction to modelling of dynamic systems in state space.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction to continuous control systems:** Definition of a control system, open-loop, closed loop (automatic and manual) control.	04
2.	**Mathematical modeling:** Transfer functions, block diagrams, signal flow graphs	08
3.	**First and second order system:** Example of first and second order systems, responses of these systems to step, ramp, parabolic and sinusoidal inputs, transient, steady state and error analysis	10
4.	**Stability studies:** Definition of stability, stability and pole locations, stability and Routh Table, stability and frequency response bode plot, polar plot, Nyquist's criterion , root locus.	10
5.	Proportional, Integral, Derivative (P.I.D) control. Compensator design Lead – lag compensators . Modeling of dynamic systems in state space (Introduction).	10
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Control Systems Engineering	Norman S. Nise	John wiley
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing
3	Control systems	A.Anand Kumar	PHI Learning Private limited
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall
5.	Design of feedback control systems	Stefani	Oxford university press

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE--403 Course Title **ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS**

2 Contact Hours	L	3	T	1	P	0

3 Examination Duration (Hrs):	Theory	02	Practical	00

4 Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00

5 Credits:	04	4th Semester	Autumn		Spring	√

6 **Course Outcomes**

CO1: To study the construction and principle of operation of various electromechanical indicating instruments and their mathematical analysis.
CO2: Evaluation of power, energy, and power factor of single and three phase circuits.
CO3: Determination of small, medium and large resistances using different methods.
CO4: Evaluation of Inductance, Capacitance, and Frequency using AC bridges.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Definition of basic terms used in measurements**	02
2.	**Electro-mechanical indicating instruments.** Classification, effects utilized in measuring instruments, various forces in an electro-mechanical indicating instrument, errors and their types, various methods of damping, galvanometers (D' Arsonal and Ballistic) Ammeters and Voltmeters (PMMC, Induction, Electrostatic and Dynamometer type), errors in voltmeters and ammeters, extension of instrument range, ammeter shunts, voltmeter multipliers	14
3.	**Measurement of Power, Energy and Power Factor** Power measurement in three phase a.c. circuits using single phase and 3-phase watt meter, measurement of reactive power (Single phase and 3-phase), Energy measurement using induction type meter, Energy meter testing, Power factor meter.	07
4.	**Measurement of Resistance:** Resistance classification, Measurement of Low resistance using potentiometer method and Kelvin double bridge, Measurement of medium resistance using ammeter-voltmeter method, substitution method, Wheatstone bridge, Measurement of high resistance using loss of charge method, Meggar.	06
5.	**Measurement of Inductance, Capacitance and Frequency using a.c bridges**.	05
6.	**Potentiometers;** D.C potentiometers, Crompton potentiometer, application of D.C potentiometer, A.C potentiometers, Drysdale Tinsley and Cambell larsen Potentiometers, Applications of A.C Potentiometers	04
7.	**Virtual Instrumentation:** Introduction to virtual Instrumentation. Measurement of Electrical and non-electrical quantities using virtual instruments.	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electrical Measurements and Measuring Instruments	Golding, Widdis	Pitman
2	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-403P	Course Title	**ELECTRICAL MEASUREMENT LAB**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	4th Semester	Autumn		Spring	√			

6 **Objective: The objective of the lab is to make students aware of various measuring techniques and various measuring instruments used in the measurement of electric quantities.**

7 Lab. Experiments:

S.No	Experiments
1	Measurement of power in single phase and three phase circuits using single phase and three phase wattmeters.
2	Energy Measurement using watt-hour meter as well as using wattmeter and stop watch.
3	To study the constructional details of an electromechanical indicating instrument with the help of demonstration type of instrument
4	Measurement of Inductance and capacitance using Bridge techniques(Anderson's Bridge, Wheat Stone's Bridge.)
5	Measurement of Resistance by different methods (Loss of charge method, substitution Method, Kelvin's Double Bridge)
6	To Study RC and LC models of a transmission line and observe the variation of voltage magnitude and phase along the line.
7	Measurement of Electrical and Non Electrical quantities using virtual instrumentation. (Dasylab)

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ECE –402** Course Title **ELECTRONICS -II**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 04 | 4th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Develop the concept of feedback and analysis of different feedback topologies.
CO2: Analysis and design of sinusoidal oscillators and multi-vibrators.
CO3: Understanding of basic concepts of power amplifiers and IC regulated power supplies.
CO4: Understanding basics of an OPAMP, its linear & non-linear applications and understanding circuit design of basic gates using various logic families.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Feedback Basics** Negative feedback, Effect of negative feedback on the performance of amplifiers e.g. on bandwidth. Types of feedback amplifiers, current shunt, current series, voltage shunt, and voltage series feedback. Analysis of feedback amplifiers circuits	10
2.	**Sinusoidal Oscillators:-** Basic operations, analysis of general oscillator circuit, Barkhausen's criteria, various types of oscillator circuits and their analysis, Design of practical oscillator circuits.	05
3.	**Power Amplifiers and Power Supplies** Classification of power amplifiers, Class A, Class B, Class AB and Class C power amplifiers; analysis and design. Power supplies and IC regulators	07
4.	**Operational Amplifiers:-** Operational amplifiers stages, Differential amplifier, CMRR, Cascade amplifier, Ideal and practical operational amplifier characteristics and properties OP amp applications, inverting and non inverting amplifiers, difference amplifier, summer, differentiator and integrator, rectifiers etc. OP amp in analog computation. Frequency response, Gain Bandwidth product, Signal to noise ratio.	10
5.	**Multivibrators and Wave Form Generators** Bistable, Monostable and astable multivibrators circuits, and their analysis. Wave form generators, triangular and square wave generators.	05
6.	**Logic families:** Introduction to DTL, TTL, ECL, RTL CMOS Logic family; CMOS, Pseudo-nMos, Pass Transistor. CMOS inverter Static and dynamic operation, common CMOS Logic Gate circuits.	05
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Integrated circuits	Millman & Halkias	Tata Mc-Graw Hill
2	Microelectronic circuits	Sedra and Smith	Oxford university Press
3	Introduction to Electronic Circuit Design	Spencer and Ghausi	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	**ECE –402-P**		Course Title	**ELECTRONICS LAB - II**				
2	Contact Hours			L	0	T	0	P	1
3	Examination Duration (Hrs):			Theory	00	Practical	02		
4	Relative Weight age			MSLE	25	ESLE	25		
5	Credits:	01	4th Semester	Autumn		Spring	√		

6 **Course Outcomes**

CO1: Comprehensive learning of synthesizing amplifier circuits using BJT and study its different configurations.

CO2: Understanding and design of circuits for different applications of OP-Amp like inverters, integrators, differentiators.

CO3: Study the characteristics of an Op-Amp and measure its parameters.

CO4: Synthesis of filter circuit using Op-Amp and study their characteristics.

7 Lab. Experiments:

S.No	Experiments
1	To assemble a differential amplifier and obtain its CMRR
2	(i) To assemble current series feedback amplifier and study its performance. (ii) To assemble a voltage shunts feedback amplifier and study its performance.
3	To assemble an RC phase shift oscillator.
4	(a) Study performance of multivibrator circuits using 555 chip in following Modes: (i) Bistable (ii) Astable (iii) Monostable. (b) Use of 555 chip as a timer circuit.
5	To assemble a schmitt trigger ckt. And to obtain its characteristics and to use it as Squaring circuit.
6	To assemble a Class A power amplifier and to determine its power gain.
7	To study different applications of OP-AMPS. (i) OP- AMP as an inverting amplifier. (ii) OP-AMP as a non-inverting amplifier. (iii) OP-AMP as an integrator. (iv) OP-AMP as a differentiator.
8	To study the performance of a voltage regulator IC chip.
9	To measure the following parameters of a typical OP-AMP. (i) I/P Impedance (ii) (ii) O/P Impedance (iii) (iii) Slew rate (iv) CMRR (iv) (v) Freq. response.
10	MINI PROJECT: To design & fabricate a regulated power supply.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **CIV-401** Course Title **HYDAULICS AND HYDRAULIC MACHINES**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 4th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: To develop an understanding about fluid properties and fluid statics involving pressure on plane and curved surfaces.

CO2: To develop an understanding of various aspects of kinematics of fluid flow which may include types of flows, continuity equation, etc.

CO3: To develop an understanding about the dynamics of fluid flow including equations of motion and their applications especially in flow measuring devices.

CO4: To understand various aspects of fluid flow through pipes and open channels

CO5: To understand various features and theoretical aspects of hydraulic machines- turbines and pumps.

CO6: To have a basic understanding of the layout of power house.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**INTRODUCTION:** PHYSICAL Properties of Fluids.	03
2.	**Fluid Statics:** Pressure Intensity, Pascal's law, pressure-density height relationships, manometers, pressure on plain and curved surfaces, centre of pressure.	05
3.	**Kinematics of Fluid Flow:** Types of flows, stream line, streak line and path line, continuity equation.	04
4.	**Dynamics of fluid Flow:** Euler's equation of motion along a stream line and its integration to yield Bernoulli's equation, Flow measurement, pitot tube, prandtl tube, Venturimeter, orifice meter, orifices and mouthpieces, Weirs and Notches.	07
5.	**Flow through Pipes:** Hydraulic grade line, Darcey-Weisbachh formula, Design of pipes, Equivalent diameter of pipes, Transmission of power through pipes.	06
6.	**Flow in open Channels:** Chezy's formula, Maining's formula. Design of Cannels, Economic section.	05
7.	**Hydraulic Machines:** Types of turbines, description and principles of Impulse and reaction turbines, unit quantities and specific speed, run a ay speed, turbine characteristics, selection of turbines, governing of turbines, centrifugal pumps, specific speed, Power requirement, Reciprocating pumps.	07
8	**Layout of power House:** General layout and arrangement of Hydropower units.	05
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Fluid Mechanics & Fluid Power Engineering	Dr D.S.Kumar	S.K.Kataria & Sons
2	Engineering Fluid Mechanics	R.J.Garde & A.G.Miraj	Scitech Publication
3	A textbook of Fluid & Hydraulic Machines	Dr R.K Bansal	Laxmi Publication

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **MTH –402** Course Title **MATHEMATICS-IV**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 4th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Determination of Analytic fuctions their Harmonic conjugates and Laplace equation
CO2: Differentiate and Integrate complex functions
CO3: Calculate singularities of a complex function and their classification and Expand complex valued functions in terms of Taylor, Laurent series
CO4: Evaluation of Integrals over contours
CO5: Understand Wavelet transform as a two parameter transform and its properties

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Complex Variables:** Review of Complex numbers, Applications of De-moivre's theorem, complex functions, hyperbolic functions. Analytic functions, Cauchy Riemann equations, Complex integration, Cauchy's fundamental theorem Cauchy's integral formula, Cauchy's inequality and Liouville's theorem, Taylor's and Laurent's expansions, Zeros and poles of analytic functions, Residues and Contour integration. Conformal Mappings, Bilinear Transformation.	30
2.	**Wavelet Transform:** Continuous wavelet transform, Basic properties of wavelet transform, Discrete wavelet transform, Orthonormal wavelets, Multi resolution analysis, Construction of orthonormal wavelets, Daubchies wavelets and algorithms. Band limited wavelets, Balian low theorem.	12
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Complex Variables and Applications	R.V.Churchill	Mc-Graw Hill International Book Company.
2	Theory of functions	Titchmarsh	Oxford university press
3	Advanced Engineering Mathematics	R.K.Jain and S.R.K. Iyenger, Narosa.	Narsa publication
4	A first course on Wavelets	Eugenio Hernandez, Guido and Weiss	Weiss, C.R.C.Press, Boca Raton New York.
	Ten lectures on Wavelets	I,Daubchies	SIAM Publications

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE –405 Course Title **Electrical Machines (ECE)**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 4th Semester | Autumn | | Spring | √ |

6 **Objective: : The objective of the course is to describe the operating principles, characteristics &applications of transformers and rotating electric machines (DC motors and generators)**

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Transformers:** Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test, autotransformers, three-phase transformer connections, impedance matching, isolation & instrument transformers.	10
2.	**D.C. Machines:** Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction, characteristics & application of d.c generators, starting & speed control of d.c motors, characteristics & applications of d.c motors, electric braking.	10
3.	**Induction Machines:** Three-phase induction motors. Principle of operation, construction, types. Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control. Single phase induction motors, starting, application	10
4.	**Synchronous Machines:** Construction, types & operating principle of synchronous generator, A.C armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change. Synchronous Motor, principle, starting, hunting, damper windings.	08
5.	**Special Purpose Motors:** Stepper Motor, Universal Motor, Shaded-pole Motor.	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill
2	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education
3	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill
4	Electric Machinery and Transformer	Guru, Hiziroglu	Oxford University press
5	Electric Machinery	P.S.Bimbhra	Khanna Publishers
6	Basic Electric Machines	Vincent Deltoro	Prentice Hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE–405P		Course Title	**Electrical Machines Laboratory (ECE)**					
2	Contact Hours			L	0	T	0	P	1	
3	Examination Duration (Hrs):			Theory	00	Practical	02			
4	Relative Weight age			MSLE	25	ESLE	25			
5	Credits:	01	4th Semester	Autumn		Spring	√			

6 **Objective: The objective of the lab is to familiarize the students with different electric machines, their operation and working and to perform various tests on them.**

7 Lab. Experiments:

S.No	Experiments
1	To study various parts of a dc machine and draw sketches of the same.
2	To plot the saturation curve of a dc machine.
3	To plot the external characteristic of a dc shunt generator and compare the characteristics with that of a separately excited generator.
4	To plot the external characteristics of a dc series generator
5	To perform open circuit and short circuit tests on a single-phase transformer
6	To perform polarity test on a single phase transformer
7	To determine the efficiency and voltage regulation of a single phase transformer
8	Study of the construction of a synchronous machine,
9	To obtain the OCC and SCC of a synchronous machine
10	To synchronize an alternator with bus bars using bright / dark lamp method.
11	To determine the equivalent–circuit parameters of a 3 -ϕ Induction motor by (i) No load test (ii) (ii) Blocked rotor test
12	To determine the Torque / speed characteristics of a 3-ϕ Induction motor
13	To study different methods of starting of single – phase induction motor.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-**–407** Course Title **CONTROL SYSTEMS (ECE)**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 4th Semester | Autumn | | Spring | √ |

6	Course Outcomes
CO1	Introduction to control systems, compare and contrast open and closed loop, automatic and manual systems and their applications. To study the effect of feedback system. To determine the mathematical modelling of the physical system.
CO2	Introduction to transfer functions, developing and analyzing block diagrams, evaluating signal flow graphs.
CO3	To determine and analyze the time response of first and second order systems to various standard test inputs.
CO4	Investigate, evaluate and analyze the stability of control systems, compare and contrast absolute and relative stability.
CO5	Study and design of PID controllers, lead-lag Compensators and modeling of dynamic systems in state space.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction to continuous control systems:** Definition of a control system, open-loop, closed loop (automatic and manual) control.	04
2.	**Mathematical modeling:** Transfer functions, block diagrams, signal flow graphs	08
3.	**First and second order system:** Example of first and second order systems, responses of these systems to step, ramp, parabolic and sinusoidal inputs, transient, steady state error analysis	10
4.	**Stability studies:** Definition of stability, stability and pole locations, stability and Routh Table, stability and frequency response bode plot, polar plot, Nyquist's criterion , root locus.	10
5.	Proportional, Integral, Derivative (P.I.D) control. Compensator design : Lead – lag compensators.	10
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Control Systems Engineering	Norman S. Nise	John wiley
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing
3	Control systems	A.Anand Kumar	PHI Learning Private limited
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall
5.	Design of feedback control systems	Stefani	Oxford university press

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-407P		Course Title	**CONTROL SYSTEMS Lab. (ECE)**					
2	Contact Hours			L	0	T	0	P	1	
3	Examination Duration (Hrs):			Theory	00			Practical	02	
4	Relative Weight age			MSLE	25			ESLE	25	
5	Credits:	01	4th Semester	Autumn		Spring	√			

6 **Objective: The objective of the lab is make students understand the application of control systems in day to day life.**

7 Lab. Experiments:

S.No	Experiments
1	To study the performance of Relay control and Combination of P,I and D control schemes in a typical thermal system.(oven)
2	To study the torque-speed characteristics of an AC servomotor.
3	To study the time response of a variety of simulated linear systems
4	To study the role of feedback in a DC speed control system
5	To study the role of feedback in a DC position control system.
6	To study the role of a combination of P,I and D control actions in a variety of simulated linear systems.
7	To study the computer simulation of a number of systems.
8	Use of MATLAB / SIMULINK /Control System tool boxes.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-**–407** Course Title **CONTROL SYSTEMS (IT Deptt.)**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 4th Semester | Autumn | | Spring | √ |

6	Course Outcomes
CO1	Introduction to control systems, compare and contrast open and closed loop, automatic and manual systems and their applications. To study the effect of feedback system. To determine the mathematical modelling of the physical system.
CO2	Introduction to transfer functions, developing and analyzing block diagrams, evaluating signal flow graphs.
CO3	To determine and analyze the time response of first and second order systems to various standard test inputs.
CO4	Investigate, evaluate and analyze the stability of control systems, compare and contrast absolute and relative stability.
CO5	Study and design of PID controllers, lead-lag Compensators and modeling of dynamic systems in state space.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction to continuous control systems:** Definition of a control system, open-loop, closed loop (automatic and manual) control.	04
2.	**Mathematical modeling:** Transfer functions, block diagrams, signal flow graphs	08
3.	**First and second order system:** Example of first and second order systems, responses of these systems to step, ramp, parabolic and sinusoidal inputs, transient, steady state and error analysis	10
4.	**Stability studies:** Definition of stability, stability and pole locations, stability and Routh Table, stability and frequency response bode plot, polar plot, Nyquists criterion , root locus.	10
5.	Proportional, Integral, Derivative (P.I.D) control. Compensator design : Lead – lag compensators . Modeling of dynamic systems in state space (Introduction), solution of state – variable models using digital computers, an introduction to intelligent control.	10
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Control Systems Engineering	Norman S. Nise	John wiley
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing
3	Control systems	A.Anand Kumar	PHI Learning Private limited
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall
5.	Design of feedback control systems	Stefani	Oxford university press

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE –406** Course Title **Electrical Engineering Technology (Mechanical Engg)**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 4th Semester | Autumn | | Spring | √ |

6 **Course Outcome**

CO1 To analyze and evaluate the electrical circuits, apply basic laws in circuit theory and to determine electric circuit parameters

CO2 To study and analyses of AC and DC series-parallel circuit, various network theorems, and basics of phasor and power of electrical circuit.

CO3 To analyses the characteristics of 3 phase systems, current and voltage relations in star/delta configuration's, Balanced/unbalanced systems.

CO4 To study and analyze the basics about electrical installation including switches, MCB, transformer, overhead and underground cables, and their specifications

CO5 To study and analyze of fundamental/basic operation, construction and working AC machines.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Network Analysis and theorems:** Basic Circuit theory (D.C and A.C.), Resistance's, Inductance and capacitance, Ohm's law, KCL, KVL, Power and energy relations, super-position theorem, Thevenin's theorem, Norton's theorem, Maximum power- transfer theorem.	07
2.	**Sinusoidally –excited circuits:** Basic definitions of a .c. circuits, phasor algebra and complex number representations, solutions of sinusoidally-excited R, L, C circuits. Introduction to 3-phase circuits.	04
3.	**Transformers:** Construction, Principle of operation, Emf equation, Phasor diagrams, No Load and on load, Equivalent circuit model, Voltage-regulation and tests, Introduction to 3-phase transformers, Applications.	05
4.	**D.C. Generators and motors:** Basic construction, Principles of operation, Types of d.c. generators and motors , Applications	05
5.	**Transducers:** Definitions, Types of transducers and their applications for mechanical measurements.	03
6.	**Ammeters and voltmeters:** Meter-range extension and their connections in the circuits.	04
7	**Bridge methods to measure:** Resistance, inductance and Capacitance: Various types of bridges and their applications for measuring, R, L and C.	06
8	**Measurement of power and energy:** Wattmeters, measurement of power using Wattmeters, Energy meters and measurement of electrical using energy meters.	06
9	**Digital Instruments:** Introduction to digital meters for the measurement of various electrical quantities	02
	Total Contact Hours	42

8. Suggested Books:

S.No	Name of Book	Author	Publisher
1	Principles of Electrical Engineering	Vincent Del Toro.	Prentice Hall
2	Electric Machines	Nagrath and Kothari.	Tata McGraw-Hill
3	Electric Machinery	Fitzgerald, Kingsley , Umans	Tata McGraw-Hill
4	Electrical Measurements and Measuring	Golding, Widdis	Pitman

	Instruments		
5	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 Subject Code ELE—**406P** Course Title **Electrical Engineering Technology LAB (Mechanical Engineering)**

2 Contact Hours

L	0	T	0	P	1

3 Examination Duration (Hrs):

Theory	00	Practical	02

4 Relative Weight age

MSLE	25	ESLE	25

5 Credits: 01 4th Semester

Autumn		Spring	√

6 **Objective:**
The objective of the lab is study the various basic electrical components and their behaviour and response in electric circuitry.

7. Lab. Experiments:

S.No	Experiments
1	To study the overall safety procedures to be employed while working with electric circuits.
2	To study the series and parallel operation of resistors, inductors and capacitors.
3	To verify (a) KVL and KCL in DC circuits. (b) Superposition theorem. (c) Thevenins Theorem
4	To measure electric power in a single phase AC circuit with resistive load, R-L load and RLC load.
5	To study the overall construction of electric machines
6	Measurement of Electrical Energy by (i) KWH Meter (ii) Watt meter
7	Measurement of power factor by (i) Power Factor meter (ii) Voltmeter, ammeter and watt meter method.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-**–407**			Course Title	**CONTROL SYSTEMS (CSE)**					
2	Contact Hours				L	2	T	1	P	0	
3	Examination Duration (Hrs):				Theory	02			Practical	00	
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	03		4th Semester	Autumn		Spring	√			

6	**Course Outcomes**
CO1	Introduction to control systems, compare and contrast open and closed loop, automatic and manual systems and their applications. To study the effect of feedback system. To determine the mathematical modelling of the physical system.
CO2	Introduction to transfer functions, developing and analyzing block diagrams, evaluating signal flow graphs.
CO3	To determine and analyze the time response of first and second order systems to various standard test inputs.
CO4	Investigate, evaluate and analyze the stability of control systems, compare and contrast absolute and relative stability.
CO5	Study and design of PID controllers, lead-lag Compensators and modeling of dynamic systems in state space.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction to continuous control systems:** Definition of a control system, open-loop, closed loop (automatic and manual) control.	04
2.	**Mathematical modeling:** Transfer functions, block diagrams, signal flow graphs	08
3.	**First and second order system:** Example of first and second order systems, responses of these systems to step, ramp, parabolic and sinusoidal inputs, transient, steady state and error analysis	10
4.	**Stability studies:** Definition of stability, stability and pole locations, stability and Routh Table, stability and frequency response bode plot, polar plot, Nyquists criterion , root locus.	10
5.	Proportional, Integral, Derivative (P.I.D) control. Compensator design : Lead – lag compensators . Modeling of dynamic systems in state space (Introduction), solution of state – variable models using digital computers, an introduction to intelligent control.	10
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Control Systems Engineering	Norman S. Nise	John wiley
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing
3	Control systems	A.Anand Kumar	PHI Learning Private limited
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall
5.	Design of feedback control systems	Stefani	Oxford university press

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 5th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-501	Power Systems - I	2	1	0	3	-	3
	ELE-501P	Power Systems – I Lab	0	0	2	0	1	1
2	ELE-502	Electric Machines-II	3	1	0	4	-	4
	ELE-502P	Electric Machines-II Lab	0	0	2	-	1	1
3	ELE-503	Control System-II	2	1	0	3	-	3
	ELE-503P	Control System-II & VI Lab.	0	0	2	-	1	1
4	ELE-504	Computer Aided Simulation of Electrical Systems	0	0	3	-	2	2
5	ECE-508	Communication Systems	2	1	0	3	-	3
6	ECE-509	Digital Electronics & Logic Design	2	1	0	3	-	3
	ECE-509P	Digital Electronics & Logic Design Lab	0	0	2	-	1	1
7	MTH-503	Mathematics-V	2	1	0	3	-	3
		Total	14	6	9	22	3	25

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	**ELE-501**			Course Title	**POWER SYSTEMS-I**					
2	Contact Hours				L	2	T	1	P	0	
3	Examination Duration (Hrs):				Theory	02			Practical	00	
4	Relative Weight age	M-I	20	M-II 20	ASM	10	ME	50	PRE	00	
5	Credits:	03		5th Semester	Autumn	√	Spring				

6 **Course Outcomes**

CO1: Understand the basics of Power System - Generation, Transmission and Distribution.

CO2: Classify and analyze the overhead line insulators.

CO3: Design and evaluate various parameters of short, medium and long transmission lines.

CO4: Classify and grade the underground cables and identify its fault location.

CO5: Understand the concept of corona and its effect on transmission line design.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Introduction to Power Systems generation, transmission & distribution. Element of AC distribution. Single fed, double fed and ring main distributor.	06
2.	Overhead line insulator types; pin, suspension, strain, shackle, guy etc. String efficiency & methods of equalizing potential drop over string of suspension insulators.	08
3.	Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance. Models of short, medium and long transmission lines. Skin, proximity and Ferranti effect. Power transfer capability of a transmission line. Mechanical Design of transmission line. Electric Power Transmission Towers.	16
4.	Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, capacitance calculation, losses and current carrying capacity. Location of faults, methods of laying of underground cables.	08
5.	Corona, Visual & critical voltages, corona loss, effect of corona on line design practical considerations	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power System Analysis	J.J. Grainger and W.D Stevenson	Mcgraw hill
2	Electric Power Systems	B.W. Weedy and B.J. Cory	John Wiley and sons
3	Electric Power Systems	C.L. Wadhwa	New age international
4	Power System Engineering	Nagrath and Kothari	Tata Mcgraw hill
5.	Power System Analysis	Hadi Saadat	Mc Graw Hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	**ELE-501P**		Course Title	**POWER SYSTEMS-I Lab**				
2	Contact Hours			L	0	T	0	P	1
3	Examination Duration (Hrs):			Theory	00			Practical	02
4	Relative Weight age			MSLE	25			ESLE	25
5	Credits:	01	5th Semester	Autumn	√	Spring			

6 **Course Outcomes**

CO1: Design and analyze the AC and DC Distribution system.

CO2: Evaluate the efficiency and different parameters of Transmission line system.

CO3: Classify and analyze the overhead line insulators and underground cables.

CO4: Design, implement and practice different power system models in simulative environment.

7. Lab. Experiments:

S.No	Experiments
1	A.C distribution
2	D.C. distribution
3	Efficiency, Regulation & ABCD parameters of Transmission line
4	Study of cables & find charging current
5	Study of different types of insulators
6	Computer Simulation of Power System

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-502** Course Title **ELECTRICAL MACHNINES - II**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 04 | 5th Semester | Autumn | √ | Spring | |

6 **Objective:**
The objective of the course is to study the various types of conventional and advanced motors , generators and transformers. It helps to build a strong foundation in an electrical power system.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Basic Concepts in A.C. Rotating Electrical Machines** The rotating magnetic field, Magneto-motive force and flux distribution, Induced voltage, Production of torque, Leakage fluxes, losses and efficiency	2
2.	**Induction Machines** a. Three Phase Induction Motors Principle of operation of an induction motor, Construction, Types, Equivalent circuit, Torque/speed characteristics, Induction motor tests, Starting, Speed control, Induction generator, Schrage Motor, Circle Diagram, Applications and selection b. Single-Phase Induction Motors Types of 1-phase induction motors, analysis and testing of 1-phase induction motors, universal motor	22
3.	**Synchronous Machines** Constructional features, Types and working principle, windings, Equivalent circuit, voltage regulation and its determination, saturation effect, parallel operation, Two-axis theory, Salient type machines, steady-state power-angle characteristics, Excitation systems, V-curves, synchronous capacitors, Hunting, synchronous Machine Transients, Analysis of sudden 3-phase short circuit, Transient power-angle characteristics.	18
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electric Machinery by Fitzgerald	Kingslay, Umans	Tata Mcgraw hill
2	Electric Machines	Nagrath and Kothari	Tata Mcgraw hill
3	Electric Machines	Guru	Oxford university press
4	Electrical Machines and Transformers	Geroge Mc Pherson	John Wiley
5.	Electric Machinery Fundamentals	Chapman	Tata Mcgraw hill
6.	Electric machinery and Transformers	Irving Kosow	Pearson
7.	Alternating current machinery	Langsdorf	Tata Mcgraw hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-502P	Course Title	**ELECTRICAL MACHINES LAB –II**						
2	Contact Hours		L	0	T	0	P	1		
3	Examination Duration (Hrs):		Theory	00	Practical	02				
4	Relative Weight age		MSLE	25	ESLE	25				
5	Credits:	01	5th Semester	Autumn	√	Spring				

6 **Objective:**
The objective of the lab is to familiarize the students with the different electric machines, their operation and working.

7. Lab. Experiments:

S.No	Experiments
1	To study the different parts of an Induction motor. To determine the equivalent–circuit parameters of a 3 -ϕ Induction motor by (i) No load test (ii) Blocked rotor test
2	To determine the Torque / speed characteristics of a 3-ϕ Induction motor
3	To determine the speed characteristics of a schrage motor
4	To study the speed control of an Induction motor by pole-changing method
5	To determine the speed / Torque characteristics of an AC series motor (Universal motor)
6	To determine the equivalent circuit parameters of a 1-ϕ Induction motor by (i) No load test (ii) Blocked rotor test
8	Study of the construction of a synchronous machine
9	To obtain the OCC and SCC of a synchronous machine by Synchronous impedance method
10	To synchronize an alternator with bus bars using bright / dark lump method
11	To find voltage regulation of an alternator by actual loading
12	To obtain the V-curves and inverted V-curves of a synchronous motor
13	To conduct slip-test on a salient-pole synchronous machine and hence determine its direct and quadrature – axis reactances

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	**ELE-503**			Course Title	**CONTROL SYSTEM-II**					
2	Contact Hours				L	3	T	1	P	0	
3	Examination Duration (Hrs):				Theory	02			Practical	00	
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	04		5th Semester		Autumn	√	Spring			

6 **Course Outcomes**

CO1 Explain the knowledge of state variable modelling
CO2 Analysis and design of state vector equations, controllability and observability.
CO3 Study and analysis of Digital control system.
CO4 Study of non-linear control systems, its linearization, design using linearized models

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**State variable modeling.** Block diagram, transfer function and signal flow graphs in state space	08
2.	State variable analysis and design solution of state vector equations, design using state – variable feed back. Controllability and observability.	14
3.	**Digital control system**: Hardware elements of a digital control system, Z- transform, inverse Z-transform, difference equations, pulse transfer function. Discrete time system analysis	10
4.	**Non linear control systems.** Linearization of Non-linear control system about and nominal operating point, analysis and design using linearized models	04
5.	**Advanced control techniques:** Fuzzy logic control Adaptive control Neural Network based control	08
	Total Contact Hours	44

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	State variable methods and digital control	M. Gopal	Tata Mcgraw Hill
2	Control system engineering	Norman .s. Nise	John Wiley
3	Control systems	A. Anand Kumar	PHI Learning Pvt. Ltd
4	Feedback control of dynamic systems	Franklin and powel	Prentice hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-503P Course Title **CONTROL SYSTEMS & V I LAB.**

2	Contact Hours	L	0	T	0	P	1	
3	Examination Duration (Hrs):	Theory	00	Practical	02			
4	Relative Weight age	MSLE	25	ESLE	25			
5	Credits: 01	5th Semester	Autumn	√	Spring			

6 **Objective:**
The objective of the lab is to make the students understand the applications of control system in day to day life.

7 Lab. Experiments:

S.No	Experiments
1	To study the performance of Relay control Combination of P, I and D control schemes in a typical thermal system (Oven).
2	To study the torque-speed characteristics of an AC servomotor
3	To study the time response of a variety of simulated linear systems
4	To study the role of feedback in a DC speed control system
5	To study the role of feedback in a DC position control system
6	Use of MATLAB / SIMULINK /Control System tool boxes
7	To study the role of a combination of P,I and D control actions in a variety of simulated linear systems
8	To study the computer simulation of a number of systems
9	System identification using frequency domain techniques
10	Lead/ lag compensator design
11	Microprocessor based PID control
12	Computer control of systems
13	Control of stepper motor
14	Control system (State Space)
`15	Fuzzy logic and neural network tool boxes

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	ELE-504		Course Title	**Computer Aided Simulation**					
2	Contact Hours			L	0	T	0	P	3	
3	Examination Duration (Hrs):			Theory	00			Practical	02	
4	Relative Weight age			MSLE	25			ESLE	25	
5	Credits:	02	5th Semester	Autumn	√	Spring				

6 **Objective:**

The objective of the course is to make students analyze different control systems using MATLAB and SIMULINK tool boxes.

7. Lab. Experiments:

S.No	Experiments
1	Use of MATLAB in: 1. Analysis of D.C Circuits 2. Transient and steady state analysis of A.C/D.C circuits. 3. Analysis of control systems Analysis of Electric Machines and Transformers
2	Use of MATLAB and SIMULINK Tool boxes
3	Use of Control System (State Space), Fuzzy Logic & Neural Network Tool Boxes

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 Subject Code **ECE-** Course Title **COMMUNICATION SYSTEMS**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 5th Semester | Autumn | √ | Spring | |

6 **Course Outcomes**

CO1: Understanding of basic principles of communication system and Fourier analysis of different signals.

CO2: To understand and analyze various analog modulation and demodulation schemes (AM, FM, PM)

CO3: To understand various reception techniques and the performance analysis of different radio receivers.

CO4: To understand and analyze Analog to conversion and various digital modulation techniques.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Spectral analysis of Signals:** Fourier series of repetitive signals, Fourier transform of non- repetitive signals, amplitude spectrum of special signals viz. Pulse train and pulse waveform	08
2.	**Modulation:** AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter	10
3.	**Demodulation:** AM and FM signals, Radio Receivers – AM & FM, (Block diagram)	06
4.	**Noise Analysis:** Performance of AM & FM Systems in presence of noise, Threshold in AM & FM Demodulations, Pre- emphasis, and De-emphasis in FM Systems	06
5.	**Digital Communication:** Sampling, Quantization, Quantization noise, Coding, Pulse code Modulation; Differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation. PWM & PPM	08
6.	**Digital Modulation Techniques:** ESK, FSK, PSK, M-FSK, DPSK, GPSK schemes	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electronics communication System	G. Kennedy	Mcgraw hill education (India) Ltd
2	Principles of Communication system	Taub and Shelling	Tata Mcgraw hill education Pvt Ltd
3	Communication system	S. Haykins	Willey India Pvt Ltd

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 Subject Code **ECE-509** Course Title **DIGITAL ELECTRONICS AND LOGIC DESIGN**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 5th Semester | Autumn | √ | Spring | |

6 **Objective:**

The objective of the course is to make students familiar with Digital controls and different components used in digital electronics. It provides the review of basic principles, without any prior knowledge of the topic.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Review of Binary, octal and hexadecimal number systems. Various types of codes	06
2.	Boolean algebra and Boolean theorems.	04
3.	Logic gates and implementation of Boolean functions with various types of logic gates. Circuit equivalence.	06
4.	Simplification techniques and minimization by map methods. Tabular method	06
5.	Combination logic and arithmetic circuits. Encoders and Decoders, multiplexes & de-multiplexes	04
6.	Sequential circuits –state diagrams and state tables, design and analysis of flip-flops, registers, counters. Synchronous and asynchronous operation of sequential circuits. Analog to digital convertor, digital to analog convertor	08
7.	Latches and memory organisation. ROM's, EPROM's and RAM's –Dynamic and static	04
8.	Introduction to PLA's	02
9.	IEEE notations	02
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Digital logic	M. Moris Mano	Pearson
2	Digital principles and applications	A.P. Malvino	Tata Mcgraw hill
3	Switching circuits	Marcus	Prentice hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ECE509P Course Title **DIGITAL ELECTRONICS AND LOGIC DESIGN LAB**

2 Contact Hours | L | 0 | T | 0 | P | 1 |

3 Examination Duration (Hrs): | Theory | 00 | Practical | 02 |

4 Relative Weight age | MSLE | 25 | ESLE | 25 |

5 Credits: 01 5th Semester | Autumn | √ | Spring | |

6 **Objective:**
The objective of the lab is to make students familiar with the different digital devices used in digital electronics.

7 Lab. Experiments:

S.No	Experiments
1	To verify the truth table of following logic gates: AND, OR and NOT. NAND, NOR, XOR and XNOR
2	To realize the above gates using discrete active and passive components
3	To implement XOR and XNOR using universal logic gates
4	To verify DE Morgan's law using logic gates
5	To implement certain Boolean expressions and check their equality
6	To design and realize a) Half adder and verify its truth table. b) Full adder and verify its truth table. c) Half subtractor and verify its truth table. d) Full subtractor and verify its truth table
7	To design a multiplexer/ demultiplexer using two input NAND gates
8	To design a 4-bit binary to decimal convertor
9	To design a modulo 10 counter
10	Given the frequency f obtain the waveforms with frequencies f/2, f/5 & f/10
11	Design and realize the following flip-flops using logic gates. **a)** RS flip flop **b)** JK flip flop. **c)** D flip flop **d)** T flip flop.
12	Use PLL as a) Frequency multiplier. b) Frequency demodulator
13	MINI PROJECT: Design and fabricate a frequency counter clock

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 Subject Code **MTH-503** Course Title **MATHEMATICS-V**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 5th Semester | Autumn | √ | Spring | |

6 **Course Outcomes**

CO1: Understand and apply Newton difference formulae

CO2: Solve algebraic and transcendental equations using numerical techniques
CO3: Solve integrals by using numerical techniques
CO4: Solve ordinary differential equations by numerical techniques
CO5: To understand Law of Total Probability, Baye's Theorem, Random Variables and apply Law of expectations

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Finite Difference:** Difference Table and its usage. The difference operators Δ,▼ and the operator E	04
2.	**Interpolation:** Interpolation with equal intervals, Newton's advancing difference formula. Newton's backward difference formula. Interpolation with unequal intervals. Newton's divided difference formula. Lagrange's interpolation formula	06
3.	**Central Differences:** The central difference operator δ and the over-raging operator μ. Relations between the operators. Gauss forward and backward interpolation formula, Sterling's, Bessel's, Laplace and Everett's formulae	04
4.	**Numerical solution of algebraic and Transcendental Equations:** Graphic Method, Regula-Fast method, Bolzano's Process of bisection of intervals, Newton-Raphson Method and its geometrical significance	06
5.	**Numerical Integration:** Numerical Integration, General Quadrature Formula, Simpson's one-third and three-eight rules, Weddle's' rule, Hardy's rule, Trapezoidal rule.	06
6.	**Numerical Solution of ordinary differential equations:** Numerical solution of ordinary differential equations, Picard's method. Taylors series method, Euler's method, Runge-Kutta Method	06
7.	**Statistics and Probability:** Random experiment, sample space, events, Mutually exclusive events, Classical and Axiomatic approach (definition) of probability, Dependent and independent events. Addition and multiplication theorems on probability, Bayes' theorem on conditional probability. Covariance, Correlation, coefficient of correlation,, lines of Regression, Method of least squares, fitting a straight line and parabola of second degree. Random variable, Moments and moment generating function of discrete and continuous random variables Additive and Multiplicative law of mathematical expectation	10
	Total Contact Hours	42

Books Suggested:

S.No	Name of Book	Author	Publisher
1	Numerical Methods for Scientists and Engineering	M.K.Jain, S.R.Iyengar & R.K. Jain, Wiley Eastern Ltd	New age publishers
2	Mathematical Numerical Analysis	S.C. Scarborough	CBS Publishers and distributors
3	Introductry methods in Numerical Analysis	S.S.Sastry	PHI learning Pvt Ltd
5	Numerical Methods for Mathematics, Sciences and Engg	J. H. Mathews	Prentice hall college division
6	Fundamentals of Mathematical Statistics	S.C.Gupta and V.K.Kapoor	S. Chand
7	Statistical Theory and Methodology in Science and Engineering	Brownlee	Krieger publishers co
8	Introduction to Mathematical Statistics	R.E. Walpole 3rd edition	Prentice hall

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 6th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-601	Power Systems-II	3	1	0	4	-	4
	ELE-601P	Power Systems-II LAB	0	0	2	-	1	1
2	ELE-602	Power Electronics	3	1	0	4	-	4
	ELE-602P	Power Electronics LAB	0	0	2	-	1	1
3	ELE-603	Electric Machines Design	3	1	0	4	-	4
4	ELE-604	Tour & Training	0	0	0	2	-	2
5	ELE-605	Digital Signal Processing	3	1	0	4	-	4
6	ELE-606	Microprocessors	3	1	0	4	-	4
	ELE-606P	Microprocessors LAB	0	0	2	-	1	1
Total Credits								25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE SIXTH (6th) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-607	Power Electronics (For ECE Department)	2	1	0	3	0	3
	ELE-607P	Power Electronics Lab. (For ECE Department)	0	0	2	0	1	1

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-601 **Course Title** **POWER SYSTEM -II**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 6th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Acquire and apply the knowledge of Per unit representation of Power system.

CO2: Analysis of balanced faults & unbalanced faults.

CO3: Investigating the concepts of Insulation co-ordination, over voltage, lightning surges, switching surges, and switching operations.

CO4: Analysis of interference of power lines with communication circuits.

CO5: Analysis of Surge Impedance Loading performance of transmission lines and the knowledge of HVDC & FACTS Technology.

7. **Details of the Course:**

S. No	Particulars	Contact Hours
1.	**Per Unit Representation of Power Systems:** Single line diagram, impedance and reactance diagram of a system, per unit calculations, per unit representation of a power system.	6
2.	**Fault Analysis (Balanced Faults**: Faults, types of faults, symmetrical 3-phase balanced faults – calculation of fault currents, current limiting reactors.	6
3.	**Fault Analysis (Un-symmetrical Faults)** Symmetrical components, sequence impedances, sequence networks, unsymmetrical faults –single line to ground, line-to-line, double line to ground faults on unloaded alternators and on power systems.	8
4.	**Insulation Co-ordination:** Generation of over-voltages in a power system, lightning phenomena, lightning surges, switching surges-interruption of short circuits and switching operations, switching surges – interruption of capacitive circuits, resonance over voltages, protection of power system components against over voltages – ground wires, lightning arrestors. Concept of insulation coordination, Basic impulse insulation level, standard impulse test wave, volt-time curve, location and rating of lightning arrestors.	8
5.	**Surge Performance of Transmission Lines:** Traveling waves on transmission lines, open-end line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction, line terminated through a capacitance, line terminated through an inductance, Attenuation of traveling waves.	6
6.	**Interference of Power Lines with communication Circuit** Electrostatic and Electromagnetic effects. .	2
7.	**High Voltage Direct Current Transmission & FACTS Technology** Comparison of HVAC and HVDC transmission lines. Thyristors (brief revision). Basic converter and D.C system operation – rectification, inversion. Complete direction current link. Objective of FACTS. Basic types of FACTS controllers. Introduction to FACTS Devices.	6
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power System Analysis	J.J. Grainger and W.D Stevenson	Tata McGraw Hill
2	Electrical Power Systems.	C.L. Wadhwa	New age Publication
3	Power Systems Engineering	Nagrath and Kothari	Tata McGraw hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE-601P Course Title **POWER SYSTEM II LAB**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	6th Semester	Autumn		Spring	√			

6 **Course Outcomes**

CO1: Acquire and apply the knowledge of Per unit representation of Power system.

CO2: Analysis of balanced faults & unbalanced faults.

CO3: Investigating the concepts of Insulation co-ordination, over voltage, lightning surges, switching surges, and switching operations.

CO4: Analysis of interference of power lines with communication circuits.

CO5: Analysis of Surge Impedance Loading performance of transmission lines and the knowledge of HVDC & FACTS Technology.

7. Lab. Experiments:

S.No	Experiments
1	Per unit representation of a power system.
2	Measurement of positive, negative and zero sequence impedance and currents.
3	Measurement of earth resistance.
4	Measurement of insulation resistance of insulators
5	Transmission line fault analysis
6	Application of software packages in power systems.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-602 **Course Title** **POWER ELECTRONICS**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 04 | 6th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Develop the knowledge of Power Semi-conductor devices and apply it in the real world.
CO2: Analysis of driving and control circuits.
CO3: Analysis and design of A.C to D.C converters (Rectifiers),
CO4: Analysis and design of DC to DC converters (choppers) and D.C to A.C converters (Inverters).
CO5: Analysis and design of A.C Voltage controllers and Cyclo-converters (1-phase & 3-phase).

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction of Power Electronics, Power Semi-conductor Devices:** Power Diodes, power Transistors, power MOSFETs, IGBTs, GTOs, Thyristors, Basic theory of operation, characteristics, Ratings, Protection and cooling, Recent Advances in Power Semi-conductor Devices.	8
2.	**Driving and control circuits:** series and parallel operation of devices, commutation of power switching devices.	4
3.	**Power Electronic converters**: 1-phase / 3 phase phase-controlled converters (Semi-converters, full – converters and Dual converters). Analysis and performance with passive load, Harmonics and power factor, PWM Rectifiers.	8
4.	**D.C-to-D.C converters (choppers) :**Buck, Boost and Buck-Boost type and various chopper configurations.	5
5.	**A.C voltage controllers.**	2
6.	**D.C –to-A.C converters (Inverters):** 1-phase / 3-phase, VSI, PWM VSI, CSI, Frequency and voltage control, Line-commutated inverters (LCIs).	6
7.	**Cyclo-converters (1-phase and 3-phase)**	3
8	**Power quality issues and present status of improved power quality converters (IPQCs).**	4
9.	**Some typical applications of power Electronics**	2
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1.	Power Electronics: Circuits, Devices and Applications	M. H. Rashid	Pearson education India
2.	Power Electronics	C.W Lander.	McGraw-Hill
3.	Power semi-conductor controlled Drives	G.K.Dubey	Prentice Hall
4.	Thyristorized Power controllers	G.K. Dubey, Doradla, Joshi and Sinha	New age international publishers
5.	Power Electronics and Variable Frequency Drives	B.K Bose	IEEE press

6.	Modern power Electronics	B.K Bose	IEEE press
7.	Power Electronic control of AC Motor	Murphy and Turnbull	Pergamon press

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-602P **Course Title** **POWER ELECTRONICS LAB**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	6th Semester	Autumn		Spring	√			

6 **Course Outcomes**

CO1: Obtain the characteristics and study the performance of SCR and UJT.

CO2: To study triggering techniques for SCRs

CO3: To Analyze the performance of single-phase half wave and full wave uncontrolled and semi-controlled rectifier circuits.

CO4: To understand the power quality problems associated with thyristor-controlled converters

7. Lab. Experiments:

S.No	Experiments
1	To obtain the V-I static characteristics of an SCR, triac and diac,.
2	To study various triggering circuits
3	To obtain the UJT characteristics
4	To study the operation of a Line Synchronised UJT Relaxation Oscillator.
5	To study the illumination control using SCR.
6	To study the light operated SCR Alarm circuit.
7	To study half wave gate controlled rectifier using one SCR.
8	To study single phase half controlled, full wave rectifier.
9	To study various techniques of forced commutation of an SCR.
10	To study the DC circuit breaker action of an SCR.
11	To study the speed control of a DC shunt motor using single phase bridge converter.
12	To study the speed control of a single phase induction motor using single phase voltage controller.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-603 **Course Title** **Electric Machine Design**

2	Contact Hours			L	3	T	1	P	0		
3	Examination Duration (Hrs):			Theory	02			Practical	00		
4	Relative Weight age	M-I	20	M-II	20	ASM	10	ME	50	PRE	00
5	Credits:	04		6th Semester		Autumn		Spring	√		

6 **Course Outcomes**

CO1: To study principles of electrical machine design, magnetic circuit calculations and armature winding design in AC and DC machines.

CO2: To study DC machines design.

CO3: To design single phase and three phase transformers.

CO4: To study about induction and synchronous machines design.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Principles of Electrical Machine Design:** Considerations in design, design factors, limitations in design, modern trends in design.	6
2.	**Magnetic Circuit Calculations** Magnetization curves, Magnetic leakage, calculation of mmf for air gap and teeth, effect of saliency	5
3.	**Armature Winding Design.** Winding design, Integrated approach for windings, A.C armature windings, production of emf in windings, Mmf distribution of armature windings, eddy current losses in conductors	6
4.	**Design of D.C Machines::** Output equation, Main dimensions, Armature design, Armature windings, Design of commutator and brushes, Design of Field systems, Design of interpoles.	7
5.	**Design of single-phase and three-phase Transformers** Output equation, core design, winding design, yoke design, Design of transformer tank with tubes, design of insulation	7
6.	**Design of Induction Motors (1-phase and 3-phase)** Output equation, main dimensions, Stator winding, stator conductors, shape of stator slots, number of stator slots, stator core, rotor design (squirrel cage and wound rotor)	7
7.	**Design of Synchronous Machines:** Main dimensions, length of air gap, stator	3
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electric Machine Design	A.K. Sawhney	Dhanpat rai and sons
2	Design of Electrical Machines	Mittal and Mittal	Standard publishers and distributers
3	Electrical machine Design	R.K. Agarwal	S. S. Kataria and sons

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-605 **Course Title** **DIGITAL SIGNAL PROCESSING**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 6th Semester | Autumn | | Spring | √ |

6 Course Outcomes

CO1 Compare and contrast various Signals & Systems.
CO2 Evaluation and analysis of sampling of continuous time signals.
CO3 Mathematical analysis of Z-Transform and Fourier transform of Linear time invariant systems.
CO4 Study and designing the structure of Discrete-time Systems
CO5 Mathematical analysis and comparison of Filter Design Techniques.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Discrete Time Signals & Systems** Sequences, & sequence operations, Discrete-time systems. Linear Time – Invariant systems, impulse response, causality, stability. Frequency-Domain Representation of Discrete-Time signals and systems, Fourier Transforms, properties, theorems.	8
2.	**Sampling of Continuous – Time Signals.** Periodic sampling, frequency- domain representation of sampling, reconstruction of signals, discrete-time processing of continuous –time signals, continuous –time processing of Discrete-time signals, changing the sampling rate.	8
3.	**Transform Analysis of Linear time Invariant Systems.** Z- Transform, Region of Convergence, properties, Inverse Z-Transform, Frequency Response of LTI systems, system functions, linear constant coefficient, difference equations FIR and IIR systems, Frequency Response.	9
4.	**Structure of Discrete-Time Systems.** Block Diagram Representation of linear constant-coefficient Difference equations, signal flow graph representation. Basic structures for IIR systems, Transposed forms, Basic network structures for FIR systems.	8
5	**Filter Design Techniques.** Design of Discrete-Time IIR filters from continuous – Time filters. Impulse invariance, bilinear transformation. Butterworth Chebyshev, Eliptic Approximation, low pass, high pass, band-pass and Band-stop filters, design of FIR filters by windowing. Kaiser, Hamming, Hamming windows.	9
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Discrete Time Signal Processing.	A.V Oppenheim and R. W Schafer	Prentice hall international
2	Digital Signal Processing Principles, Algorthims and Applications.	John G. Proakis and D.G Manolavis:	Prentice hall
3	Introduction To Digital Signal Processing.	J.R Johnson	Prentice hall
4	Theory and Application of Digital Signal	L.R Rabinder and B. Gold	Prentice hall

	Processing.		

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 **Subject Code** ELE-606 **Course Title** **MICROPROCESSORS**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 04 6th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Have a clear understanding of the architecture and instruction set of 8085 and 8086

CO2: Be able to interface peripherals and memories with 8085.

CO3: Be able to understand the application of 8085 in waveform generators.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Overview of Microprocessor:** Basic Terminology, evolution of Microprocessors, State of Art of μ P, why we study 8085 μ P	6
2.	**8085 μp Architecture:** Pin diagram, detailed internal architecture, state transition Diagrams, T-states (clock cycles), machine cycles, instruction cycles, instruction formats.	6
3.	**Instruction Set and Programming Techniques:** Different addressing modes, complete description of all instructions with macro and micro RTL (Register Transfer language), programming examples, simulation of time delays.	6
4.	**Interrupts:** Concept of interrupts, priority of interrupts signals, software generated interrupts and hardware generated interrupts.	6
5.	**Serial I/O:** Introduction with reference to 8085, general concepts.	4
6.	**Interfacing:** Concept of fold back addresses, memory maps, memory mapped I/O isolated I/o, interfacing of seven segment LED display, toggle switches, keyboard interfacing, memory interfacing, simplification of interfacing circuitry with the help of decoders, general purpose programmable peripheral devices, interfacing of A/D and D/A conversion devices.	8
7.	**Microprocessor Applications:** Some illustrative examples.	4
8.	**Introduction to 8086 μp**	2
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Microprocessor Architecture Programming and Applications with the 8085	Ramesh S. Gaonkar.	Prentice hall
2	Microprocessors and Programmed Logic	K.L. Short	Prentice hall
3	Microprocessors: Theory and Applications (Intel and Motorola)	M. Rafiquzzaman	Prentice hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-606P **Course Title** **MICROPROCESSOR LAB**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	6th Semester	Autumn		Spring	√			

6 **Course Outcomes**

CO1: Have a clear understanding of the instruction set of 8085 and development of related programs using 8085 training kit

CO2: Be able to develop the programs using subroutines and nesting of loops.

CO3: Be able to understand the interfacing of peripherals with 8085 and Square wave generation.

7. Lab. Experiments:

S. No	Experiments
1	Microprocessors (8085) training kit and its working.
2	Programs related to data transfer between registers, between registers and memory.
3	Programs related to logic instructions.
4	Programming techniques with additional instructions. Looping, counting and indexing.
5	Programs related to Arithmetic Instructions, 8 bit and 16 bit Addition and Subtraction.
6	Copying Blocks of data from one part of memory to another, conditional copy.
7	Programs related to Counters and time delays
8	Programs related to use of stack and subroutines. Nesting.
9	Interfacing concepts. Switch and LED interfacing. Square wave generation.
10	ADC interfacing.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 **Subject Code** ELE-607 **Course Title** **POWER ELECTRONICS (ECE)**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 6th Semester | Autumn | | Spring | √ |

6 **Course Outcomes**

CO1: Develop the knowledge of Power Semi-conductor devices and apply it in the real world.
CO2: Analysis of driving and control circuits.
CO3: Analysis and design of A.C to D.C converters (Rectifiers),
CO4: Analysis and design of DC to DC converters (choppers) and D.C to A.C converters (Inverters).
CO5: Analysis and design of A.C Voltage controllers and Cyclo-converters (1-phase & 3-phase).

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction of Power Electronics, Power Semi-conductor Devices:** Power Diodes, power Transistors, power MOSFETs, IGBTs, GTOs, Thyristors, Basic theory of operation, characteristics, Ratings, Protection and cooling, Recent Advances in Power Semi-conductor Devices	8
2.	**Driving and control circuits:** series and parallel operation of devices, commutation of power switching devices.	4
3.	**Power Electronic converters**: 1-phase / 3 phase phase-controlled converters (Semi-converters, full – converters and Dual converters). Analysis and performance with passive load, Harmonics and power factor, PWM Rectifiers.	8
4.	**D.C-to-D.C converters (choppers) :**Buck, Boost and Buck-Boost type and various chopper configurations.	5
5.	**A.C voltage controllers.**	2
6.	**D.C –to-A.C converters (Inverters):** 1-phase / 3-phase, VSI, PWM VSI, CSI, Frequency and voltage control, Line-commutated inverters (LCIs).	6
7.	**Cyclo-converters (1-phase and 3-phase)**	3
8.	**Power quality issues and present status of improved power quality converters (IPQCs).**	4
9.	**Some typical applications of power Electronics**	2
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1.	Power Electronics: Circuits, Devices and Applications	M. H. Rashid	Pearson education India
3.	Power Electronics	C.W Lander.	McGraw-Hill
4.	Power semi-conductor controlled Drives	G.K.Dubey	Prentice Hall
5.	Thyristorized Power controllers	G.K. Dubey, Doradla, Joshi and Sinha	New age international publishers
6.	Power Electronics and Variable Frequency Drives	B.K Bose	Wiley publication
7.	Modern power Electronics	B.K Bose	Jaico publishers

8.	Power Electronic control of AC Motor	Murphy and Turnbull	Pergamon press

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 **Subject Code** ELE-607P **Course Title** **POWER ELECTRONICS LAB (ECE)**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	6th Semester	Autumn		Spring	√			

6 **Course Outcomes**

CO1: Obtain the characteristics and study the performance of SCR and UJT.

CO2: To study triggering techniques for SCRs

CO3: To Analyze the performance of single-phase half wave and full wave uncontrolled and semi-controlled rectifier circuits.

CO4: To understand the power quality problems associated with thyristor-controlled converters

7. Lab. Experiments:

S.No	Experiments
1	To obtain the V-I static characteristics of an SCR, triac and diac,.
2	To study various triggering circuits
3	To obtain the UJT characteristics
4	To study the operation of a Line Synchronised UJT Relaxation Oscillator.
5	To study the illumination control using SCR.
6	To study the light operated SCR Alarm circuit.
7	To study half wave gate controlled rectifier using one SCR.
8	To study single phase half controlled, full wave rectifier.
9	To study various techniques of forced commutation of an SCR.
10	To study the DC circuit breaker action of an SCR.
11	To study the speed control of a DC shunt motor using single phase bridge converter.
`12	To study the speed control of a single phase induction motor using single phase voltage controller.

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 7th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-701	Power System Protection	2	1		3		3
2	ELE-701 P	Power System Protection LAB.			2		1	1
3	ELE-702	Advanced Power Electronics	3	1	0	4		4
4	ELE-703	Power Systems-III	3	1	0	4		4
5	ECE-708	Electronic Measurements & Instrumentation	2	1		3		3
6	ECE-708P	Electronic Measurements & Instrumentation LAB			2		1	1
7	ELE-704	Power Station Practice	2	1	0	3		3
8	ELE-1-14	Elective-I	2	1	0	3		3
9	ELE-706P	Project Preliminary Work/ Seminar	0	0	3		3	3
Total credits								25

SUBJECTS OFFERED BY THE DEPARTMENT OF ELECTRICAL ENGINEERING TO THE SEVENTH (7th) SEMESTER STUDENTS OF SISTER DISCIPLINES.

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	ELE-705	Electrical Power Systems (For ECE Department)	2	1		3		3
2	ELE-705P	Electrical Power Systems Lab. (For ECE Department)	0	0	2		1	1

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-701** Course Title **Power System Protection**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 7th Semester | Autumn | √ | Spring | |

6 **Course Outcomes**

CO1: Understand principles, functions and analyze the characteristics of protective relays

CO2: Compare and contrast different types of electromagnetic relays, their operating principles, and characteristics.

CO3: Investigation of different types of faults in a generator and its methods of protection and gain knowledge of digital protection, learn about various DSP techniques, numerical algorithms, and simulation of transients.

CO4: Evaluating and analyzing different protection schemes for the transformer and Understand working, classification and characteristics of fuses.

CO5: Investigating various protection schemes for feeders, bus bars, and transmission lines and explain the basic principle of operation of circuit breakers and their types.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**PROTECTIVE RELAYING:** Function of protective relaying, fundamental principles, primary and backup relaying, functional characteristics	02
2.	**CLASSIFICATION OF RELAYS:** Operating principles and characteristics of the following electromechanical relays: Current, voltage, directional, current balance, voltage balance, differential relays, and distance relays.	04
3.	**PROTECTION OF GENERATORS:** Short- circuit protection of stator windings, protection against turn-to-turn fault, stator ground-fault protection, stator open circuit protection, Overheating protection, Over voltage protection, Loss of excitation protection, rotor overheating protection, Protection against vibration, protection against motoring over speed protection, etc.	07
4.	**TRANSFORMER PROTECTION:** Short circuit protection, over current and earth-fault protection differential protection. Use of biased relay for differential protection, self-balance system protection, differential magnetic balance protection, Buchholz relay, protection of parallel transformer banks, etc.	05
5.	**PROTECTION OF FEEDERS, BUSBARS AND TRANSMISSION LINES:** Protection of feeders, time limit fuse, over current protection for radial feeders, protection of parallel feeders, differential protection for parallel feeders, protection of ring mains, differential pilot wire protection, Circulating current protection, protection for bus-bars, frame leakage protection, differential protection, for bus bars, protection for double bus-bar system, transmission line protection, using over-current relays, using distance relays. Setting of over-current and distance relays, coordination of relays. Phase fault and earth fault protection.	07
6.	**DIGITAL PROTECTION:** Introduction, Review of DSP techniques, sampling, aliasing, DFT & FFT. Numerical algorithms. Simulations of transients and electromagnetic transient program (EMTP).	04
7	**FUSES:** Fusing element, classification of fuses, current carrying capacity of fuses, high rupturing capacity (H.R.C.) cartridge fuses, characteristics of H.R.C. fuses, selection of HRC fuses.	04
8	**CIRCUIT BREAKERS:** Types of circuit breakers , basic principle of operation, phenomena of arc, initiation of a arc, maintenance of arc, arc extinction, d. c. circuit breaking, a.c. circuit breaking, arc voltage and current waveforms in a.c. circuit breaking, restriking and recovery voltages, de-ionization and current chopping, ratings of circuit breakers, oil circuit breakers, air blast circuit breakers, SF6 Circuit breakers , Vacuum breakers.	09
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Art and Science of Protective Relaying	Mason	John Wiley & Sons
2	Protective relaying, Principles and Applications	J. L Black Burn	CRC Press
3	Computer Relaying for Power Systems, (2nd Edition)	A.G. Phadke and J.S Thorp	John Wiley and sons New York

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-701P** Course Title **POWER SYSTEM PROTECTION LABORATORY**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	7th Semester	Autumn	√	Spring				

6 **Course Outcomes**

CO1: Study of various types of relays, Characteristics of fuses of different relays, Characteristics of inverse time over current relays

CO2: Time graded protection using inverse time O/C relay, Visit to an Electric Sub-station to study various protective schemes.

CO3: Study of circuit breakers, Study of differential protection scheme, Study of an oil circuit breaker.

CO4: Operating quantity versus polarizing quantity characteristic of a directional attracted Armature relay, Experiment on Digital Protection

7. Lab. Experiments:

S.No	Experiments
1	Study of various types of relays.
2	Characteristics of fuses of different relays.
3	Characteristics of inverse time over current relays
4	Time graded protection using inverse time O/C relay
5	Visit to an Electric Sub-station to study various protective schemes.
6	Study of circuit breakers.
7	Study of differential protection scheme.
8	Study of an oil circuit breaker.
9	Operating quantity versus polarizing quantity characteristic of a directional attracted Armature relay.
10	Experiment on Digital Protection

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-702** Course Title **Advanced Power Electronics**

2 Contact Hours | L | 3 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 04 | 7th Semester | Autumn | √ | Spring | |

6 **Course Outcomes**

CO1: Understand modern self-commutating power semiconductor devices

CO2: Understand three phase voltage source and current source inverters and their modulation strategies.

CO3: Understand the operation of non-isolated DC-DC Converters

CO4: Understand the operation of isolated DC-DC converter.

CO5: Perform comparative assessment of different modulation techniques

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Module-I:** Introduction to Modern self-commutating power semi-conducting devices: Power MOSFET, IGBT, GTO, IGCT, etc.	06
2.	**Module-II:** Three phase PEM Voltage source inverters and Three phase current source inverters. Different modulation strategies.	10
3.	**Module III:** Switched mode Power supplies: Basic structure and comparison between Linear Power supplies and SMPS	04
4.	**Module IV:** Switched Mode DC-DC conversion: a) Non-isolated DC-DC converters, DC-DC Buck converter, DC-DC Boost converter, DC-DC Buck-Boost converter, Cuk converter. b) Isolated DC-DC converters: Flyback converter, Forward converter, Push-Pull converter, Half-Bridge converter and Full-Bridge converter.	16
5.	**Module V:** Power line disturbances and their effect on equipment, Power conditioners, offline and online UPS	04
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power Electronics Converters, Applications, and Design	Mohan, Undeland, Robbins	Wiley Indian Edition (3/e)
2	Power Electronics	M. H. Rashid	Academic Press
3	Power Electronics and Motor Drives: Advances and Trends	Bimal K. Bose	Academic Press
4	Power Semi-conductor controlled Drives	G.K. Duby	
5	Power Electronic Control of AC motor	Murphy and Turnbull	
6	IEEE, IET and Elsevier Papers	------	IEEE
7	NPTEL lectures on power electronics	-------	NPTEL

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-703** Course Title **Power Systems-III**

2 Contact Hours

L	3	T	1	P	0

3 Examination Duration (Hrs):

Theory	02	Practical	00

4 Relative Weight age

M-I	20	M-II	20	ASM	10	ME	50	PRE	00

5 Credits: 04 7th Semester

Autumn	√	Spring	

6 **Course Outcomes**

CO1: Gain knowledge of load flow techniques, mathematical analysis, and their comparison.

CO2: Develop an overview of power system stability phenomenon.

CO3: Discuss Automatic Generation Control by developing various models and their control strategies

CO4: Understand and evaluation of generation and absorption of reactive power and study various voltage control methods.

CO5: Formulation and analysis of the economic operation of the power system.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Load Flows:** Nature and importance of the problem, Network model formulation, algorithm for the formulation of Ybus matrix, formulation of Ybus by singular transformation, primitive network, Bus incidence matrix, load flow problem, load flow equations, bus classification – List of variables in load flow equations, Gauss - Seidel & Newton-Raphson method for solving load flow problem, comparison of load flow methods, De-coupled & Fast de-coupled power flow method, Modeling of tap-changing transformers and phase-shifters	**10**
2.	**Power System Stability:** The stability problem, steady state, dynamic and transient stability, rotor dynamics and swing equation, power- angle curve, equal-area criterion of stability, Numerical solution of swing equation, Factors affecting transient stability.	**08**
3.	**Automatic Generation Control:** Real power balance and its effect on system frequency, load frequency control of single area system – Models of speed governing system, turbine and generator load, steady state analysis and dynamic response, proportional plus integral control, two area load frequency control, economic dispatch control.	**08**
4.	**Control of voltage and Reactive Power:** Generation and absorption of reactive power, Relation between voltage and reactive power, Need for voltage control at various system buses, Methods of voltage control – injection of reactive power, tap changing transformers, booster transformers, phase – shift transformers	**08**
5.	**Economic Operation of Power System:** Introduction, system constraints, economic dispatch neglecting losses, penalty factor, economic dispatch with losses, transmission loss equation, automatic load dispatching.	**08**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power System Analysis	J.J. Grainger and W.D Stevenson	Tata McGraw-Hill
2	Electrical Power Systems	B.M. Weedy and Cory	John Wiley & sons.
3	Power Systems Engineering	Nagrath and Kothari	McGraw-Hill Education
4	Electric Power Systems	C.L. Wadlhwa	New Age Publications
5	Electric Energy System Theory	O. I Elgard	McGraw-Hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ECE-708** Course Title **Electronic Measurements and Instrumentation**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 03 | 7th Semester | Autumn | √ | Spring | |

6	Course Outcomes
CO1	To familiarize with measurement standards and systems with their responses and get a detailed understanding of various electronic meters
CO2	To introduce transducers, sensors and actuators used in measurements
CO3	Understanding of Instrumentation amplifiers and various wave analysers
CO4	To understand the working of Phase and Frequency meters and to get knowledge about data acquisition system and its interfacing with microcontrollers

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**INSTRUMENTATION SYSTEM:** Classification of instrumentation errors. Basic features of instrumentation system. Dynamic response and accuracy of an instrumentation system.	05
2.	**TRANSDUCERS:** Transducers of following types: Resistance, Inductance, Capacitance, Piezoelectric, Optical and Digital. Measurement of various electrical and non electrical quantities.(Temp., torque, speed, stress, strain, etc)	07
3.	**INSTRUMENTATION AMPLIFIERS**	05
4.	**WAVE ANALYSERS:** Analyzers for Audio and radio frequency waves, Measurement of distortion. Spectrum analysis.	05
5.	**PHASE AND FREQUENCY MEASUREMENT:** Analog and Digital Measurement of frequency and time.	05
6.	**DATA ACQUISITION SYSTEM:** Comments of data acquisition, system, Sample and Hold circuits, Recorders: Strip Chart recorders, Magnetic tape recorder, Digital recorder, Ultraviolet recorder, Heat sensitive recorder, Single channel and Multi-channel data acquision system. Using DAC, ADC and Multiplexing	10
7	**Microprocessor based Measurement techniques:**	05
Total Contact Hours		42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Electronic measurements and instrumentation	Cooper	Prentice-Hall
2	Electrical and Electronic measurements & instrumentation	A.K. Sawhney.	Khanna
3	Electrical and Electronic measurements & instrumentation	J.B Guptha	S.K Kataria

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ECE-708P** Course Title **Electronic Measurements and Instrumentation Laboratory**

2	Contact Hours			L	0	T	0		P	1	
3	Examination Duration (Hrs):	Theory	00			Practical	02				
4	Relative Weight age	MSLE	25			ESLE	25				
5	Credits:	01		7th Semester		Autumn	√	Spring			

6 **Objective: The experimental setups are introduced to and performed by the students to enable them to give optimal performance during professional life.**

7. Lab. Experiments:

S.No	Experiments
1	Find Q of an LC circuit.
2	To study use of 741 as an instrumentation Amplifier.
3	Study of ADC- 0801.
4	Study of DAC – 0808.
5	Experiments on study and use of transducers for common electrical and non- electrical quantities.
6	Experiments on wave form analysis for audio and radio range of signals.
7	Study of intelligent instruments and measurement systems.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-704** Course Title **Power Station Practice**

2 Contact Hours

L	2	T	1	P	0

3 Examination Duration (Hrs):

Theory	02	Practical	00

4 Relative Weight age

M-I	20	M-II	20	ASM	10	ME	50	PRE	00

5 Credits: 03 7th Semester

Autumn	√	Spring	

6 **Course Outcomes**

CO1: To study economic aspects of power generation and power factor improvement.

CO2: To study Power tariff.

CO3: To design and study of neutral grounding.

CO4: To study about different types of power stations and their auxiliaries

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Economic Aspects and power factor improvement:** Economics of generation, factors affecting the cost of generation, reduction of costs by interconnection of stations, curves useful in system operation, choice of size and number of generating units. Power factor, disadvantages of low power factor, methods of improving power factor, location of power factor improvement apparatus, economics of power factor improvement.	10
2.	**Power Tariff:** Cost of generating station, fixed capital, running capital, annual cost, running charges, fixed charges, factors influencing the rate of tariff, designing tariff, different types of tariff, flat rate tariff, block rate tariff, two part tariff, maximum demand tariff, power factor tariff.	8
3.	**Neutral Grounding:** Neutral grounding, solid grounding, resistance grounding, reactance grounding, arc suppression coil grounding, earthing transformers, choice of methods of neutral grounding equipment, grounding for safety.	8
4.	**Overview of different types of power stations and their auxiliaries:** Thermal power plants, hydroelectric stations, nuclear power stations, diesel power stations, gas turbine plants, Hydro Stations – Selection of Site, Mass Curve, Flow Duration Curve, Hydrograph, Classification of Hydro Plants.	8
5.	**Overview of substations and substation equipment:**	8
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Elements of Power Station	Deshpande	Prentice hall
2	The Art and Science of Utilisation of Electric Energy	H. Pratab	Dhanpat Rai And Sons
3	Substation Design and Equipment	Satnam	Dhanpat Rai And Sons
4	A Course in Electrical Power	Soni, Gupta and Batnagar	Dhanpat Rai And Sons

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-1-14** Course Title **Elective-1**

2 Contact Hours

L	2	T	1	P	0

3 Examination Duration (Hrs):

Theory	02	Practical	00

4 Relative Weight age

M-I	20	M-II	20	ASM	10	ME	50	PRE	00

5 Credits: 03 7th Semester

Autumn	√	Spring	

6 **Objective:** The course is designed to introduce students the basic concepts and the sufficient information of this course so as to enable them to give optimal performance during professional life.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Syllabi given along with Annexure-I	
Total Contact Hours		

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
	Given along with Annexure-I			

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-705** Course Title **Electrical Power Systems (ECE)**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: 03 7th Semester | Autumn | √ | Spring | |

6 **Objective:** The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Power System Scenario in India, Electric Supply Systems, Comparison of AC & DC distribution. A.C distribution calculation, Representation of Power System components, single line diagram, per unit system	**08**
2.	Main components of overhead lines, Calculation of inductance & capacitance, Conductor materials ACSR conductors, Line supports and insulation	**12**
3.	Characteristic & performance of transmission lines, short, medium & long line representation, Power flow across transmission lines, Underground cables, Classification & construction, current rating of cable	**08**
4.	Symmetrical component application to fault analysis, Introduction to load flow analysis.	**08**
5.	Introduction to Power System Protection. Function of relay & circuit breaker	**03**
6	Real & Reactive Power Control & stability concepts	**03**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Elements of Power System	Stevenson	Tata McGraw-Hill
2	Power Systems Engineering	Nagrath and Kothari	McGraw-Hill Education
3	Electric Power Systems	C.L. Wadlhwa	New Age Publications
4	Electric Power System	Asfhaq Hussain	CBS publishers

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-705P** Course Title **ELECTRICAL POWER SYSTEM LAB (ECE)**

2	Contact Hours	L	0	T	0	P	2		
3	Examination Duration (Hrs):	Theory	00	Practical	02				
4	Relative Weight age	MSLE	25	ESLE	25				
5	Credits: 01	7th Semester	Autumn	√	Spring				

6 **Objective:**

7. Lab. Experiments:

S.No	Experiments
1	A.C distribution
2	D.C. distribution
3	Efficiency, Regulation & ABCD parameters of Transmission line
4	Study of cables & find charging current
5	Study of different types of insulators
6	Computer Simulation of Power System

ELECTRICAL ENGINEERING DEPARTMENT

SEMESTER WISE COURSE STRUCTURE

B. Tech. 8th

S. No.	Course No.	TITLE / Subjects	ENGAGEMENT			C R E D I T S		
			L	T	P	TH	P	Total
1	HSS-701	General Management & Economics	2	1	0	4		03
2	ELE-1-14 / MTH-705	Elective-II	2	1	0	3		03
3	ELE-803	High Voltage Engineering	2	1	0	3		03
4	ELE-803P	High Voltage Engineering Lab.	0	0	2	0	1	01
5	ELE-802	Project	0	0	18	12		12
6	ELE-1-14	Elective-III	2	1	0	3		03
Total Credits								25

L- Lecture T- Tutorial P- Practical TH- Theory

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	**HSS-701**			Course Title	**General Management & Economics**					
2	Contact Hours				L	2	T	1	P	0	
3	Examination Duration (Hrs):				Theory	02	Practical	00			
4	Relative Weight age	M-I	20	M-II 20	ASM	10	ME	50	PRE	00	
5	Credits:	03		8th Semester	Autumn		Spring	√			

6. **Course Outcomes**

CO1: Describe the economic terms; concepts and explain the function of market, its types and determination of price under various competencies.

CO2: Identify the ability to employ the economic way of thinking like application of marginal analysis, use of benefit/cost analysis, utility and demand forecasting techniques.

CO3: Describe the process of management's four functions: planning, organizing, directing and controlling and make an appropriate staffing decision which includes recruitment and selection.

CO4: Demonstrate organization's characteristics and how they might impact on management practices and analyze both qualitative and quantitative information to isolate issues and formulate best control methods.

7. **Details of the Course:**

S.No	Particulars			Contact Hours
1.	**Industrial Economics**	**1.1 Meaning & Importance of Industrialization**. Organizations – Various types of organizations. Division of Economics, Basic Constituents (Micro and Macro Economics).		03
		1.2. Consumption and Market Structure Law of demand and Elasticity of demand – Consumer's surplus, Utility and its measurement. Types of market structure – Perfect, Monopoly, Monopolistic and Oligopoly. Demand Forecasting Techniques. Meaning and factors influencing location of Industrial Units, Scale of Production - Large Vs Small Industrial Units.		05
2.	**Management**	**2.1 Introduction of Management** It's Nature, purpose and definitions. Process and functions of Management - Planning, Organizing, Actuating and Controlling, Functional Areas of management, Skills and role of Management.		03
		2.2 Planning: Nature and purpose of planning, Types of Plans, Steps in Planning Process.	**2.2(a) Objectives:** The Nature and importance of objectives; Types of objectives, primary, Secondary, individual and personal Objectives, Guidelines for setting objectives.	04
			2.2(b) Decision Making Importance and limitations of Rational Decision Making, types of decisions – Programmed and non-programmed decisions – process of Decision Making under certainty, uncertainty and Risk.	04
		2.3. Organizing: Nature and Purpose of Organizing: Steps in Organizing/Process of Organizing; Formal and informal	**2.3(a) Decentralization of Authority**; The nature of decentralization- Degree of decentralization. Decentralization as philosophy & Policy	04
			2.3(b) Delegation of Authority: Meaning of Authority/delegation steps in the	04

		organization; Span of Control & factors determining effective span.	process of delegation, Factors determining the degree of delegation. Art of delegation	
			2.3(c) <u>Line/Staff Organization</u>: Line organization, Staff organization, Line and Staff organization, Functional and Committee Organization, the nature of line and staff relationship.	04
		2.4 <u>Actuating:</u> Nature and purpose of Actuating, Steps in Actuating/Actuating Process.	**2.4(a) <u>Essentials of Human Resource management.</u>** Importance and functions of Human Resource Management. Importance of Human Resource planning, Recruitment, Selection, training and Development, Performance Appraisal, Compensation packages, promotions, Transfers, demotion and Separation etc.	05
			2.4(b) <u>Leadership:</u> Meaning and importance, Leadership qualities	02
			2.4(b) <u>Motivation</u>: The Need – want – Satisfaction chain.	01
		2.5. <u>Controlling:</u> Nature and purpose of controlling, Steps in controlling/process of controlling, Types of controls, Recruitments of effective controls.		03
Total Contact Hours				42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1.	Industrial Organization and Management	Y. K. Bushan.	Sultan chand
2.	Principles of Management	A.K. Chatterjee.	-
3.	Principles of Management	George Terry.	R. D. Irwin
4.	Industrial Organization and Management	V.D. Sinha and Gad Gill.	-
5.	Principles of Management	Kroontz & O' Donnell	McGraw-Hill,
6.	Elementary Economics Theory	K.K. Dewett and J.D. Verma	S. Chand & Company
7.	An Introduction to Economics	M.L. Sethi	Sultan chand
8.	Economics	Samuelson & William	McGraw-Hil
9.	Advanced Economics	K.P.M. Sundram	S. Chand
10.	Indian Economics	K.K.Dewett and J.D. Verma	S. Chand & Company
11.	Engineering Economics	Mansoor Ali & S. K. Delala	-

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-1-14 & MTH-705** Course Title **Elective-II**

2 Contact Hours

L	2	T	1	P	0

3 Examination Duration (Hrs):

Theory	02	Practical	00

4 Relative Weight age

M-I	20	M-II	20	ASM	10	ME	50	PRE	00

5 Credits: 03 8th Semester

Autumn		Spring	√

6 **Objective:**

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Syllabi given along with Annexure-I	
	Total Contact Hours	

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
	Given along with Annexure-I			

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-803** Course Title **HIGH VOLTAGE ENGINEERING**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 03 | 8th Semester | Autumn | | Spring | √ |

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**CONDUCTION AND BREAKDOWN IN GASES:** Gases as insulators, ionization, current growth, Townsend's criterion for breakdown, electro-negative gases, Paschen's Law, Streamer breakdown mechanism, corona discharges, post breakdown phenomena, practical considerations in using gases for insulating materials.	**08**
2.	**CONDUCTION AND BREAKDOWN IN LIQUID DIELECTRICS:** Classification of liquid dielectrics, conduction and breakdown in pure liquids and in commercial liquids.	**04**
3.	**BREAKDOWN IN SOLID DIELECTRICS:** Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, breakdown of composite insulation, solid dielectric used in practice.	**06**
4.	**APPLICATIONS OF INSULATING MATERIALS IN DIFFERENT ELECTRICAL APPARATUS.** Applications in power transformers, rotating machines, circuit breakers, cables, power capacitors, electronic equipment.	**03**
5.	**GENERATION OF HIGH VOLTAGES AND CURRENTS:** Generation of high d.c. and a.c. voltages, generation of impulse voltages and currents.	**08**
6.	**MEASUREMENT OF HIGH VOLTAGES AND CURRENTS:** Measurement of high d.c. , a c. and impulse voltages, Measurement of high d.c, a.c and impulse currents.	**06**
7.	**NON DESTRUCTIVE TESTING:** Measurement of d.c. resistivity, dielectric constant and loss factor , partial discharge measurement.	**04**
8.	**TESTING OF ELECTRICAL APPARATUS:** Testing of insulators, bushings, isolators, circuit breakers, cables, transformers and surge diverters.	**03**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	High Voltage Engineering Fundamentals	E. Kuffel, W.S Zaengl	Newnes
2	High Voltage Engineering	M.S. Naidu, V. Karamraju	Tata McGraw-Hill
3	High voltage test techniques	Dieter kind, Kurt Feser.	Newnes
4	An Introduction to High Voltage Engineering	Subir Ray.	Prentice Hall of India

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	**ELE-803P**		Course Title	**HIGH VOLTAGE ENGINEERING LABORATORY**				
2	Contact Hours			L	0	T	0	P	1
3	Examination Duration (Hrs):			Theory	00	Practical	02		
4	Relative Weight age			MSLE	25	ESLE	25		
5	Credits:	01	8th Semester	Autumn		Spring	√		

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. Lab. Experiments:

S.No	Experiments
1	To test the breakdown voltage of insulating liquids according to specification ASTM D877.
2	To carry out one-minute power-frequency dry withstand and flashover test on 11 and 33 KV pin insulators.
3	To carry out one minute power-frequency dry withstand and flashover test on a string of three unit suspension type insulator.
4	To study the effect of front resistance, tail resistance, generator capacitance and the load capacitance on the impulse voltage wave shape.
5	Measurement of high voltages using sphere gaps.
6	To carry out impulse voltage withstand test on a pin insulator /string of insulators as per international specifications.
7	To find out the 50% impulse flashover voltage of a pin insulator / insulator string.
8	Study of breakdown characteristics of electrodes with different shapes under d.c., a.c., and impulse voltage conditions.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-1-14** Course Title **Elective-III**

2 Contact Hours | L | 2 | T | 1 | P | 0 |

3 Examination Duration (Hrs): | Theory | 02 | Practical | 00 |

4 Relative Weight age | M-I | 20 | M-II | 20 | ASM | 10 | ME | 50 | PRE | 00 |

5 Credits: | 03 | 8th Semester | Autumn | | Spring | √ |

6 **Objective:**

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Syllabi given along with Annexure-I	
Total Contact Hours		

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
	Given along with Annexure-I			

ANNEXURE I

Electives for 7th & 8th Semesters (Electrical)

BATCH 2015 ONWARDS

Electives –I, II, III

3 Credits each

1.	Distribution System Automation	ELE-1/E
2.	Industrial Process Instrumentation & Telemetry	ELE-2/E
3.	Selected Topics in Advanced Control	ELE-3/E
4.	Mechatronics	ELE-4/E
5.	Advanced Power Systems Control	ELE-5/E
6.	Power Systems Transients	ELE-6/E
7.	System Planning & Load Forecasting	ELE-7/E
8.	EHV AC & DC Transmission	ELE-8/E
9.	Maintenance & Design of Electrical Sub Stations	ELE-9/E
10.	Power System Reliability	ELE-10/E
11.	Utilization & Traction	ELE-11/E
12.	Microcontroller & their Applications + LAB	ELE-12/E
13.	Electric Drives + LAB	ELE-13/E
14.	Renewable Sources of Electrical Energy	ELE-14/E
15.	Optimization Techniques	MTH-705

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE -1/E** Course Title **Distribution System Automation**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**
The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Introduction to distribution automation.	**02**
2.	Configuration of distribution system.	**04**
3.	Nature of loads and load forecasting.	**04**
4.	Layout of substations and feeders.	**03**
5.	Design considerations.	**03**
6.	Distribution system load flow.	**03**
7.	Optimum Siting and Sizing Of Substations.	**03**
8.	Optimum capacitor placement	**03**
9.	Distribution system monitoring and control	**04**
10.	SCADA, Remote metering and load control strategies,	**02**
11.	Optimum feeder switching for loss minimization and load control.	**03**
12.	Distribution system restoration,	**03**
13.	Distribution system protection and switch gear.	**03**
14.	Power quality issues.	**02**
Total Contact Hours		**42**

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-2/E** Course Title **Industrial Process Instrumentation and Telemetry**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**
The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Transducers:** Definition, different types of transducers, transduction principles, classification of transducers and their characteristics, transducers for measurement of different physical variable like displacement, velocity, force, pressure, torque, thickness, strain, temperature, weight, humidity, moisture, PH value.	**16**
2.	**Process Controllers:** General purpose process controllers, control actions, and various types of controllers, feedback controllers, cascade controllers, feed forward controllers and ratio controllers.	**14**
3.	**Telemetry :** Introduction to telemetry, Remote control and supervisory control remoter signaling and signal transmission (Method and Media)	**12**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Measurement Systems"	E.O. Deoblin	McGraw-Hill
2	A course in electrical and electronic measurement and instrumentation"	A.K. Sahney	Dhanpat Rai and sons Publication
3	Handbook of transducers for electronic measuring systems	Norton H.N	Prentice-Hall
4	Instrument transducers : an introduction to their performance and design"	Neubert H. K. P	Oxford University Press
5	Handbook of Telemetry and Remote Control"	Grumberg E.L	McGraw-Hill
6	Fundamentals of Automation and Remote Control	Ginz Beng	Pergamon Press,
7	Telecontrol: Method of application of Telemetry and Remote Control.	Swoloda G.	Van Nostrand-Reinhold

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-3/E** Course Title **Selected Topics in Advanced Control**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**
The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
	Topics shall be selected by the Teacher Incharge	
Total Contact Hours		**42**

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-4/E** Course Title **Mechatronics**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0 3** Practical **0 0**

4 Relative Weight age M-I **2 0** M-II **2 0** ASM **1 0** ME **5 0** PRE **0 0**

5 Credits: **0 3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Computer Integration of electro-mechanical systems, sensor modeling, actuator modeling, interfacing, mixed dynamic systems modeling, data acquisition and virtual instrumentation, real-time monitoring and control, LabVIEW real-time data acquisition and control, MATHWORKS tools for real-time acquisition and control, laboratory experiments for Mechatronics.	**42**
Total Contact Hours		**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	. Mechatronics	, Dan Necsulescu	Pearson education
2	Introduction to Mechatronics and Measurement Systems,	D. G. Alciatore, M. B. Histand	Tata McGrawHill.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-5/E** Course Title **Advanced Power Systems Control**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Decoupling between p-f and q-v Control loops, Coherency, load frequency control –classical and optimal, voltage control, Static Var compensation, use of short term storage units , computer control.	**42**
Total Contact Hours		**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power System operation and Control	P.S.R. Murthy	McGraw-Hill
2	Economic Control of Interconnected Power Systems	L.K. Kirchmayer	John Wiley & Sons. Ltd
3	Electric Energy Systems Theory: An Introduction.	Elgerd	Tata McGrawHill.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-6/E** Course Title **Power System Transients**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Origin and nature of transients and surges, Surge parameters. Equivalent circuit representations. Lumped and distributed circuit transients.	**06**
2.	Line energization and de-energization transients. Earth and earth wire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies. Control of transients	**12**
3.	Lightening Phenomenon. Influence of tower footing resistance and earth resistance. Traveling waves in distributed parameter multi conductor lines, parameters as a function of frequency. Simulation of surge diverters in transient analysis. Influence of pole opening and pole reclosing.	**12**
4.	Insulation Co-ordination: Over voltage limiting devices, dielectric properties, breakdown of gaseous insulation, tracking and erosion of insulation, high current arces, metallic contacts	**12**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Transients in Power Systems	Lou van der Sluis,	John Wiley & Sons.
2	Transients in Power Systems	V. A. Vanikov	Mir Publications, Moscow
3	Traveling Waves on Transmission Lines	Bewley,	L.V Dover Publications Inc., New York
4	High Voltage Insulation Engineering.	Ravindera Arora, Wolfgang Mosch,	New Age International Publishers Limited
5	Electrical Transients in Power Systems	Greenwood	John Wiley & Sons

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-7/E** Course Title **System Planning and Load Forecasting**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Forecasting** –Needs uses and current status of forecasting-fundamentals of quantitative forecasting-explanatory and time serious forecasting-least square estimates-peak load forecasting-Accuracy of forecasting methods. Regression and en** methods – Box Jenkins time serious methods.	**14**
2.	**Problems facing electricity industry**-Long term forecasting techniques –Methods of long term forecasting – Special load forecasting – Multivariate procedures- Short Term forecasting techniques.	**14**
3.	**Forecasting and Planning.** The role of forecasting in planning – comparison and selection of forecasting methods. The accuracy of forecasting methods – Pattern of the Data and its effects on individual forecasting methods. Time horizon effects on forecasting methods. Generation planning-fundamental economic analysis-Generation planning optimized according to generating unit categories distribution & transmission system planning.	**14**
Total Contact Hours		**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Forecasting methods and application.	Makridakis and Spyrox,	John Wiley
2	Modern Power System Planning.	X. Wing & J. R. MCDonald.	McGraw Hill
3	Electrical Power System Planning.	A.S. Pabla	Mac Millan
4	Power System Planning	Sullivan	M.CGraw Hill

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-8/E** Course Title **EHV AC & DC Transmission**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0 3** Practical **0 0**

4 Relative Weight age M-I **2 0** M-II **2 0** ASM **1 0** ME **5 0** PRE **0 0**

5 Credits: **0 3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Introduction.	**06**
2.	Need of EHV transmission, comparision of EHV ac & dc transmission, mechanical considerations of transmission line.	**08**
3.	Parameters of EHV line, over-voltage due to switching, ferroresonance, line insulator and clearance, corona, long distance transmission with series & shunt.	**08**
4.	Compensations, principle of half wave transmission flesible ac transmission.	**08**
5.	**EHV DC Transmission** Types of dc links, terminal equipment and their operations, HVDC system control reactive power control, harmonics, multiterminal dc (MTDC) system , ac/dc system analysis, protection of terminal equipments.	**12**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Extra High Voltage AC Transmission Engineering,	Rakesh Das Begmudre.	New Age International Ltd.
2	HVDC Power Transmission System.	K.R. Padiyar,	New Age International Ltd..
3	EHV-AC and HVDC Transmission Engineering & Practice.	E.W. Kimbark.	Khanna Publishers.

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-9/E** Course Title **MAINTENANCE & DESIGN OF ELECTRICAL SUB STATIONS**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	General aspects of sub-station design & layout with all equipment's.	**04**
2.	Bus bar arrangement with detailed layout.	**04**
3.	Isolating switches, location, rating, selection, operation and control. Interlocking.	**04**
4.	Voltage & Current Transformers. Governing specifications, rating & selection requirement of CT's & PT's for different protection schemes.	**06**
5.	Circuit Breakers: Standard ratings & selection. Restriking voltage & recovery voltage, particular performance & testing of circuit breaker.	**08**
6.	Control & Relay panels: Design of control & relay panels. Planning of control circuit. Voltage selection scheme.	**06**
7.	General earthing of a substation. Complete design of earthing grid.	**04**
8.	Auxiliaries: Wiring diagrams and control cable schedule. D.C Supply.	**04**
9.	Gas Insulated substation – introduction.	**02**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Substation Design and Equipments	P.S Satnam & P.V Gupta.	Dhanpat Rai Publications

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-10/E** Course Title **Power System Reliability**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Generator System Models State Load Model, Probability Methods, Unit Unavailability Outage Probability. Generating Capacity Limits – Recursive Techniques- Capacity Expansion Analysis – Scheduled Outages _ Reliability Indices – Frequency Duration Method.	**12**
2.	**Interconnected Systems:** Two systems with Tie, Probability Array Methods, Reliability Indices, Variable Reserve and Maximum Peak Load Reserve, Multi Connected Systems, Operating Reserve, PJM Method, ORR UC Risk Economics & Reliability. Hot Reserve, Rapid Start Units, Security Function Approach.	**16**
3.	**Distribution System:** Interruption Indices, System Performance – risk prediction, Radial Systems, Effect of Load Transfer, Line Failures, Parallel and Mesh Networks. Industrial Systems.	**14**
	Total Contact Hours	**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Power System Reliability Evaluation	Roy Billinton.	Plenum Press, New York.
2	Reliability Assessment of Large Electric Power Systems.	Roy Billinton, Ronald N. Allan.	IEEE press
3	Reliability Engineering Fundamentals and Applications,	R. Ramakumar.	Prentice Hall
4	Applied Reliability Assessment in Electric Power Systems.	Roy Billinton, Ronald W. Allan and Luigi Salvaderi.	IEEE Press
5	Reliability Modeling in Electrical Power Systems.	J. Endrenyi, Willey.	New York

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-11/E** Course Title **Utilization and Traction**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0** **3** Practical **0** **0**

4 Relative Weight age M-I **2** **0** M-II **2** **0** ASM **1** **0** ME **5** **0** PRE **0** **0**

5 Credits: **0** **3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Electric Drive:** Factors governing selection of Electric drive. Control devices for industrial motors. Motors for particular services. Applications of Electric Drive.	10
2	**ELECTRIC TRACTION**: Introduction, requirements of an ideal traction, systems of traction, speed time curve, tractive effort, co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. Breaking methods used in Traction Motor, specific energy consumption and factors affecting it.	12
3	**INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES**: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.	8
4	**ILLUMINATION:** Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparison, Glare and its remedy	6
5	**HEATING AND WELDING:** Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment.	6
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Utilization Of Electric Energy,	E Openshaw Taylor	12th Impression, 2009, Universities Press
2	Modern Electric, Hybrid Electric and Fuel Cell Vehicles,	E. Gay, Mehrdad, Ehsani, Yimin Gao, Sabastien.	Ali Emadi- CRC Press.
3	Art & utilization of Electric Energy	H. Partab.	
4	Utilization of Electric Power & Electric Traction	J.B Gupta	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-12/E** Course Title **MICRO CONTROLLERS AND THEIR APPLICATION**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0 3** Practical **0 0**

4 Relative Weight age M-I **2 0** M-II **2 0** ASM **1 0** ME **5 0** PRE **0 0**

5 Credits: **0 3** **7th /8th** Semester

6 **Objective:**

The course is introduced to the students to enable them to give optimal performance and to tackle every challenge during professional experience.

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Microcontrollers and their Applications :** Brief Review of 8255A PPI, 8259 PIC and 8251 USART peripheral chips.	**10**
2.	**Historical background of micro-controllers:** Introduction to Intel 8 bit & 16 bit Micro-controllers, 8031/8051 – Architectural details, Bus timing, Memory organization, Memory Map expansion, Fetch / Execute sequences, External Memory Access, Addressing Modes, Hardware description of 8031/51, Instruction formats, Instruction sets, interrupt structure & interrupt priorities, Port structures & Operation, linear counter Functions, different Modes of Operation and Programming examples, Interfacing, Adding external devices to the bus, Some practical examples of interfacing (Example: Converter and Inverter control).	**32**
Total Contact Hours		**42**

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	The 8051 Micro-controller: Architecture, Programming and Applications.	Kenneth J. Ayala	Penram International Publishing
2	Programming & Customizing the 8051 Micro-controller	M. Predko	McGraw-Hill
3	Intel Manual		Intel Corporation
4	Microprocessors and Programmed Logic	K.L. Short.	Prentice Hall

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **ELE-14/E** Course Title **Renewable sources of Electrical Energy**

2 Contact Hours: L **3** T **0** P **0**

3 Examination Duration (Hrs): Theory **0 3** Practical **0 0**

4 Relative Weight age M-I **2 0** M-II **2 0** ASM **1 0** ME **5 0** PRE **0 0**

5 Credits: **0 3** **7th /8th** Semester

6 **Objective: The objective of this course is to introduce the students to the different Non-conventional and renewable energy sources, their advantages and applications in day to day life and the methods of conversion of energy from these resources into usable form.**

7. **Details of the Course:**

S.No	Particulars	Contact Hours
1.	Review of conventional & Non-conventional Energy resources, Energy problem, Energy & environment , Need for renewable. Relevant energy conversion systems & Technologies, Electricity generation, Rural Energy.	08
2.	Wind & Solar Energy, Principles of power Gen. From wind, site selection, wind speed & power duration curves, wind power system components, Wind-Diesel Hybrid systems & recent developments. Solar radiation, solar collectors – flat plate & concentrating collectors, Solar water heaters & solar thermal power plants. Miscellaneous Applications	11
3.	Electric Power Generation from Tidal, OTEC & Geothermal energy. Simple power plant based on Tidal / OTEC / Geothermal	06
4.	Direct Energy Conversion techniques, Why Direct Energy Conversion, Solar cell, principle and operation. Solar module & array, solar photovoltaic power system / solar wind Diesel system – operation & design. MHD & Thermo-Electric power generation.	08
5.	Energy conservation. Energy conservation in Transport sector, rural energy, urban energy, Industrial energy, power generation & distribution, Energy efficient buildings. Energy audit. Typical case studies.	05
6.	Future Energy Sources. Nuclear Fusion Energy – Tokamak reactor, Hydrogen Energy An introduction to power generation, advantages and limitations. Exploring new energy sources. Economic evaluation of energy systems.	04
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher
1	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication
2	Energy Technology	S. Rao, B.B Parlekar	Khanna Publications
3	Wind & Solar Power System	M.Patel	CRC Press
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication