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 | 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 | 4 | 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 Single Phase Transformers Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circu model, Phasor diagrams, Losses and efficiency, Voltage 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 (Introduction)	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	Year of Publication
1	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill	6th Edition
2	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education	4th Edition
3	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill	3rd Edition
4	Electric Machinery and Transformer	Guru, Hiziroglu	Oxford University press	3rd Edition
5	Electric Machinery	P.S.Bimbhra	Khanna Publishers	4th Edition
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-I**					
2	Contact Hours			L	0	T	0	P	2	
3	Examination Duration (Hrs):			Theory	0	0	Practical	0	2	
4	Relative Weight age			MSLE	2	5	ESLE	2	5	
5	Credits:	0	1	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 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 | 02 | T | 01 | 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** | 4th Semester | | Autumn | √ | Spring |

6 **Objective: The objective of the course is to introduce the students to modeling, analysis and design of control systems which are an integral part of modern society and have widespread application in science and industry.**

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).	10
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Control Systems Engineering	Norman S. Nise	John wiley	2009
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing	Second Edition
3	Control systems	A.Anand Kumar	PHI Learning Private limited	2009
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall	5th Edition
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 02 T 01 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 4 4th Semester Autumn ☐ Spring ☑

6 **Objective: The objective of the course is to introduce the students to the basic concepts of measurement, different measuring devices and various techniques used in the measurement of electrical quantities.**

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, efforts 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	Year of Publication
1	Electrical Measurements and Measuring Instruments	Golding, Widdis	Pitman	5th Edition
2	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai	2006

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE-403P		Course Title	**ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS LABORATORY**						
2	Contact Hours			L	0	T	0	P	2		
3	Examination Duration (Hrs):			Theory	0	0		Practical	0	2	
4	Relative Weight age			MSLE	2	5		ESLE	2	5	
5	Credits:	0	1	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.**

8. Lab. Experiments:

S.No	Experiments
1	Measurement 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 ELE-–**404** Course Title **NON-CONVENTIONAL ENERGY SOURCES**

2 Contact Hours | L | 03 | 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 | 4th Semester | | Autumn | √ | Spring |

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	Year of Publication
1	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication	
2	,– Energy Technology	S. Rao, B.B Parlekar	Khanna Publications	3rd edition
3	Wind & Solar Power System	M.Patel	CRC Press	
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

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

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

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

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

5 Credits: | 0 | 4 | 4th Semester | | Autumn | | √ | Spring |

6 **Objective: The objective of the course is to introduce the students with basic electronic circuits,their operations and applications**

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 invergter Static and dynamic operation, common CMOS Logic Gate circuits.	05
	Total Contact Hours	42

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Integrated circuits	Millman & Halkias	Tata Mc-Graw Hill	2008
2	Microelectronic circuits	Sedra and Smith	Oxford university Press	5th Edition
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 2		
3	Examination Duration (Hrs):			Theory 0 0		Practical 0 2				
4	Relative Weight age			MSLE 2 5		ESLE 2 5				
5	Credits: 0 1		4th Semester	Autumn		√ Spring				

6 **Objective: The objective of the lab is to make the students familirise with working of various electronic circuitry**

9. 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 | 02 | T | 01 | 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: | | **3** | 4th Semester | | Autumn | √ | Spring |

6 **Objective: To study water related phenomenon and their effect on the design and analysis of water retaining structures and water regulating structures**

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 lines, streak lines and oath lines, continuity equation.	04
4.	Dynamics of fluid Flow: Euler's equation of motion along a stream line and its integration to yield Bernouli's equation flow measurement, pitot tube, prandtl tube, Venturimeter, orifice meter, orifices, Weirs and Matchces.	07
5.	Flow through Pipes: Hydraulic grade line, Darcey-weisbachh formulla, Design of pipes, Equivallent diameter of pipes, Transmission of power through pipes.	06
6.	Flow in open Channels:Chezy's formula, Mannings formula. Design of Cannels, Economic seciton.	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	Year of Publication
1	Fluid Mechanics & Fluid Power Engineering	Dr D.S.Kumar	S.K.Kataria & Sons	2008-09
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	9th Edition

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

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

2 Contact Hours | L | 02 | T | 01 | 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 | 4th Semester | | Autumn | √ | Spring |

6 **Objective: The main objective of the couse is to make the students understand the fundamentals of complex varaiables and wavelet transforms. The application of complex variables in determination of various electric quantities(for example electrostatic potential & flux) and the use of wavelet transforms in digital signal processing.**

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 on integral function, 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	Year of Publication
1	Complex Variables and Appications	R.V.Churchill	Mac- Graw HillInternational BookCompany.	8th edition
2	Theory of functions	Oxford university press		
3	Advanced Engineering Mathematics	R.K.Jain and S.R.K. Iyenger,Narosa-2001.		
4	A first course on Wavelets	Eugenio Hernandez and Guido	Weiss,C.R.C.Press,B ocaRaton 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 –406 Course Title **Electrical Machines (ECE)**

2 Contact Hours | L | 02 | T | 02 | 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 | 4 | 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 generatos)**

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	Year of Publication
1	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill	6th Edition
2	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education	4th Edition
3	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill	3rd Edition
4	Electric Machinery and Transformer	Guru, Hiziroglu	Oxford University press	3rd Edition
5	Electric Machinery	P.S.Bimbhra	Khanna Publishers	4th Edition
6	Basic Electric Machines	Vincent Deltoro	Prentice Hall	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1	Subject Code	ELE- ELE –406P			Course Title	**Electrical Machines Laboratory**					
2	Contact Hours				L	0	T	0	P	1	
3	Examination Duration (Hrs):				Theory	0	0	Practical	0	2	
4	Relative Weight age				MSLE	2	5	ESLE	2	5	
5	Credits:	0	1	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.**

10. 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 | 02 | T | 01 | 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 | **4** | 4th Semester | | Autumn | √ | Spring |

6 **Objective: : The objective of the course is to introduce the students to modeling, analysis and design of control systems which are an integral part of modern society and have widespread application in science and industry.**

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	Year of Publication
1	Control Systems Engineering	Norman S. Nise	John wiley	2009
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing	Second Edition
3	Control systems	A.Anand Kumar	PHI Learning Private limited	2009
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall	5th Edition
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	0	0	Practical	0	2		
4	Relative Weight age			MSLE	2	5	ESLE	2	5		
5	Credits:	0	1	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.**

11. 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	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-–**405** Course Title **NON-CONVENTIONAL ENERGY SOURCES (ECE)**

2 Contact Hours | L | 03 | T | 0 | P | 0 |

3 Examination Duration (Hrs): | Theory | 0 | 4 | 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 | 4th Semester | | Autumn | √ | Spring |

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 renewables. 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	Year of Publication
1	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication	
2	,– Energy Technology	S. Rao, B.B Parlekar	Khanna Publications	3rd edition
3	Wind & Solar Power System	M.Patel	CRC Press	
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE–**407** Course Title **CONTROL SYSTEMS (Information & Technology)**

2 Contact Hours L 02 T 01 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 **4** 4th Semester [ ] Autumn [√] Spring

6 **Objective: : The objective of the course is to introduce the students to modeling, analysis and design of control systems which are an integral part of modern society and have widespread application in science and industry.**

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	Year of Publication
1	Control Systems Engineering	Norman S. Nise	John wiley	2009
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing	Second Edition
3	Control systems	A.Anand Kumar	PHI Learning Private limited	2009
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall	5th Edition
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 LABORATORY **(IT)**						
2	Contact Hours			L	0	T	0	P	1		
3	Examination Duration (Hrs):			Theory	0	0		Practical	0	2	
4	Relative Weight age			MSLE	2	5		ESLE	2	5	
5	Credits:	0	1	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.**

12. 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	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-–**405** Course Title **NON-CONVENTIONAL ENERGY SOURCES (Information & Technology)**

2 Contact Hours | L | 03 | T | 0 | P | 0 |

3 Examination Duration (Hrs): | Theory | 0 | 4 | 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 | 4th Semester | | Autumn | √ | Spring |

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 renewables. 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	Year of Publication
1	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication	
2	,– Energy Technology	S. Rao, B.B Parlekar	Khanna Publications	3rd edition
3	Wind & Solar Power System	M.Patel	CRC Press	
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication	

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code ELE- **ELE –406** Course Title **ELECTRICAL ENGG. TECHNOLOGY (Mechanical Engineering)**

2 Contact Hours L 02 T 01 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 4 4th Semester [ ] Autumn [√] Spring

6 **Objective: the objective of the course is to introduce the basic concepts of electrical engineering to students, some basics of electric machines and some basic concepts of electric measurements techniques.**

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.	Sinusolidally –excited circuits: Basic definitions of a .c. circuits, phasor algebra and complex number representations, solutions of sinusolidally-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	Year of Publication
1	Principles of Electrical Engineering	Vincent Del Toro.	Prentice Hall	
2	Electric Machines	Nagrath and Kothari.	Tata McGraw-Hill	3rd Edition
3	Electric Machinery	Fitzgerald, Kingsley , Umans	Tata McGraw-Hill	6th Edition
4	Electrical Measurements and Measuring Instruments	Golding, Widdis	Pitman	5th Edition
5	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai	2006

NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: Electrical Engineering

1 Subject Code ELE—**406P** Course Title ELECTRICAL ENGG. TECHNOLOGY **LAB (Mechanical Engineering)**

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

3 Examination Duration (Hrs): | Theory | 0 | 0 | Practical | 0 | 2 |

4 Relative Weight age | MSLE | 2 | 5 | ESLE | 2 | 5 |

5 Credits: | 0 | 1 | 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.

13. 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 | 02 | T | 01 | 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 **4** 4th Semester [ ] Autumn [√] Spring

6 **Objective:**
: The objective of the course is to introduce the students to modeling, analysis and design of control systems which are an integral part of modern society and have widespread application in science and industry.

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	Year of Publication
1	Control Systems Engineering	Norman S. Nise	John wiley	2009
2	Control systems(Principles and Design)	M.Gopal	Tata McGraw-Hill Publishing	Second Edition
3	Control systems	A.Anand Kumar	PHI Learning Private limited	2009
4	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall	5th Edition
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.**						
2	Contact Hours			L	0	T	0	P	1		
3	Examination Duration (Hrs):			Theory	0	0		Practical	0	2	
4	Relative Weight age			MSLE	2	5		ESLE	2	5	
5	Credits:	0	1	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.**

14. Lab. Experiments:

S.No	Experiments
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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-–**405** Course Title **NON-CONVENTIONAL ENERGY SOURCES (CSE)**

2 Contact Hours | L | 03 | T | 0 | P | 0 |

3 Examination Duration (Hrs): | Theory | 0 | 4 | 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 | 4th Semester | | Autumn | √ | Spring |

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
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8. **Suggested Books:**

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3	Wind & Solar Power System	M.Patel	CRC Press	
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication	