

**NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR**

NAME OF THE DEPARTMENT:

**Electrical Engineering**

1	Subject Code	<b>ELE-701</b>	Course Title	<b>Power System Protection</b>																				
2	Contact Hours:	<table border="1"><tr><td>L</td><td>2</td></tr></table>	L	2	<table border="1"><tr><td>T</td><td>1</td></tr></table>	T	1	<table border="1"><tr><td>P</td><td>0</td></tr></table>	P	0														
L	2																							
T	1																							
P	0																							
3	Examination Duration (Hrs):	<table border="1"><tr><td>Theory</td><td>0</td><td>3</td></tr></table>	Theory	0	3	<table border="1"><tr><td>Practical</td><td>0</td><td>0</td></tr></table>	Practical	0	0															
Theory	0	3																						
Practical	0	0																						
4	Relative Weight age	<table border="1"><tr><td>M-I</td><td>2</td><td>0</td></tr></table>	M-I	2	0	<table border="1"><tr><td>M-II</td><td>2</td><td>0</td></tr></table>	M-II	2	0	<table border="1"><tr><td>AS</td><td>1</td><td>0</td></tr><tr><td>M</td><td></td><td></td></tr></table>	AS	1	0	M			<table border="1"><tr><td>ME</td><td>5</td><td>0</td></tr></table>	ME	5	0	<table border="1"><tr><td>PRE</td><td>0</td><td>0</td></tr></table>	PRE	0	0
M-I	2	0																						
M-II	2	0																						
AS	1	0																						
M																								
ME	5	0																						
PRE	0	0																						
5	Credits:	<table border="1"><tr><td>0</td><td>4</td></tr></table>	0	4	7 <sup>th</sup> Semester	<table border="1"><tr><td>↓</td></tr><tr><td>Autumn</td></tr></table>	↓	Autumn	<table border="1"><tr><td></td></tr><tr><td>Spring</td></tr></table>		Spring													
0	4																							
↓																								
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.	<b><u>PROTECTIVE RELAYING:</u></b> Function of protective relaying, fundamental principles, primary and backup relaying, functional characteristics	02
2.	<b><u>CLASSIFICATION OF RELAYS:</u></b> Operating principles and characteristics of the following electromechanical relays: Current, voltage, directional, current balance, voltage balance, differential relays, and distance relays.	04
3.	<b><u>PROTECTION OF GENERATORS:</u></b> 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.	<b><u>TRANSFORMER PROTECTION:</u></b> 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.	<b><u>PROTECTION OF FEEDERS, BUSBARS AND TRANSMISSION LINES:</u></b> 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.	<b><u>DIGITAL PROTECTION:</u></b> Introduction, Review of DSP techniques, sampling, aliasing, DFT & FFT. Numerical algorithms. Simulations of transients and electromagnetic transient programme (EMTP).	04
7	<b><u>FUSES:</u></b> 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	<b><u>CIRCUIT BREAKERS:</u></b> 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 choppings, ratings of circuit breakers, oil circuit breakers, air blast circuit breakers, SF6 Circuit breakers , Vacuum breakers.	09
<b>Total Contact Hours</b>		<b>42</b>

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Art and Science of Protective Relaying	Mason	John Wiley & Sons	1956
2	Protective relaying, Principles and Applications	J. L Black Burn	CRC Press	2006
3	Computer Relaying for Power Systems, (2 <sup>nd</sup> Edition)	A.G. Phadke and J.S Thorp	John Wiley and sons New York	2009

# 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
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T	0
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P	2
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3 Examination Duration (Hrs): 

Theory	0	0
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Practical	0	2
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4 Relative Weight age 

MSLE	2	5
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ESLE	2	5
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5 Credits: 

0	1
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 7<sup>th</sup> Semester 

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Autumn

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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	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
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T	1
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P	0
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3 Examination Duration (Hrs): 

Theory	0	3
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Practical	0	0
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4 Relative Weightage 

M-I	2	0
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M-II	2	0
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AS	1	0
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ME	5	0
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PRE	0	0
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5 Credits: 

0	4
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 8<sup>th</sup> Semester 

Autumn
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Spring
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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.	<b>Module-I:</b> a) Modern solid-state power semi-conducting devices: Power MOSFET, IGBT, GTO, IGCT, etc. b) Power Modules, Intelligent power modules, Gating circuits, Their control through digital signal processors.	<b>05</b>
2.	<b>Module-II:</b> a) Non-isolated DC-DC converters: Buck, Boost, Buck-Boost, Cuk, SEPIC, ZETA converters in DCM and CCM. b) Isolated DC-DC converters: Flyback, Forward, Cuk, SEPIC, ZETA, Push-Pull, Half-Bridge and Full-Bridge converters in DCM and CCM. c) Self power factor correction (PFC) properties of DC-DC converters at the mains of single-phase, single-stage AC/DC converters. d) Applications in SMPS, UPS, Welding and Lighting systems.	<b>08</b>
3.	<b>Module-III:</b> a) Single-phase Improved Power Quality AC/DC Converters: Buck, Boost, Buck-Boost, PWM VSC, PWM CSC, Multi-level converters. b) Three-phase Improved Power Quality AC/DC Converters, VSC, CSC, Multi-phase converter, Multi-pulse converters. c) Multi-level converters	<b>08</b>
4.	<b>Module-IV:</b> <u>Power Quality mitigation apparatus:</u> a) Passive filters, Active Power Filters (APFs) and Hybrid filters b) DTSTCOM (Distribution Static Compensator), DVR (Dynamic Voltage Restorer) and UPQC (Unified Power Quality Conditioner).	<b>05</b>
5.	<b>Module-V:</b> <u>FACTS Devices:</u> TCR (Thyristor Controlled Reactor), TSC (Thyristor Switched Capacitor), STATCOM (Static Synchronous Compensator), SSSC (Static Series Synchronous Compensator), UPFC (Unified Power Flow Controller) and IPFC (Interline Power Flow Controller).	<b>05</b>
6.	<b>Module-VI:</b> HVDC systems: Evolution of HVDC system, Comparison of HVDC and HVAC systems, 12-pulse converter-based HVDC system, Analysis of HVDC converters, HVDC system control features, Smoothing reactor and DC lines, Reactive power requirements, Harmonic analysis, Filter design, Converter mal-operation like misfiring and commutation failure.	<b>08</b>

7.	<b>Module-VII:</b> Various applications of Power Electronics in residential, commercial and industrial environments, Energy conservation (some typical examples), Interdisciplinary nature of Power Electronics, Solid state controllers for motor drives.	<b>03</b>
Total Contact Hours		<b>42</b>

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Power Electronics Converters, Applications, and Design	Mohan, Undeland, Robbins	Wiley Indian Edition (3/e)	2007
2	Power Electronics	M. H. Rashid	Academic Press	2006
3	Power Electronics and Motor Drives: Advances and Trends	Bimal K. Bose	Academic Press	2006
4	Understanding FACTS	Hingorani	Wiley-IEEE Press	1999
5	IEEE Transactions on Power Electronics & Industrial Electronics		IEEE Transactions	

# 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	3
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T	1
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P	0
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3 Examination Duration (Hrs): 

Theory	0	3
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Practical	0	0
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4 Relative Weight age 

M-I	2	0
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M-II	2	0
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AS M	1	0
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ME	5	0
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PRE	0	0
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5 Credits: 

0	4
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 7<sup>th</sup> Semester 

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Autumn

Spring
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6. **Objective: The course is designed to introduce the student to the basic concepts of Economics and Management so as to enable them to give optimal performance during professional life.**

7. **Details of the Course:**

S.No	Particulars	Contact Hours		
1.	<p><b><u>Industrial Economics</u></b></p> <p><b>1.1 Meaning &amp; Importance of Industrialization.</b> Organizations – Various types of organizations. Division of Economics, Basic Constituents (Micro and Macro Economics).</p> <p><b>1.2. Consumption and Market Structure</b> 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.</p>	03  05		
2.	<p><b><u>Management</u></b></p> <p><b>2.1 Introduction of Management</b> 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.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>2.2 Planning:</b> Nature and purpose of planning, Types of Plans, Steps in Planning Process.</p> </td> <td style="width: 50%; vertical-align: top;"> <p><b>2.2(a) Objectives:</b> The Nature and importance of objectives; Types of objectives, primary, Secondary, individual and personal Objectives, Guidelines for setting objectives.</p> <p><b>2.2(b) Decision Making</b> Importance and limitations of Rational Decision Making, types of decisions – Programmed and non-programmed decisions – process of Decision Making under certainty, uncertainty and Risk.</p> </td> </tr> </table> <p><b>2.3. Organizing:</b> Nature and Purpose of Organizing: Steps in Organizing/Process of Organizing; Formal and informal organization; Span of Control &amp; factors determining effective span.</p> <p><b>2.3(a) Decentralization of Authority;</b> The nature of decentralization- Degree of decentralization. Decentralization as philosophy &amp; Policy</p>	<p><b>2.2 Planning:</b> Nature and purpose of planning, Types of Plans, Steps in Planning Process.</p>	<p><b>2.2(a) Objectives:</b> The Nature and importance of objectives; Types of objectives, primary, Secondary, individual and personal Objectives, Guidelines for setting objectives.</p> <p><b>2.2(b) Decision Making</b> Importance and limitations of Rational Decision Making, types of decisions – Programmed and non-programmed decisions – process of Decision Making under certainty, uncertainty and Risk.</p>	03  04  04
<p><b>2.2 Planning:</b> Nature and purpose of planning, Types of Plans, Steps in Planning Process.</p>	<p><b>2.2(a) Objectives:</b> The Nature and importance of objectives; Types of objectives, primary, Secondary, individual and personal Objectives, Guidelines for setting objectives.</p> <p><b>2.2(b) Decision Making</b> Importance and limitations of Rational Decision Making, types of decisions – Programmed and non-programmed decisions – process of Decision Making under certainty, uncertainty and Risk.</p>			
		04		

			<b>2.3(b) Delegation of Authority:</b> Meaning of Authority/delegation steps in the process of delegation, Factors determining the degree of delegation. Art of delegation	4
			<b>2.3(c) Line/Staff Organization:</b> Line organization, Staff organization, Line and Staff organization, Functional and Committee Organization, the nature of line and staff relationship.	4
		<b>2.4 Actuating:</b> Nature and purpose of Actuating, Steps in Actuating/Actuating Process.	<b>2.4(a) Essentials of Human Resource management.</b> 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.	5
			<b>2.4(b) Leadership:</b> Meaning and importance, Leadership qualities	2
			<b>2.4(b) Motivation:</b> The Need – want – Satisfaction chain.	1
		<b>2.5. Controlling:</b> Nature and purpose of controlling, Steps in controlling/process of controlling, Types of controls, Recruitments of effective controls.		3
<b>Total Contact Hours</b>				<b>42</b>

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1.	Industrial Organization and Management	Y. K. Bushan.	Sultan chand	2006
2.	Principles of Management	A.K. Chatterjee.	-	-
3.	Principles of Management	George Terry.	R. D. Irwin	1977
4.	Industrial Organization and Management	V.D. Sinha and Gad Gill.	-	-
5.	Principles of Management	Kroontz & O' Donnell	McGraw-Hill,	1972
6.	Elementary Economics Theory	K.K. Dewett and J.D. Verma	S. Chand & Company	2010
7.	An Introduction to Economics	M.L. Sethi	Sultan chand	-
8.	Economics	Samuelson & William	McGraw-Hil	2004
9.	Advanced Economics	K.P.M. Sundram	S. Chand	-
10.	Indian Economics	K.K.Dewett and J.D. Verma	S. Chand & Company	2010
11.	Engineering Economics	Mansoor Ali & S. K. Delala	-	-

# 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
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T	1
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P	0
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3 Examination Duration (Hrs): 

Theory	0	3
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Practical	0	0
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4 Relative Weight age 

M-I	2	0
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M-II	2	0
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AS M	1	0
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ME	5	0
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PRE	0	0
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5 Credits: 

0	3
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 7<sup>th</sup> Semester 

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Autumn

Spring
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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.	<b><u>INSTRUMENTATION SYSTEM:</u></b> Classification of instrumentation errors. Basic features of instrumentation system. Dynamic response and accuracy of an instrumentation system.	05
2.	<b><u>TRANSDUCERS:</u></b> 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.	<b><u>INSTRUMENTATION AMPLIFIERS</u></b>	05
4.	<b><u>WAVE ANALYSERS:</u></b> Analyzers for Audio and radio frequency waves,. Measurement of distortion. Spectrum analysis.	05
5.	<b><u>PHASE AND FREQUENCY MEASUREMENT:</u></b> Analog and Digital Measurement of frequency and time.	05
6.	<b><u>DATA ACQUISITION SYSTEM:</u></b> 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 acquisition system. Using DAC, ADC and Multiplexing	10
7	Microprocessor based Measurement techniques:	05
<b>Total Contact Hours</b>		<b>42</b>

8. **Suggested Books:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Electronic measurements and instrumentation	Cooper	Prentice-Hall	1985
2	Electrical and Electronic measurements & instrumentation (Reprint Edition)	A.K. Sawhney.	Khanna	2010-2011
3	Electrical and Electronic measurements & instrumentation (Reprint Edition)	J.B Guptha	S.K Kataria	2010

# NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

- 1 Subject Code **ECE-709P** Course Title **Electronic Measurements and Instrumentation Laboratory**
- 2 Contact Hours: 

L	0
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T	0
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P	2
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- 3 Examination Duration (Hrs): 

Theory	0	0
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Practical	0	2
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- 4 Relative Weight age 

MSLE	2	5
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ESLE	2	5
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- 5 Credits: 

0	1
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 7<sup>th</sup> Semester 

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

8. Lab. Experiments:

S.No	Experiments
1	
2	
3	
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7	
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9	
10	

## NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **Electrical Engineering**

1 Subject Code **Elective-I ELE-4/E** Course Title **Selected Topics in Advanced Control**

2 Contact Hours: 

L	3
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T	0
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P	0
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3 Examination Duration (Hrs): 

Theory	0	3
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Practical	0	0
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4 Relative Weight age 

M-I	2	0
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M-II	2	0
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AS	1	0
M		

ME	5	0
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PRE	0	0
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5 Credits: 

0	3
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 7<sup>th</sup> Semester 

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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.	Topics shall be selected by the Teacher Incharge it self	
<b>Total Contact Hours</b>		

**NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR**

NAME OF THE DEPARTMENT: **Electrical Engineering**

1	Subject Code	Elective-II	ELE 15/E	Course Title	[Utilization & Traction]											
2	Contact Hours	L	2	T	1	P	0									
3	Examination Duration (Hrs):	Theory	0	3	Practical	0	0									
4	Relative Weightage	M-I	2	0	M-II	2	0	Asm	1	0	ME	5	0	PRE	0	0
5	Credits:	0	3	5 <sup>th</sup> Semester	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Autumn	<input type="checkbox"/>	Spring	<input type="checkbox"/>					

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.	Unit 1 Electric Drive: Factors governing selection of Electric drive. Control devices for industrial motors. Motors for particular services. Applications of Electric Drive.	
2.	Unit 2,3,4 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. AC series motor characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption.	
3.	Unit 5 INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.	
4.	Unit 6,7 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.	
5.	Unit 8,9 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.	
<b>Total Contact Hours</b>		<b>42</b>

**Books Suggested:**

S.No	Name of Book	Author	Publisher	Year of Publication
1	Utilization Of Electric Energy,	E Openshaw Taylor	12th Impression, 2009, Universities Press	2009
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		



**NAME OF THE DEPARTMENT:**

**Electrical Engineering**

- 1 Subject Code ELE-703P Course Title **Electrical Power System Laboratory ( ECE)**
- 2 Contact Hours 

L	0
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T	0
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P	2
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- 3 Examination Duration (Hrs): 

Theory	0	0
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Practical	0	2
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- 4 Relative Weightage 

MSLE	2	5
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ESLE	2	5
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- 5 Credits: 

0	1
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 3<sup>rd</sup> Semester 

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Autumn

Spring
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- 6 **Objective:**  
The objective of the lab is to make students familiar with the different electrical power system components their efficiency and regulation.

9. 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