GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.
Department of Electrical Engineering.
Scheme for B. Tech. (Electrical Engineering)

SEM III

Course Code	Name of the Course	Group	Teaching Scheme Hrs/ week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
SH 201	Engineering Mathematics III	A	3	1	-	4	10	15	15	60	-	-	100	4
EE 201	Electronic Devices and Linear Integrated Circuits	B	3	-	-	3	10	15	15	60	-	-	100	3
EE 202	Electrical Circuit Analysis	D	3	-	-	3	10	15	15	60	-	-	100	3
EE 203	Electrical and Electronic Measurements	D	3	-	-	3	10	15	15	60	-	-	100	3
EE 204	Power Plant Engineering	B	3	-	-	3	10	15	15	60	-	-	100	3
EE 205	Electronic Devices and Linear Integrated Circuits Lab	B	-	-	2	2	-	-	-	-	25	25	50	1
EE206	Mini Project-I	B	-	-	2	2	-	-	-	-	50	-	50	1
EE207	Electrical Circuit Analysis Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE208	Electrical and Electronic Measurements Lab	D	-	-	2	2	-	-	-	-	50	25	75	1
EE209	Electrical and Electronic Material Lab	D	-	1	-	1	-	-	-	-	25	-	25	1
EE 261	Circuit Simulation Lab	B	-	-	2	2	-	-	-	-	50	-	50	2
		Total	**15**	**2**	**10**	**27**	**50**	**75**	**75**	**300**	**225**	**75**	**800**	**23**

ISA :Internal Sessional Assessment **ISE : In Semester Examination** **ESE: End Semester Examination**
ICA : Internal Continuous Assessment **TH: Theory Lecture,** **TUT: Tutorial,** **PR: Practical**

- **ISA**: Internal Sessional Assessment should support the principle of continuous assessment and may be based on three / four different tools like surprise test, quiz, group discussion, home assignments, presentation skills, attendance etc
- **ICA :** Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.
Department of Electrical Engineering.
Scheme for B. Tech. (Electrical Engineering)

SEM IV

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
EE 251	Electromagnetic Fields	D	3	-	-	3	10	15	15	60	-	-	100	3
EE 252	Fundamentals of Electric Machinery	D	3	-	-	3	10	15	15	60	-	-	100	3
EE253	Digital Electronics and Microprocessors	D	4	-	-	4	10	15	15	60	-	-	100	4
EE254	Power System	D	3	-	-	3	10	15	15	60	-	-	100	3
EE255	Signals and Systems	B	3	-	-	3	10	15	15	60	-	-	100	3
SH 204	General Proficiency -II	C	1	-	2	3	-	-	-	-	25	25	50	2
EE256	Electrical workshop	D	-	-	2	2	-	-	-	-	50	-	50	1
EE257	Digital Electronics and Microprocessor Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE258	Signals and Systems Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE259	Power System Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE260	Electrical Machines Lab I	D	-	-	2	2	-	-	-	-	25	25	50	1
		Total	**17**	**-**	**12**	**29**	**50**	**75**	**75**	**300**	**175**	**125**	**800**	**23**

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination
ICA : Internal Continuous Assessment TH: Theory Lecture, TUT: Tutorial, PR: Practical

- **ISA**: Internal Sessional Assessment should support the principle of continuous assessment and may be based on three / four different tools like surprise test, quiz, group discussion, home assignments, presentation skills, attendance etc

- **ICA :** Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

GOVERNMENT COLLEGE OF ENGINEERING,JALGAON.

Department of Electrical Engineering.

Proposed Scheme for B. Tech. (Electrical Engineering)

SEM V

Course Code	*Name of the Course*	Group	Teaching Scheme Hrs /week				Evaluation Scheme							*Credits*
							Theory				Practical		Total	
			TH hrs/week	TUT hrs/week	PR hrs/week	Total hrs/ week	ISA	ISE1	ISE2	ESE	ICA	ESE		
EE301	AC Machines	D	3	-	-	3	10	15	15	60	-	-	100	3
EE302	Power System Analysis	D	3	1	-	4	10	15	15	60	-	-	100	4
EE303	Microcontrollers and its Applications	D	3	-	-	3	10	15	15	60	-	-	100	3
EE304	Electrical Testing and Maintenance	D	3	-	-	3	10	15	15	60	-	-	100	3
EE305	Industrial Organization and Management	C	3	-	-	3	10	15	15	60	-	-	100	3
EE306	AC Machines Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE307	Power System Analysis Laboratory	D	-	-	2	2	-	-	-	-	25	25	50	1
EE308	Microcontrollers and its Applications Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE309	Electrical Testing and Maintenance Lab	D	-	-	2	2	-	-	-	-	50	-	50	1
EE310	Numerical Methods and Computer Programming Lab	B	-	-	2	2	-	-	-	-	50	-	50	1
EE311	Self Study I	D	-	-	-	-	-	-	-	-	-	-	**50	2
		Total	**15**	**1**	**10**	**26**	**50**	**75**	**75**	**300**	**175**	**75**	**800**	**23**

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

TH: Theory Lecture, TUT: Tutorial, PR: Practical

**Marks and hence grade of course Self Study shall be based on one test each conducted on 20% syllabus of four subjects - EE301, EE302, EE303, EE304

The 20% syllabus for self - study shall be declared by subject teacher at the beginning of semester and he/shall conduct the test examination for that course, assess answer papers of test examination and submit the marks to course coordinator

- **ISA**: Internal Sessional Assessment should support the principle of continuous assessment and may be based on three / four different tools like surprise test, quiz, group discussion, home assignments, presentation skills, attendance etc
- **ICA :** Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of *Electrical Engineering*.

Scheme for B. Tech. (*Electrical Engineering*)

SEM VI

Course Code	Name of the Course	Group	Teaching Scheme Hrs/week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH Hrs/ week	TUT Hrs/ week	PR Hrs/ week	Total Hrs/ week	ISA	ISE1	ISE2	ESE	ICA	ESE		
EE351	Electrical Traction and Utilization	D	3	--	--	3	10	15	15	60	-	-	100	3
EE352	Switchgear and Protection	D	3	--	--	3	10	15	15	60	-	-	100	3
EE353	Feedback Control System	B	3	-	--	3	10	15	15	60	-	-	100	3
EE354	Power Electronics	B	3	-	--	3	10	15	15	60	-	-	100	3
EE355	Digital Signal Processing	B	3	-	--	3	10	15	15	60	-	-	100	3
EE356	Electrical Traction and Utilization Lab	D	-	-	2	2	-	-	-	-	50	-	50	1
EE357	Switchgear and Protection Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE358	Feedback Control System Lab	B	-	-	2	2	-	-	-	-	25	25	50	1
EE359	Power Electronics Laboratory	B	-	-	2	2	-	-	-	-	25	25	50	1
EE360	Digital Signal Processing Lab	B	-	-	2	2	-	-	-	-	25	-	25	1
EE361	Mini Project	D	-	-	2	2	-	-	-	-	25	-	25	1
EE 362	Self study - II	D	-	-	-	-	-	-	-	-	-	-	**50	2
EE 363	Industrial Lecture	D	1	-	-	1	-	-	-	-	-	-	-	-
		Total	**16**	**-**	**12**	**28**	**50**	**75**	**75**	**300**	**175**	**75**	**800**	**23**

ISA : Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

TH: Theory Lecture, TUT: Tutorial, PR: Practical

**Marks and hence grade of course Self Study shall be based on one test each conducted on 20% syllabus of four subjects - EE351, EE353, EE354, EE355. The 20% syllabus for self - study shall be declared by subject teacher at the beginning of semester.

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• ICA : Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of *Electrical Engineering*.

Scheme for B. Tech. (*Electrical Engineering*)

SEM VII

Course Code	Name of the Course	Group	Teaching Scheme Hrs/week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH Hrs/ week	TUT Hrs/ week	PR Hrs/ week	Total Hrs/ week	ISA	ISE1	ISE2	ESE	ICA	ESE		
EE401	Electric Drives	D	3	-	--	4	10	15	15	60	--	--	100	3
EE402	Applications of Programming in Electrical Engineering	B	3	1	--	4	10	15	15	60	--	--	100	4
EE 403-407	Departmental Elective -I	E	3	--	--	3	10	15	15	60	--	--	100	3
EE411-415	Departmental Elective -II	E	3	--	--	3	10	15	15	60	--	--	100	3
EE411,421-425	Inter-disciplinary Elective	E	3	--	--	3	10	15	15	60	--	--	100	3
EE430	Project -I	D	--	--	2	2	--	--	--	--	50	50	100	2
EE431	Electric Drives Laboratory	D	--	--	2	2	--	--	--	--	25	25	50	1
EE432	Applications of Programming in EE Laboratory	B	--	--	2	2	--	--	--	--	25	25	50	1
EE434	Seminar	D	--	--	2	2	--	--	--	--	50	--	50	1
EE435	Self Study-III	D	--	--	--	--	--	--	--	--	-	--	**50	2
		Total	**15**	**2**	**8**	**25**	**50**	**75**	**75**	**300**	**150**	**100**	**800**	**23**

Interdisciplinary Elective		Departmental Electives		Departmental Electives	
A	EE 411-Renewable Energy Systems	A	EE403-Smart Grid	F	EE411- Renewable Energy Systems
B	EE 424- Electrical Machines and Drives	B	EE404-Energy Conservation and Auditing	G	EE412-Optimization Techniques
C	EE 402- Energy Conservation and Auditing	C	EE405- Electrical Vehicles and Hybrid Vehicles	H	EE413-Computer Aided Power System Analysis
		D	EE406-Control System Design	I	EE414-Intelligent Control
		E	EE407-Power System Stability	J	EE415- Robotics and Automation

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

TH: Theory Lecture, TUT: Tutorial, PR: Practical

**Marks and hence grade of course Self Study shall be based on one test each conducted on 20% syllabus of EE401,EE402,EE403-407,EE411-415.

The 20% syllabus for self - study shall be declared by subject teacher at the beginning of semester.

•**ISA**: Internal Sessional Assessment should support the principle of continuous assessment and may be based on three / four different tools like surprise test, quiz, group discussion, home assignments, presentation skills, attendance etc. **ICA :** Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.
Department of *Electrical Engineering*
Scheme for B. Tech. (*Electrical Engineering*)
SEM VIII

Course Code	Name of the Course	Group	Teaching Scheme Hrs/week				Evaluation Scheme							Credits
							Theory				Practical			
			TH Hrs/week	TUT Hrs/ week	PR Hrs/ week	Total Hrs/ week	ISA	ISE1	ISE2	ESE	ICA	ESE	Total	
EE 451	Electrical Machine Design	D	3	-	-	3	10	15	15	60	-	-	100	3
EE 452	Power System Operation & Control	D	3	-	-	3	10	15	15	60	-	-	100	3
EE 471-475	Departmental Elective -III	E	3	-	-	3	10	15	15	60	-	-	100	3
EE 481-485	Departmental Elective –IV	E	3	-	-	3	10	15	15	60	-	-	100	3
EE 453	Project and Finance Management	B	2	-	-	2	-	-	-	-	50	-	50	2
EE454	Entrepreneurship Development	E	-	-	2	2	-	-	-	-	50	-	50	1
EE455	Power System Operation & Control Lab	D	-	-	2	2	-	-	-	-	25	25	50	1
EE456	Self Study IV	D	-	-	2	2	-	-	-	-	-	--	**50	2
EE 457	Industrial Lectures	D	1	-	-	-	-	-	-	-	-	-	25	1
EE 458	Industrial Visit	D	-	-	-	-	-	-	-	-	-	-	25	-
EE457	Project-II	D	-	-	4	4	-	-	-	-	50	100	150	4
		Total	**14**	**0**	**10**	**25**	**40**	**60**	**60**	**240**	**175**	**125**	**800**	**23**

Departmental Elective -III		Departmental Elective -IV	
A	EE-471 Generation, Planning and Load Dispatch	A	EE-481 Advanced Electric Drives
B	EE-472 HVDC & FACTs	B	EE-482 Special Topics in Electrical Engineering
C	EE-473 Power System Design	C	EE-483 High Voltage Engg
D	EE-474 EHVAC	D	EE-484 Illumination Engg
E	EE-475 Power Quality	E	EE -485 Electrical Machine Analysis

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination
ICA : Internal Continuous Assessment TH: Theory Lecture, TUT: Tutorial, PR: Practical

**Marks and hence grade of course Self Study shall be based on one test each conducted on 20% syllabus of EE451,EE452,EE471-475,EE481-485. The 20% syllabus for self - study shall be declared by subject teacher at the beginning of semester.

- At least 12 Industrial Lectures could be arranged for EE 457 in semester based on it test may be conducted
- **ISA**: Internal Sessional Assessment should support the principle of continuous assessment and may be based on three / four different tools like surprise test, quiz, group discussion, home assignments, presentation skills, attendance etc

ICA : Internal Continuous Assessment should support for regular performance of practical and its regular assessment with proper understanding the principles of experimental set-up/experiment carried out.

EE 301: AC MACHINES

Teaching Scheme: 03L+00T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The course explores on understanding of construction, basic principles underlying the operation of electrical machines, performance, characteristic of ac machines. It also gives the platform to understand construction, working, performance and application of alternator, asynchronous motors, synchronous motors, single phase motors and special machines. This course is covering ac machines which will further strengthen the knowledge of the students.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical engineering and their concepts.

COURSE OBJECTIVES:

The objectives of the course are to
1. know fundamentals and working principles of ac machines.
2. understand characteristics of ac machines.
3. analyze ac machines.
4. understand various aspects of ac machines

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to
1. learn fundamentals of ac machines.
2. study operation and applications of ac machines.
3. understand mathematical analysis of operation of ac machines.
4. design ac machines and apply basic knowledge of science and engineering to understand ac machines.

Relevance of COs /POs and strength of co-relation:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	1	1	-
PO-b	1	1	1	3
PO-c	3	3	3	3
PO-d	2	2	2	3
PO-f	3	3	-	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 301: AC MACHINES

Teaching Scheme: 03L+0T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Synchronous Generator: Construction, types, winding factors, emf equation, armature reaction, phasor diagram, load characteristics, voltage regulation by synchronous impedance method, mmf method, zero power factor method, two reaction theory, slip test. Parallel operation of Synchronous Generators, methods of synchronization, synchronization power, synchronizing torque, operation of synchronous generator on infinite bus bar, effect of load on synchronization power, effect of unequal voltage, effect of change in excitation and steam supply, operating charts for large generators, short circuit ratio and its importance, Power angle characteristics, efficiency and losses, applications,

Synchronous Motor: Principle of operation, Phasor diagram, Methods of starting, Operation at constant power & fixed excitation, Equivalent circuit, Power developed, Effect of excitation, Hunting and methods of suppression, Effect of harmonics, Synchronous condenser.

Three phase Induction Motor: Rotating magnetic field, Principle of operation, Torque equation, Torque-slip characteristics, Losses and efficiency, Energy efficient IM, Phasor diagram and equivalent circuit, No load test, Block rotor test, Circle diagram, Speed control, Starting of Induction Motors, Harmonics, Starters used in industries. Introduction to Induction Generator, working principle, equivalent circuit, types and operation. Double Cage Induction Motor, torque slip characteristics, comparison of single cage and double cage

Fractional Kilowatt Motors: Single Phase Induction Motors, Double field revolving theory, Equivalent circuit, Torque-slip characteristics, Starting methods and types. Universal Motor, Principle of working, Speed control , applications. Special A.C. Machines Single phase synchronous motors, permanent magnet motor
Special Machines: Constructional details of reluctance machine, variable-reluctance permanent magnet machines and stepper motors, restraining torque.

Text Books:

1. Electric Machines by I. J. Nagrath, D. P. Kothari, TMH, 2nd edition, reprint 2003.
2. Electric Machinery by A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans,,Tata McGraw Hill Publication, 6th edition 2002.

Reference Books:

1. Performance and Design of A.C. Machines by M. G. Say, E.L.B.S.Publications,5th edition, 1985.
2. Theory of Alternating Current Machinery by A.S. Langsdorf, TMH, E.L.B.S. Publication 5th edition, 1985.
3. Electric Machinery by Dr P. S. Bhimbra, Khanna Publishers 5th edition, 1992.
4. Electrical Machines by J. B. Gupta, kataria,1st,2009.

EE 302 : POWER SYSTEM ANALYSIS

Teaching Scheme : 03L + 01T, Total:04 **Credit :** 04
Examination Scheme: 15 ISE 1 + 15 ISE 2 + 10 ISA + 60 ESE **Total marks:** 100
Duration of ESE : 3 hrs

COURSE DESCRIPTION:

This course imparts knowledge about power system analysis. This course also provides information of line parameters, performance of transmission line parameters. Course also provides knowledge of symmetrical faults and unsymmetrical faults and load flow study.

DESIRABLE AWARENESS/SKILLS:

Knowledge of power system, power plant, generation, transmission and distribution and their concepts.

COURSE OBJECTIVES:

The objectives of the course are to

1. provide the knowledge to understand line constants.
2. analyze sending end voltage, receiving end voltage, transmission efficiency and regulation of transmission line.
3. develop and solve the positive, negative and zero sequence network for a given system.
4. recognise the common causes of faults in power system.
5. formulate the power flow problems using load flow methods

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. understand the knowledge to line constants.
2. analyse sending end voltage, receiving end voltage, transmission efficiency and regulation of transmission line.
3. develop and solve the positive, negative and zero sequence network for a given system.
4. recognise the common causes of faults in power system.
5. formulate the power flow problems using load flow methods

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	3	3	-	2	2
PO-b	3	2	2	2	2
PO-c	2	2	2	1	1
PO-e	2	3	3	1	1
PO-f	--	1	1	2	2

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 302: POWER SYSTEM ANALYSIS

Teaching Scheme: 04L+0T,Total 04 **Credits** : 04
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE: 03 hrs

Line Parameters: Resistance of line, influence of skin effect on resistance and proximity effect, inductance of single phase two wire line, flux linkage of one conductor of one group, inductance of composite conductor line, G.M.R. and G.M.D., inductance of three phase line with equilateral spacing, unsymmetrical spacing, effect of transposition, bundled conductors, inductance of three phase double circuit cine, capacitance of transmission line, capacitance of a three-phase transposed line, effect of earth on capacitance.

Performance of Transmission Lines: Representation and performance of short, medium line- nominal T and nominal π method, long transmission line–rigorous solution, evaluation of ABCD constants interpretation of long line equations, equivalent T and π representation, Ferranti effect, power flow through transmission line

Representation of Power System Component and Characteristic of Transmission Line: Power in single-phase ac circuit, complex power flow, one line diagram, impedance and reactance diagrams of a power system per unit system, representation of synchronous machine and power transformer, characteristics and performance of long transmission line, equivalent circuit of long line, Ferranti effect, power flow through transmission line, voltage regulation, efficiency of transmission line, methods of voltage control, receiving end circle diagram, sending end circle diagram with graphs and related numerical

Symmetrical Fault Analysis: Transient on transmission line, short circuit current and reactances of synchronous machine on no load and loaded condition, bus impedance in fault calculations, algorithm for short circuit studies. Synthesis of unsymmetrical phasors from their symmetrical components, symmetrical components of unsymmetrical phasors, power in terms of symmetrical components

Unsymmetrical Faults : Single line to ground fault (LG) on an unloaded generator, line to line fault (LL)on an unloaded generator, double line to ground fault(LLG)on an unloaded generator, unsymmetrical fault on power systems, Single line to ground fault (LG) on a power system, line to line fault (LL)on a power system, double line to ground fault(LLG) on a power system faults through impedance, analysis of unsymmetrical faults

Load Flow Study: Introduction, bus classifications, network equations: graph theory and its applications for formation of primitive networks and Z and Y matrices, incidence matrices, Y-bus and Z-bus, Y-bus matrices, development of load flow equations, load flow solution using Gauss - Seidel and Newton- Raphson method, approximation to N-R method, surge impedance loading and its derivation, introduction to travelling waves, travelling wave on long transmission line

Text Books:

1. Elements of Power System Analysis William Stevenson,TMH,6th edition,2006
2. Modern Power System Analysis by J. Nagrath & D. P. Kothari TMH, 3rd Edition Reprint 2010.
3. Power System Analysis, Hadi Saadat McGraw Hill. -2003

Reference Books:

1. A course in Electrical Power by J.B.Gupta, S.K.Kataria and Sons, 1st,2009
2. Electrical power by Soni Gupta Bhatnagar, Dhanpat Rai, 4th,1997

EE 303: MICROCONTROLLER AND ITS APPLICATIONS

Teaching Scheme: 03L+0T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The course explores knowledge of microcontroller and applications. The course comprises of architecture of microcontroller, assemble language programming and interfacing of peripherals and their applications. To meet the challenges of growing technology, student will be conversant with the programmable aspect of microcontroller. The objective of course is to understand microcontroller principles, concept and develop skill in both hardware and programming.

DESIRABLE AWARENESS/SKILLS:

Knowledge of digital electronics and microprocessor fundamentals.

COURSE OBJECTIVES:

The objectives of the subject are to
1. know the pin configuration of a typical microcontroller
2. understand memory organization of microcontroller
3. develop assemble language programming skills
4. do higher study in the field of automation, operation and control of power system based on applications of microcontroller.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to
1. know the pin configuration and memory organization of a typical microcontroller
2. understand memory organization of a typical microcontroller
3. develop assemble language programming skills
4. do higher study in the field of automation, operation and control of power system based on applications of microcontroller.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	1	--	3
PO-b	2	2	--	3
PO-c	3	2	3	2
PO-e	1	1	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE303 :MICROCONTROLLER AND ITS APPLICATIONS

Teaching Scheme: 03L +00 T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Introduction to Microcontroller: Evolution of microcontrollers. Comparison of different microcontrollers such as Intel 8051/PIC/At mega 16 etc, internal block diagram of 8051, CPU, ALU, address bus, data bus, control signals, working registers, SFRs, clock and reset circuits, stack and use of stack pointer, program counter. I/O ports, memory structure, data memory, program memory, memory expansion techniques, different addressing modes

Microcontroller Programming Interfacing, instruction set .Illustrative applications and programming techniques, tutorial programs should include programming using: arithmetic instructions, jump, loop and call instructions, I/O programming, logic instructions, single bit instructions, timer/counter programming, UART programming, Programming interrupts, priority, interrupt handling, power off and power on-reset situations, self check and recoveries.

Peripherals and Interfacing: Digital input and output pin of PWM, ADC, I/O pins, timers, counters, interrupts, I2C, SPI, flash programming. Interfacing A to D, D to A, LCD/ LED and keyboard interfacing, I/O expansion techniques, etc. Stepper motor interfacing, dc motor interfacing, interfacing of sensors, relays. CAN protocol and its interfacing, RS232,USB protocol and its interfacing, blue-tooth, zig-bee protocol and its interfacing.

Integrated Development Environment (IDE) for Microcontrollers: 8051/ 89C51/XX micro controllers. Study of datasheets, programming using assembly language and Cross "C" compiler, programming tools such as simulator, assembler, cross "C" compiler, emulator and debugger.
Analysis of any Reference Design: Application examples- any reference circuit schematic with specification such as ac drive, dc drive etc application and firm ware analysis can be taken.

Text Books :

1. Microcontroller and Embedded Systems by Mazdi and Mazdi, PHE
2. The 8051 Microcontroller by Kenneth J. Ayala, Penram International, 3rd edition
3. Advanced Microprocessors and Interfacing by Badri Ram, TMH,2002
4. Advanced Microprocessors & Peripherals by A.K. Ray & K.M. Bhurchandi,TMH,3rd 1996.

Reference Books:

1. Programming and Customizing the 8051 microcontroller by Myke Predko, TMH, 1st edition
2. Embedded System by Raj Kamal, TMH, 3rd edition

EE 304: ELCTRICAL TESTING AND MAINTENANCE

Teaching Scheme: 03L+00T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The course explores knowledge of electrical testing and maintenance. The course comprises of estimation of electrical wiring, its types and design. The student will be conversant with various cables, types of earthing, groundings and how to carry out maintenance of electrical appliances. They will also understand various IS rules.

DESIRABLE AWARENESS/SKILLS:

Knowledge of power system, electrical machines, transformers fundamentals.

COURSE OBJECTIVES:

The objectives of the subject are to

1. estimate of wiring system
2. study of different illumination schemes
3. know the various methods for maintenance & testing of electrical equipment
4. learn safety rules & regulations for electrical equipments

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. do estimation of wiring system
2. study of different illumination scheme
3. analyze various methods for maintenance & testing of electrical equipments
4. understand safety rules & regulations for electrical equipments

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	1	--	3
PO-b	2	2	--	3
PO-c	3	2	3	2
PO-d	1	1	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 304: ELECTRICAL TESTING AND MAINTENANCE

Teaching Scheme: 03L + 00T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Estimation: Estimation for internal wiring of buildings residential, commercial and small industry, service lines, L.T. distribution and street light feeders, 11 kV feeders and sub stations, estimation of electrical panel boards, estimation of street light feeders using cables, estimation & costing of substation, service connection

Testing of Cables: Underground cables, classification of cables, materials used for conductors , insulators used for cables, testing of cables, comparison of overhead conductors and underground cables,

Maintenance of Electrical Equipments: Routine, preventive and breakdown maintenance, main causes of failure of electrical equipments, factors affecting maintenance schedule, maintenance schedule for distribution transformer as per I.S. 1886, maintenance schedule for power transformer as per I.S. 11028, maintenance schedule for induction motor as per I.S. 900, maintenance schedule for synchronous motor as per I.S. 4884, maintenance schedule for storage battery, maintenance schedule for switchgear and control equipments as per I.S. 3072

Various Types of Earthings: Resistor type, inductor type solid Petersons coil, ddistribution transformer, induction motor, synchronous motor, dc motor, instrument transformer as per ISI standard, testing of insulation

Grounding: Neutral grounding, solid grounding, resistance grounding, reactance grounding, earthling Transformer

Indian Electricity Rules: safety precautions, condition relating to survey and use of energy, Indian Electricity Rules 2003 for safety, maintenance of equipment, testing of equipment

Text books:

1. Art and Science of Electrical Utilization by H. Partab, Dhanpat Rai and sons New Delhi.
2. Electrical, Wiring, Estimation and Costing by B. D. Arora, New Heights New Delhi.
3. Electrical Estimating and Costing by N. Alagappan S. Ekambaram, TMH

Reference books:

1. Transmission and Distribution by J. B. Gupta, S.K. Kataria & sons New Delhi.1st 2002.
2. Electrical Wiring, Estimation & Costing by S. L. Uppal,Khanna publishers, New Delhi.

EE 305: INDUSTRIAL ORGANIZATION AND MANAGERMENT

Teaching Scheme: 03L+00T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The course explores knowledge of industrial organization and management. The course comprises of principles of management, operational management. The student will be conversant with various aspects of marketing and financial management.

DESIRABLE AWARENESS/SKILLS:

Knowledge of communication, human resources management

COURSE OBJECTIVES:

The objectives of the subject are to

1. know principles of management.
2. study of economics of management
3. understand marketing and financial management
4. know human resource management

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. know principles of management.
2. study of economics of management
3. understand marketing and financial management
4. know human resource management

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	1	--	3
PO-b	2	2	--	3
PO-c	3	2	3	2
PO-d	1	1	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 305 :INDUSTRIAL ORGANIZATION AND MANAGEMENT

Teaching Scheme: 03L+ 0T Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Principles of Management: Basic concepts, Definitions- nature, importance, management: art and science as a profession, management vs administration, evolution of management, introduction to scientific management by Taylor, administrative management by Fayol, contribution of Peter Drucker, levels and functions of management, forms of business organization. approaches to management, decision theory approach, contingency approach, systems approach. Organization, formal and informal, line and staff relationship, centralization vs. decentralization, span of management.

Managerial Economics: Meaning and scope of economics, basic theories, law of demand and supply, elasticity of demand and supply, consumer theories, meaning of utility and law of diminishing utility, cost concepts, opportunity costs, sunk costs, marginal cost, total and variable costs, fixed costs, contribution, law of diminishing return, present value, net present value, project cost

Operational Management : Plant location and layout, factors affecting plant location, different type of plant layout, CPM and PERT, quality control manufacturing system, store and inventory control, work study – techniques of work study method study, work measurement, different charts and diagrams used in method study.

Human Resource Management: Human resource planning, recruitment, selection, placement and induction, performance appraisal and development, employee training, internal & external mobility and retention management, wage and salary administration, fringe benefits & incentives payments, collective bargaining, performance appraisal, compensation, industrial laws, Factories Act 1947, Workmen's Compensation Act 1923, Maternity Benefit Act, The Payment of Wages Act 1936, The Apprentices Act 1961, industrial safety, prevention of accidents pollution control Act.

Marketing Management & Financial Management: concept of market, types of market, definition, nature and scope of marketing, marketing approaches, marketing process, functions of marketing management, 7 P's of marketing. Advertising media of advertising market forecasting. New trends in Marketing, Green Marketing, e- marketing and viral marketing. Nature and scope of financial management, capital structure, types and sources of finance, money market & capital market, role of financial institutions in industry.

Text books:

1. Industrial Engineering Managementsby O P Khanna,
2. Principles of Management by L. M. Prasad, Himalaya Publications Ltd
3. Managerial Economics by D. N. Dwivedi, Vikas Publications
4. Human resource Management (Text & Cases) by S. Chand,S. S. Khanka

Reference Books:

1. Essentials of HRM & IR (Text, Cases & Games), P. Subba Rao, Himalaya Publishing House
2. Marketing Management by Philip Kotler, Tata McGraw Hill

EE 306: AC MACHINES LAB

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

This course of AC Machines explores understanding, construction, basic principles underlying the operation of ac machines. Performance, characteristic, voltage regulation of synchronous alternator, its parallel operation and characteristic of synchronous motor. It also gives the platform to understand construction, working, performance and application of three phase and single phase motors

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical engineering and its concepts.

COURSE OBJECTIVES:

The objective of s course are to

1. understand construction, concepts, principles of operation and application of ac machines.
2. know the behavior of AC motors and analyze data to determine characteristics of machines by performing practical.
3. perform duties in industry, operation and maintenance with the sense of safety precautions.
4. apply knowledge for technological subjects such as utilization of electrical energy, switchgear and machine design for economical and sustainable developments.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. understand the construction, concepts, principles of operation and application of ac machines.
2. know the behavior of AC motors and analyze data to determine characteristics of machines by performing practical.
3. perform duties in industry, operation and maintenance with the sense of safety precautions.
4. apply knowledge for technological subjects such as utilization of electrical energy, switch gear and machine design for economical and sustainable developments.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	1	1	2
PO-b	1	1	1	2
PO-d	2	2	2	2
PO-f	3	-	-	2

1- Strongly correlated 2 – Moderately correlated 3–Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 306: AC MACHINES LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks : 50**
Duration of ESE : 03 hrs

The laboratory work should consist of experiments based on theory syllabus of EE301. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. Determination of voltage regulation and efficiency of three phase alternator by direct load test.
2. Open and short circuit test on three phase alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on three phase alternator: determination of regulation by Potier trangle method.
4. Determination of direct axis and quadrature axis reactance by slip test on synchronous machine. Determination of voltage regulation by two reactance theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.
6. Synchronous alternator on infinite bus, behaviour of machine under change in mechanical power and excitation.
7. Characteristic of synchronous motor at constant load and variable excitation.
8. Characteristic of synchronous motor at constant excitation and variable load.
9. Determination of performance of three phase induction motor by direct load test.
10. Determination of performance of three phase induction motor by no load, blocked rotor test and construction of circle diagram.
11. No load and blocked rotor tests on capacitor start single phase induction motor and determination of parameters of equivalent circuit.
12. Load test on single phase induction motor.
13. Speed control of three phase Slip Ring Induction Motor.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical's performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

EE 307 : POWER SYSTEM ANALYSIS LAB

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

This course imparts knowledge about power system analysis. This course also provides information of line parameters, performance of transmission line parameters. Course also provides knowledge of symmetrical faults and unsymmetrical faults and load flow

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and electronics engineering and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. understand the factors to be consider in site selection for different power plants in view of social, environmental and safety.
2.understand hydrology, load factor, load duration curves
3.ffamiliarize with different transmission systems and their components.
4. do higher studies in generation planning, generation scheduling and load dispatch

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. understand the factors to be consider in site selection for different power plants in view of social, environmental and safety.
2. understand hydrology, load factor, load duration curves
3. familiarize with different transmission systems and their components.
4. do higher studies in generation planning, generation scheduling and load dispatch.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	-	2
PO-b	3	2	2	2
PO-d	2	-	3	1
PO-e	--	1	1	-

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 307: POWER SYSTEM ANALYSIS LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

The laboratory work should consist of experiments based on theory syllabus of EE302. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. Measurement of ABCD parameters of a long transmission line.
2. To evaluate performance of long Plotting graph of receiving end circle diagram transmission line.
3. Plotting graph of sending end circle diagram to evaluate performance of long transmission line.
4. Study of the effect of VAR compensation on the profile of receiving end voltage using capacitor bank.
5. Static measurement of sub-transient reactance of a salient-pole alternator.
6. Measurement of sequence reactance of a synchronous machine.
7. To study the Ferranti effect of long transmission line.
8. To calculate voltage regulation and efficiency of long transmission line.
9. Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer
10. Solution of a load flow problem using Gauss-Seidal method using asoftware.
11. Solution of a load flow problem using Newton-Raphson method using software.
12. Unsymmetrical fault analysis of a 3-bus system using a software.
13. Calculation of inductance and capacitance for symmetrical and unsymmetrical configuration of transmission line using software.
14. Determination of steady state power limit of a transmission line.
15. To convert unsymmetrical components into symmetrical components using software
16. Formulation and calculation of Y- bus matrix of a system using software.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical's performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

EE308 :MICROCONTROLLERS AND ITS APPLICATIONS LAB

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The practical course explores knowledge of microcontrollers. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications.

DESIRABLE AWARENESS/SKILLS:

Knowledge of digital electronics, microprocessor principles and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. compare microprocessor and microcontroller
2. know the pin configuration and memory organization of a typical microcontroller
3. understand assemble language programming and interfacing peripherals for wide application in electrical engineering using microcontrollers.
4. develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

5. compare microprocessor and microcontroller
6. know the pin configuration and memory organization of a typical microcontroller
7. understand assemble language programming and interfacing peripherals for wide application in electrical engineering using microcontrollers.
8. develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-a	1	2	--	--	--	--
PO-b	2	3	3	3	3	3
PO-c	2	3	2	2	2	2
PO-d	2	2	2	2	2	2
PO-f	2	2	1	1	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 308 : MICROCONTROLLERS AND ITS APPLICATIONS LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

The laboratory work should consist of experiments based on theory syllabus of EE303. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1-4 Programs of 8051 based on its Instruction set.
5. Interrupts of 8051 suitable Simulator)
6. Relay control using 8051
7. Timer of 8051
8. SFR application
9. Stepper motor control using 8051/xx
10. I/O operations of 8051
11. ADC Interfacing and Programming with 8051
12. DAC Interfacing and Programming with 8051
13. Interfacing with LCD/ LED display
14. Applications of 8051.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

EE309: ELECTRICAL TESTING AND MAINTENANCE LAB

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 50ICA+0ESE **Total Marks :** 50

COURSE DESCRIPTION:

The practical course explores knowledge of electrical testing and maintenance. The course explores knowledge of electrical testing and maintenance. The student will be conversant with various cables, types of earthings, groundings and how to carry out maintenance of electrical appliances. They will also understand various IS rules.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical, electrical machines and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. understand various wiring methods.
2. locate cable fault
3. understand various earthings and groundings.
4. study electrical maintenance of electrical appliances

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. understand various wiring methods.
2. locate cable fault
3. understand various earthings and groundings.
4. study electrical maintenance of electrical appliances

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	2	--	--
PO-b	2	3	3	3
PO-c	2	3	2	2
PO-f	2	2	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE309 : ELECTRICAL TESTING AND MAINTENANCE LAB

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 50ICA **Total Marks :50**

The laboratory work should consist of experiments based on theory syllabus of EE304. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. Perform an Experiment for Measurement of earth resistance
2. Perform an Experiment for cable fault location
3. To study Acidity, flash point test of transformer oil
4. Study of cable jointing

5-7 Study of different types of sources of light and to find intensity of light of Fluorescent Lamp, HP mercury vapour lamp, HP sodium vapour lamp & Compact Fluorescent lamp (CFL)

8. To perform experiment to determine dielectric strength transformer oil
9. Perform an experiment for back to back test on transformer
10. To Perform experiment for measurement of insulation resistance of cable
11. Study of various IS Rules

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

EE 310 : NUMERICAL METHODS AND COMPUTER PROGRAMMING LAB

Teaching Scheme: 01 L+ 02P Total 03 **Credits**: 02

Examination Scheme: 50ICA **Total Marks :50**

COURSE DESCRIPTION:

The course explores role of mathematical modelling in engineering problem solving, approximation and round - off errors, accuracy and precision, truncation errors and the Taylor series, using any software or programming language like MATLAB. It also helps to study curve fitting, numerical integration and differential equations for electrical engineering applications.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical, computer programming and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. identify various mathematical problems and select a suitable numerical method for numerical treatment of the given problem
2. motivate the choice of a method by describing its advantages and limitations
3. select an algorithm leading to efficient computation language, suitable for scientific computing, e.g. MABLAB
4. utilize standard functions from e.g. MATLAB library for calculation, visualization and efficient programming

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. understand various mathematical problems and select a suitable numerical method for numerical treatment of the given problem
2. distinguish method by describing its advantages and limitations
3. learn an algorithm leading to efficient computation language, suitable for scientific computing, e.g. MATLAB
4. use standard functions from e.g. MATLAB library for calculation, visualization and efficient programming

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	2	--	--
PO-b	2	3	3	3
PO-c	2	3	2	2
PO-f	2	2	1	1

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 310 :NUMERICAL METHODS AND COMPUTER PROGRAMMING LAB

Teaching Scheme: 01 L+ 02P Total 03 **Credits**: 02
Examination Scheme: 50ICA **Total Marks :50**

Introduction: Role of mathematical modelling in engineering problem solving, approximation and round - off errors, accuracy and precision, truncation errors and the Taylor series using any software or programming language like MATLAB.

Roots of equations: Roots of algebraic and transcendental equations, bracketing methods-bisection method, false position, open methods – Newton-Raphson, Secant method. Real and complex roots of polynomials, Bairstow's method, linear simultaneous algebraic equations, Cramer's rule, Gauss elimination - pitfalls and remedies, Gauss-Seidal, Gauss-Jordan method, Newton-Raphson method. Introduction to eigen value and eigen vectors and iterative method to estimate them, applications-such as problems on design of an electrical circuit, solving resistive networks.

Curve fitting: Interpolation -Newton's polynomial, Lagrange polynomial.

Numerical Integration: Integration: Newton-Cotes formulae - Trapezoidal rule, Simpson's Rule. Differentiation, high accuracy formulae, application: calculation of RMS current.

Ordinary Differential equations: Euler's method, Modified Euler's method, Runge-Kutta methods

Text Books :

1. Numerical Methods for Engineers by Steven Chapra, Raymond P. Canale, McGrawHill International Student Edition
2. MATLAB Programming by Rudra Pratap, Tata McGraw Hill, New Delhi.

Reference Books

1. Numerical Methods for Engineers by Santosh K. Gupta, Wiley Eastern.

Numerical Methods by S.S.Shastry, PHI, New Delh,3rd Edition

The laboratory work should consist of experiments based on above syllabus. Experiments should involve programs on C/C++/MATLAB etc, result and conclusion based on it. The sample list given below is just a guide line.

List of Programs:

1. Find Roots of Polynomial Equation Using
i. Bisection Method
ii. Secant Method
iii. Newton Raphson Method
iv. Regula-Falsi Method
2. Solve Linear Simultaneous Equation Using
i. Gauss Elimination Method
ii. Gauss Siedal Method
iii. Gauss Jordan Method
3. Curve Fitting Using Various Interpolation Techniques
i. Newton’s Forward / Backward /Divided Difference
ii. Stirling Bessel’s Interpolation
iii. Least Square ,Lagrange’s ,Inverse Interpolation
4. Numerical Differentiation Using
i. Newton –Gregory
ii. Lagrange’s

5. Numerical Integration Using
i. Trapezoidal
ii. Simpson's Rule(1/3, 3/8)
6. Ordinary Differential Equation Using Euler's Method
i. Taylor's Series
ii. Runge: Kutta (2nd ,3rd , 4th Order)
iii. Predictor Corrector Method

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

EE351 : ELECTRICAL TRACTION AND UTILIZATION

Teaching Scheme: 03L Total 03 **Credits** : 03
Examination Scheme: 15ISE1+ 15ISE2+ 10ISA+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

This course is covering utilization of dc/ac machines which will further strengthen the knowledge of the students. The course explores on understanding of electric drives, electrical traction systems. It also discusses various illumination methods, heating and welding techniques.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical engineering, dc machines, ac machines, transformer and their concepts.

COURSE OBJECTIVES:

The objectives of the course are to

1. know various electric drives and their operation
2. compare various traction system
3. explain principles of electrical heating methods.
4. illustrate various welding processes.
5. understand various illumination systems.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. distinguish between A.C. and D.C. Traction systems
2. choose appropriate method of electrical heating for Industrial application
3. explain laws of illumination.
4. select a welding process for a particular application

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	1	1	-
PO-c	3	3	3	3
PO-d	2	2	2	3
PO-f	3	3	-	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

Course Content (on NEXT PAGE)

EE 351 : ELECTRICAL TRACTION AND UTILIZATION

Teaching Scheme:03L Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Electrical Drives: Types of drives, advantages of electrical drives, nature of load, factors affecting selection of motor rating, types of duties**,** continuous, intermittent and short time rating, temperature rise and rating calculations for these duties, types of enclosures, methods of coupling, load diagram, load equalization and use of flywheel

Selection of Motor Rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor ratings.

Electrical Traction: Requirement of ideal traction system, different systems of traction, systems of electric traction, comparison between dc and ac traction, existing electrical traction system in India, speed time curve, definitions-crest speed, average speed, schedule time, schedule speed, factors affecting scheduled speed, simplified speed time curve, dead weight, accelerating weight, adhesive weight, coefficient of adhesion, tractive effort, factors affecting energy consumption and specific energy consumption, special features of traction motors, control of traction motors, starting, speed control and braking, energy returned during regenerative braking, overhead and auxiliary equipments.

Illumination: Introduction, definition, laws of illumination, polar curves, photometry, artificial sources of light, incandescent lamps, arc lamps, discharge lamps, lighting scheme, street lighting, factory lighting, flood lighting.

Electrical Heating & Welding: Electrical heating, advantages, modes of transfer of heat, methods of electrical heating, resistance heating, induction heating, dielectric heating, high frequency heating, causes of feeler of heating elements.
Advantages and disadvantages of welding, resistance welding, electric arc welding, choice of welding time, submerge arc welding, electron beam welding, laser beam welding, types of welding electrodes, comparison between resistance & arc welding, electrical welding equipment, comparison between ac and dc welding.

Text Books:

1. Art and Science of Utilization of Electrical Energy by H. Pratab, Dhanapat Rai ,3rd edition,1980
2. Generation, distribution and utilization of electrical energy by C. L. Wadhawa, New age , International limited 3rd edition , 2012

Reference Books:

1. A Course in Electrical Power by J B Gupta, S. K. Kataria & Sons, 15th edition 2013
2. Utilization of Electrical Power by R. K. Rajput, Laxmi Publication Ltd.
3. Generation and Utilization of Electrical Energy by S. Sivanagaraju, Pearson publication Ltd.

EE 352 : SWITCHGEAR AND PROTECTION

Teaching Scheme:03L+0T Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

The course of switch gear and protection is covering various protection systems for various equipments/appliances. The course explores on understanding of various circuit breakers, their types and operation. It also discusses fault current protection methods for transformer, generator. With advances in protective relaying, numerical relays are also introduced.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical engineering, dc machines, ac machines, transformer and their concepts.

COURSE OBJECTIVES:

The objectives of the course are

1. Impart knowledge related to the function of switchgear in power system and the function of different types of circuit breaker.
2. Demonstrate the relay time grading scheme, current grading Scheme for relay operation.
3. Explain the application of carrier current protection to transmission line.
4. Deliver knowledge related to system protection against transients & surges.
5. Know about the recent technology in protection.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. draw constructional diagram of various switchgear.
2. illustrate various protection schemes
3. explain arc interruption phenomenon
4. recognise application of appropriate relay
5. implement recent technology for protection of power system equipment

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	1	1	1	-	2
PO-c	3	3	3	3	2
PO-d	2	2	2	3	-
PO-f	3	3	-	3	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

Course Content (on NEXT PAGE)

EE 352 : SWITCHGEAR AND PROTECTION

Teaching Scheme:03L+0T Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Introduction: Substation equipments, fault clearing process, different types of switchgears, role of protection**.**

Fundamentals of Power System Protection, Instrument Transformers and Circuit breakers: Principle of circuit interruption arc phenomenon, ac & dc circuit breaking, arc interruption theories, transient recovery voltage, restriking voltage, factors affecting TRV, Rate of Rise of Re-striking voltage, resistance switching, damping of TRV, current chopping, capacitive current breaking, auto reclosing protection principles, protection paradigms, apparatus protection and system protection, desirable attributes of protection. Introduction to C.T., C.T. equivalent circuit, C.T. saturation and dc onset current, V.T. equivalent circuit. Circuit Breakers:- arc voltage, arc interruption, resistance switching, interruption of capacitive and inductive current, circuit breaker ratings, classification of C.B. Air break, air blast, vacuum, minimum oil and bulk oil, SF6 C.B. L.T. switchgear:- MCB, MCCB, HRC fuses, type construction and application.

Fault Analysis and Over Current Protection: Review of sequence components, sequence modelling of power apparatus, calculation of fault currents, fuse protection, fundamental of over current protection, PSM setting and phase relay coordination, earth fault protection using over current relays, introduction to directional over-current relays

Basics of Numerical Relaying: Numerical relaying fundamentals, sampling theorem, anti-aliasing filters, least square method for estimation of phasors, Fourier algorithms, Fourier analysis and discrete Fourier transform, estimation of phasors from discrete Fourier transform, applications for implantation of various numerical relays.

Transmission System Protection Using Distance Relays: Introduction to distance relaying, zones of protection, setting and coordination of distance relays, pilot protection with distance relays, realization of distance relays using numerical relaying algorithms.

Protection of Transformer and Generator: Transformer protection:- Percentage deferential protection, magnetic inrush current phenomenon, percentage differential relay with harmonic restraint, restricted earth fault protection, incipient faults, Buchholz relay protection against over fluxing, generator protection, stator phase and ground fault protection, protection against unbalanced loading, loss of excitation, loss of prime mover and over speeding. Bus bar protection, lightning protection and system grounding bus bar protection, different bus bar arrangements, differential protection of bus bar, high impedance deferential relay, lightening and switching over voltages, need and types of lightening arresters, insulation co-ordination, system grounding, need, methods of system grounding, substation ground mats.

Text Books:

1. Fundamentals of Power System Protection by Y. G. Paithankar, S. R. Bhide, PHI,2nd 1996
2. Solid State Protective Relaying by Madhav Rao, Tata McGraw Hill
3. Computer relaying for power systems by A. G. Phadke, J. S. Thorp, Research studies press 1st John Wiley & sons Inc. New York.

Reference Books:

1. A Web Course on Digital Protection of Power System by Prof. Dr. S.A.Soman, IIT Bombay.

2 Switchgear Protection & Power Systems by Sunil S. Rao, Khanna Publishers, 5th edition

3. Fundamentals of Power Systems Protection by Y. G. Paithankar & S. R. Bhide ,2nd PHI,2002

EE 353 : FEEDBACK CONTROL SYSTEM

Teaching Scheme:03L+00TTotal 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

In world of automation study of feedback control system is very much important. The course elaborates mathematical modelling, block diagram, signal flow graph. It also discusses time domain analysis, Routh's stability, frequency domain analysis. Finally in state space approach modern control system is introduced.

DESIRABLE AWARETOMATIONNESS/SKILLS:

Knowledge of basic electrical engineering, dc machines, ac machines, mechanical engineering and their basic concepts.

COURSE OBJECTIVES:

The objectives of the course are to

1. explain mathematical model of linear time invariant systems.
2. introduce basic control system components and their characteristics.
3. introduce the design of sampled data system using discrete system analysis.
4. specify control System performance in Frequency domain and time domain analysis

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. derive the transfer function for single input single output system
2. derive system input output relations using signal flow graph and block diagram reduction
3. evaluate time domain response to known test signals
4. apply R-H criterion to determine stability of LTI system
5. construct bode and polar, root locus plots for various transfer functions
6. use various industrial controllers such as P, PI, PID

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	1	1	1	-	1
PO-c	3	3	3	3	2
PO-d	2	2	2	3	-
PO-f	3	3	-	3	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

Course Content (on NEXT PAGE)

EE 353 : FEEDBACK CONTROL SYSTEM

Teaching Scheme:03L+00TTotal 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Transfer Functions and Block Diagrams: Basic components and classifications of general control systems, physical and non-physical, linear and nonlinear, continuous on-off, analog and digital, open loop and closed-loop systems, mathematical models of physical systems, electrical analogy of non-electrical systems, force-current and force-voltages analogies. Definition of transfer function, block diagram representation of physical systems, block diagram reduction techniques, signal flow graphs and Mason's gain formula, transfer function of electrical, mechanical and electromechanical systems, reduction of parameter variation and effects of disturbance, sensitivity, S^{T}_{G} , S^{T}_{H}

Control System Components: Error detectors: potentiometers, synchros, optical rotary encoders, dc and ac servomotors, ac and dc tacho-generators

Time-Domain Analysis: Standard test signals, time response of first and second order systems, time domain specifications, steady state error and error coefficients, design specifications of second order systems, derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices. Stability concepts, nature of system response from the location of roots in the s-plane of characteristic equation, absolute and relative stability, Routh-Hurwitz criterion and its applications in special cases

Root Locus: Definition of root-locus, rules for plotting root-loci, root contours, stability analysis using root locus, effect of addition of poles and zeros, root locus for systems with transportation lag, computer aided root locus.

Frequency-Domain Analysis: Frequency-domain specifications, correlation between time- and frequency-domain responses, Polar plot, Bode plot, determination of gain and phase margin from Bode plot, effect of gain variation and addition of poles and zeros on Bode plot, determinations of transfer function from the given Bode plot, Bode plot for all pass and minimum phase systems, computer aided Bode plot, Nyquist stability criterion, determination of absolute and relative stability by the application of Nyquist criterion, effect of addition of poles and zeros on the shape of the Nyquist plot, stability of linear control systems with time delay

State Space Analysis: Concept of state and state variable, state equations of linear time invariant and continuous data system. Matrix representation of state equation, conversion of state variable model to transfer function, canonical form, Jordan canonical form, solution of state equations. Concept of controllability and observability

Text Books:

1. Modern Control Engineering by Katsuhiko Ogata, 6th eidion,PHI,1996
2. Control system Engineering by Norman Nise, 3rd edition, John-Willey 2000
3. Control System Engineering by I J Nagrath and M. Gopal,Wiley Eastern Ltd,3rd edition, 2000.

Reference Books:

1. Linear Control System Analysis Amd Design by John J. D'Azzo, C. H. Houpis,,McGraw Hill International,4th edition,1980
2. Control systems-Principles and Design by M.Gopal, 2nd edition,TMH,2002..
3. Automatic Control System by Benjamin C. Kuo, 7th edition PHI ,1985.

EE 354 : POWER ELECTRONICS

Teaching Scheme:03L+0T,Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

This course, Power Electronics give electronic control of appliances, dc machines and ac machines. It explores various semiconductor devices suc as scr, GTO, MCT etc with their characteristics, operation, triggering methods etc. Further ac to dc converters, dc to dc converters and dc to ac inverters are discussed.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical engineering, dc machines, ac machines, transformer and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. describe power semiconductor devices in Thyristor family.
2. present triggering methods, commutation methods etc. of Thyristor.
3. classify controlled rectifiers and dual converters.
4. demonstrate dc-dc converters and their control techniques.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. present structure, characteristics, and applications of power semiconductor devices.
2. tell different triggering methods, commutation methods of Thyristor
3. analyze single and three phase converters with different types of load and their control discuss types, operation and control techniques of choppers
4. enumerate single and three phase inverter and its control techniques like PWM

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	1	1	-
PO-c	3	3	3	2
PO-d	2	2	2	2
PO-f	3	2	-	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

Course Content (on NEXT PAGE)

EE 354 : POWER ELECTRONICS

Teaching Scheme:03L+0T,Total 04 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Thyristor and Transistor Family Devices: Power semiconductor devices, principle of operation, V/I characteristics, switching actions, trigger requirements of power semiconductor devices such as SCR, TRIAC, DIAC, GTO. Power Transistor, Power MOSFET, IGBT. Triggering methods, turn on-turn off characteristics of SCR, types of commutation, ratings, protection, series & parallel operation, gate drive IC's ratings, protections and their areas of application.

AC-DC Converters: Single phase half wave and full wave converters with different types of load, circuit configurations, working, performance parameters and input-output waveforms for R, R-L and RLE loads. Comparison with uncontrolled rectifiers. Three phase half and full wave converters, performance parameters, use of freewheeling diode, effect of source inductance, comparison of diode rectifiers, dual converter in circulating and non-circulating current modes

DC-DC Converters: Operation of chopper, types of choppers, step-up and step-down configurations, various commutation methods, CLC and TRC techniques, PWM and FM techniques. Practical transistorised chopper circuits: working, control, output waveforms, continuous and discontinuous current conduction.

DC-AC Converters: Series and parallel inverters, single phase centre tapped and bridge inverter with R, RL load, Three phase bridge inverters and three-phase thyristorised bridge circuits, output waveforms for R and R-L loads. PWM techniques-single, multiple and sinusoidal PWM. PWM Inverters: principle of operation, performance parameters, current source inverter.

Text Books:

1. Power Electronics by M.H. Rashid, PHI, 2nd edition, 1994.
2. Introduction to Power Electronics by Mohan, Undeland, Robbins, John Willey & Sons.
3. Power Electronics by B. W. Williams, John Willey, 1975.

Reference Books:

1. Power Electronics by C. W. Lander, Tata McGraw-Hill Publications India 1993.
2. An Introduction to Thyristors & Their Applications by M. Ramamoorthy, East-West Press Pvt. Ltd., New Delhi
3. Thyristorised Power Controllers by G. K. Dubey, S. R. Doradla, A. Joshi, M. K. Sinha, Wiley Eastern Ltd. 1987.

EE355: DIGITAL SIGNAL PROCESSING

Teaching Scheme:03L+0T Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

COURSE DESCRIPTION:

This course digital signal processing make the students aware about discrete signals. The course explores on understanding discrete data systems and its analysis using Z-transform, Fourier transform, and sample data systems. Further DSP Processors like TMS are introduced.

DESIRABLE AWARENESS/SKILLS:

Knowledge of digital electronics, control system and microprocessor

COURSE OBJECTIVES:

The objectives of the course are to

1. introduce the basic concepts and techniques for processing signals on a computer.
2. be familiar with the most important methods in DSP, including digital filter design
3. learn the importance of signal processors.
4. emphasizes intuitive understanding and practical implementations of the theoretical concepts

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. represent discrete-time signals analytically and visualize them in the time domain.
2. understand the meaning and implications of the properties of systems and signals.
3.understand the Transform domain and its significance and problems related to computational complexity.
4. specify and design any digital filters using MATLAB

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	1	1	1	-
PO-c	3	3	3	3
PO-d	2	2	2	3
PO-f	3	3	-	3

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

Course Content (on NEXT PAGE)

EE 355: DIGITAL SIGNAL PROCESSING

Teaching Scheme:03L+0T Total 03 **Credits** : 03
Examination Scheme: 10ISA+15ISE1+15ISE2+60ESE **Total Marks :** 100
Duration of ESE : 03 hrs

Discrete-Time Signals And Systems: Discrete time signals, sequences, time domain and frequency domain representation of discrete time signals, linear time invariant systems, properties of LTI systems. Representation of sequences by Fourier transforms, linear constant, coefficient of different equations.

Sampled data systems and sampling of continuous-time signals: Sampled data systems, multiplexers, sample and hold circuit, DAC and ADC, sampling of continuous signals, periodic sampling, frequency domain representation of sampling, reconstruction of samples. Discrete time processing of continuous time signals, continuous time processing of discrete time signals

Z-transform and realization of discrete-time systems: Z transform, definition, convergence. Properties of Z transform, inverse Z transform. System function for discrete time systems characterized by linear constant, coefficient differential equations. Recursive and non recursive structure, block diagram and signal flow graph representation of discrete time systems. Basic structure for FIR and IIR systems.

Discrete Fourier Transform and Fast Fourier Transform: Derivation of DFT from DTFT, inverse DFT, convolution using DFT. Computational complexity of the DFT, decimation in-time FFT algorithm, decimation in-frequency FFT algorithm, comparison of DIT and DIF algorithms.

Digital Signal Processors: DSP architecture: Harvard architecture, pipelining, hardware multiplier, accumulator, special instructions, On-Chip memory, parallelism. General purpose DSP: fixed point and floating point arithmetic. Comparison of some common digital processor. Architecture of TMS320 DSP: fixed point and floating point precision, instruction set/assembly code, algorithm design, mathematical, structure and numerical constraints.

DSP Programming and Applications of DSP: TMS320 assembly language programming and C Language Programming. Application of DSP in power systems: measurement of electrical quantities, power system protection, state estimation etc. Application of DSP for data compression, array processing and in control system.

Text Books:

1. DSP: Principles, Algorithms and Application by Proakis and Manolakis, PHI, 3rd edition,1996
2. Digital Signal Processing by A. V. Oppenheim and R. W. Schafer,PHI.
3. Digital Signal Processing by E C Ifeacher and B W Jervis, Adison,Wesley 1993.
4. Introduction to Digital Signal Processing by Johnny Johnson,PHI, 4th edition,1989.

Reference Books:

1. M Digital Signal Processing by H. Hayes by Schaum's McGraw-Hill 1999.
2. Small DSP laboratory using MATLAB S. K. Mitra, McGraw-Hill, 1999

EE 356: ELECTRICAL TRACTION AND UTILIZATION LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50ICA **Total Marks :** 50

DESCRIPTION:

The laboratory course Electrical Traction and Utilization gives practical exposure related to applications of dc, ac machines. It further helps to study various illumination methods, heating and welding methods.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and dc, ac machines and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. plot speed control, load test and breaking of dc and ac motors
2. compare various illumination methods
3. understand various types of enclosures
4. study heating and welding methods

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. plot speed control, load test and breaking of dc, ac motors
2. compare various illumination methods
3. understand various types of enclosures
4. study heating and welding methods

.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	-	2
PO-b	3	2	2	2
PO-d	2	-	3	1
PO-e	--	1	1	-

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 356: ELECTRICAL TRACTION AND UTILIZATION LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50ICA **Total Marks :** 50

The laboratory work should consist of experiments based on theory syllabus of EE351. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. To perform load test on single phase induction motor &plot its performance characteristics.
2. To perform load test on DC series motor& plot its performance characteristics.
3. To study the speed control of DC series motor.
4. To study the rheostatic breaking of three phase induction motor.
5. To perform load test on three phase induction motor & plot its performance characteristics.
6. To study the rheostatic breaking of DC shunt motor.
7. Speed control of three-phase slip ring induction motor by rotor resistance method.
8. To perform the load test on DC shunt motors and plots its performance characteristics.
9. Study of illumination system.
10. Study of induction heating &Welding.
11. Study of different types of enclosures.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

EE357 : SWITCHGEAR AND PROTECTION LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50ICA **Total Marks :** 50

DESCRIPTION:

The course of switch gear and protection is covering various protection systems for various equipments/appliances. The course explores on understanding of various circuit breakers, their types and operation. It also discusses fault current protection methods for transformer, generator. With advances in protective relaying, numerical relays are also introduced.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and electronics , dc, ac machines and their concepts.

COURSE OBJECTIVES:

The objectives of course are to
1. understand various types of relays
2.learn principle of circuit breakers
3. know characteristics of over current relay Illustrate various protection schemes
4. understand modern static relay, numerical relays

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to
1. perform experiment on characteristics of various types of relays
2.study principle of circuit breakers
3. plot characteristics of over current relay Illustrate various protection schemes
4. understand modern static and numerical relay

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	3	-	3
PO-b	3	2	2	3
PO-d	2	-	2	1
PO-e	--	1	1	-

11- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE357 : SWITCHGEAR AND PROTECTION LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50ICA **Total Marks :** 50

The laboratory work should consist of experiments based on theory syllabus of EE352. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. To conduct and study of Arc extinction phenomenon : Application in air circuit breaker
2. Study of relaying components and control circuit developments.
3. To conduct and plot the characteristic of rewirable fuses and MCB
4. To conduct and plot operating characteristics of inverse time over current relay
5. To conduct over current & earth fault protection scheme for alternator
6. To conduct protection of 3 phase transformer using differential relay(Merz-Price protection scheme)
7. To conduct and study the through fault stability of differential protection scheme applied to transformer
8. To conduct protection of transmission line
9. Study of MHO distance relay to plot.
   A) R-X diagram B) Relay voltage Vs admittance characteristic admittance characteristic
10. Study of Static relay
11. Demonstration of microprocessor base protection.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical's performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

EE 358 : FEEDBACK CONTROL SYSTEM LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

DESCRIPTION:

The laboratory course on feedback control system will help the students to study and plot characteristics of motors, find transfer function of various control system components. Further using any software (like MAT LAB)simulation of various controllers can be done.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and electronics , dc, ac machines, physical systems and their concepts.

COURSE OBJECTIVES:

The objectives of course are to
1 draw characteristics of potentiometer as error detector
2. analyze torque speed characteristics of ac servo motor
3. study PI,PD, PID Controller
4. know the stability analysis using root locus and Bode plot using MAT LAB

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to
1.draw characteristics of potentiometer as error detector
2. learn torque speed characteristics of ac servo motor
3.understand PI,PD, PID Controller
4. understand stability analysis using root locus and Bode plot using MAT LAB

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	3	-	2
PO-b	3	2	2	3
PO-f	2	-	3	1
PO-e	--	1	1	-

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

E358: FEEDBACK CONTROL SYSTEM LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

The laboratory work should consist of experiments based on theory syllabus of EE353. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. Study of potentiometers as error detectors.
2. Study of Synchros as error detector.
3. Study of regulator system.
4. Study of rotary position control system
5. To study torque -speed characteristics of a dc servo motor
6. To study the torque-speed characteristic of ac servo motor.
7. To study the time response of a second order system.
8. Study of continuous- time and/or digital position control system.
9. Stability Analysis of First, Second and higher order systems using MATLAB
10. To study the time response of a variety of simulated linear systems and to correlate the studies with theoretical results.
11. To plot of root locus using MATLAB.
12. To plot the Bode and Nyquist plot using MATLAB.
13. Determination of transfer function of dc motor using Simulink.
14. Stability analysis and state space model for a given system using MATLAB.
15. Study an industrial application (like Bottle filling/ Pick and Place/elevator control) using PLC.
16. Study of Tuning of a PID controller using MATLAB/Simulink.
17. Study of Temperature Controller.
22. Study of Control System Components like Servomotors, Actuators, Sensors, Displays.
23. Study of Programmable Controllers.
24. Determination of transfer function of dc motor.

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical's performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

EE 359 : POWER ELECTRONICS LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

DESCRIPTION:

The laboratory course on power electronics will help the students to perform experiments to study and plot characteristics of semiconducting devices like SCR, IGBT etc. Explore various triggering methods, study various converters, chopper and inverters. Further few experiments can be studied using simulation.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and electronics , dc, ac machines and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. understand characteristics of power semiconductor devices
2. know different triggering and commutation methods of thyristor
3. analyze half wave and full wave converters with R and RL loads
4. understand different types of inverters and choppers

COURSE OUTCOMES:

On the successful completion of this course; student shall be able to

1. analyze characteristics of power semiconductor devices
2. demonstrate different triggering and commutation methods of thyristor
3. construct and analyze half wave and full wave converters with R and RL loads
4. apply knowledge to analyze different types of inverters and choppers

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	3	-	2
PO-b	3	2	2	2
PO-f	2	-	2	1
PO-e	--	1	1	-

11- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE 359 : POWER ELECTRONICS LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 25ICA+25ESE **Total Marks :** 50
Duration of ESE : 03 hrs

The laboratory work should consist of experiments based on theory syllabus of EE354. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

Any four/three from following
1. To study the SCR/ GTO characteristics.
2. To study SCR turn-on methods.
3. To study of SCR Commutation methods.
4. To study IGBT / MOSFET characteristics, drivers.
5. To study TRIAC { Triggering modes and phase control}

Any four/ three from following
1. To study single phase /three phase converter
2. To study dual converter
3. To study dc chopper
4. To study single phase / three phase thyristorised inverter
5. To study PWM inverter

Any three from following
1. Simulation of converter / chopper
2. Simulation of PWM inverter
3. Switched mode converter / rectifier
4. Uninterrupted power supply

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical's performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

Guide lines for ESE: The end semester examination(ESE) for the laboratory course of three hrs duration, shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute

EE360 : DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50 ICA **Total Marks :** 25

DESCRIPTION:

The laboratory course of digital signal processing make the students aware about performing experiments on discrete signals. The experiments ar performed on any (eg TMS) processor or using simulation. It explores on understanding discrete data systems and its analysis using Z-transform, Fourier transform, and sample data systems.

DESIRABLE AWARENESS/SKILLS:

Knowledge of digital systems, microprocessors and microcontrollers and their concepts.

COURSE OBJECTIVES:

The objectives of course are to

1. Know discrete-time signals analytically and visualize them in the time domain.
2.Learn the meaning and implications of the properties of systems and signals.
3.Learnd the Transform domain and its significance and problems related to computational complexity.
4. Specify and design any digital filters using MATLAB

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to

1. perform experiment to represent discrete-time signals analytically and visualize them in the time domain.
2.understand the meaning and implications of the properties of systems and signals.
3.understand the Transform domain and its significance and problems related to computational complexity.
4. specify and design any digital filters using MATLAB

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	3	-	3
PO-b	3	2	2	3
PO-c	2	-	2	1
PO-f	--	1	1	-

11- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE360 : DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme:02P Total 02 **Credits** : 01
Examination Scheme: 50 ICA **Total Marks :** 25

The laboratory work should consist of experiments based on theory syllabus of EE355. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

1. To study the shifting and folding of digital signal
2. To study the linear convolution
3. To study the discrete Fourier transforms
4. To study the fast Fourier transforms
5. To study the design and implement FIR filter using windowing method
6. To study the design and implement IIR filter using butterworth approximation
7. To study the design and implement IIR filter using Chebeshev approximation
8. To study the sine/square wave generation using TMS320C67XX
9. To study the FIR filter implementation using TMS320C67XX
10. To study the IIR filter implementation using TMS320C67XX
11. To study the filtering using discrete wavelet transforms

Note :
Guide lines for ICA: Internal Continuous Assessment shall support for regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

EE361 : MINI PROJECT

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 25ICA **Total Marks :** 25

COURSE DESCRIPTION:

The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

DESIRABLE AWARENESS/SKILLS:

Knowledge of basic electrical and electronics engineering and their concepts.

COURSE OBJECTIVES:

The objectives of course are

1. design a system, component, or process to meet desired/realistic project
2. function on multidisciplinary teams, communicate effectively
3. understand the impact of engineering solutions in a global, economic, environmental.
4. use the techniques, skills, modern engineering tools and software necessary for engineering practice.

COURSE OUTCOMES:

On the successful completion of this course; student shall be able to

1. design a system, component, or process to meet desired/realistic project
2. function on multidisciplinary teams, communicate effectively
3. understand the impact of engineering solutions in a global, economic, environmental.
4. use the techniques, skills, modern engineering tools and software necessary for engineering practice.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	2	2	3	--
PO-b	3	2	3	--
PO-c	2	2	3	--
PO-d	2	2	3	3
PO-f	3	2	3	--

1- Strongly correlated 2 – Moderately correlated 3 – Weakly correlated

COURSE CONTENT (ON NEXT PAGE)

EE361 : MINI PROJECT

Teaching Scheme: 02P Total 02 **Credits** : 01
Examination Scheme: 25ICA **Total Marks :** 25

- Each student shall work on an approved project, a group of 05 students (maximum) shall be allotted for the each minor project and same group may be continued for major project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas.
- The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.

Guide lines for ICA : Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in

Table-A.

Assessment of Minor Project
Name of the Project: _____
Name of the Guide: _____

Table-A

Sample assessment

SN	Exam Seat No	Name of Student	Project Selection	Docume-ntation	Design /Simul-ation Logic	PCB/hard ware/prog ramming	Result Verifica tion	Present-ation	Total
			5	**10**	**10**	**10**	**10**	**5**	**50**

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B. Tech. Electrical Engineering

Programmes Outcomes

a)Graduates will demonstrate knowledge of mathematics, science and engineering

b)Graduates will demonstrate the ability to identify, formulate and solve engineering problems

c)Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data

d)Graduates will demonstrate the ability to design a system, component or process as per needs and specifications

e)Graduates will demonstrate the ability to visualize and work on laboratory and multi-disciplinary tasks

f)Graduate will demonstrate the skills to use modern engineering tools, software's and equipment to analyze problems

g)Graduates will demonstrate the knowledge of professional and ethical responsibilities

h)Graduate will be able to communicate effectively in both verbal and written form

i)Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues

j)Graduate will develop confidence for self education and ability for life-long learning

k)Graduate will show the ability to participate and try to succeed in competitive examinations

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON
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"Globally Accepted Engineers with Human Skills''
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Email-princoej@rediffmail.com Web : www.gcoej.ac.in
OW.NO.GCOEJ/EED/ 2016/ Date :

Equivalence and/or exemption in course in autonomous curriculum if passed the courses from NMU, Jalgaon curriculum

Sr. No	Course as per autonomous curriculum in which exemption shall be granted (Course code and Name)		Exempted if passed as per NMU, Jalgaon examination (Paper No. and Subject code)		Sign of concern HoD/BoS chairperson
1	EE301	AC Machines(Th)	165101	Engineering Machines II (Th)	
2	EE302	Power System Analysis (Th)	165102	Power System II (Th)	
3	EE303	Microcontroller and Its Applications(Th)	166115	Microprocessor and Microcontroller (Th)	
4	EE304	Electrical Testing and Maintenance(Th)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
5	EE305	Industrial Organization and Management(Th)	165105	Industrial Organization and Management (Th)	
6	EE306	AC Machines(Lab)	165306	Engineering Machines II(Lab)	
7	EE307	Power System Analysis (Lab)	165307	Power System II (Lab)	
8	EE308	Microcontroller and Its Applications(Lab)	166319	Microcontroller and Its Applications(Lab)	
9	EE309	Electrical Testing and Maintenance(Lab)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
10	EE310	Numerical Methods and Computer Programming Lab	165310	Software Application –I (Lab)	
11	EE311	Self Study I		Exempted	

12	EE351	Electrical Traction and Utilization(Th)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
13	EE352	Switchgear and Protection(Th)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
14	EE353	Feedback Control System(Th)	166312	Control system –I(Th)	
15	EE354	Power Electronics(Th)		Power Electronics (Th)	
16	EE355	Digital Signal Processing(Th)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
17	EE356	Electrical Traction and Utilization(Lab)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
18	EE357	Switchgear and Protection(Lab)		No Equivalence and hence no exemption (i.e. each student who is shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
19	EE358	Feedback Control System(Lab)	166317	Control system –I (Lab)	
20	EE259	Power Electronics(Lab)	165308	Power Electronics (Lab)	
21	EE260	Digital Signal Processing(Lab)		No Equivalence and hence no exemption (i.e. each student who is	

				shifted from NMU, Jalgaon curriculum in to autonomous curriculum shall register and pass this course.)	
22	EE361	Mini Project		Minor Project	
23	EE 362	Self Study -II		Exempted	
24	EE 363	Industrial Lecture		Exempted	

Important Notes:

1. If any student was admitted in third year (Electrical) before the academic year 2016-17 and his/her odd semester (I^{st} semester) was granted under NMU, Jalgaon curriculum but even semester (II^{nd} semester) was not granted then such student shall be shifted in autonomous curriculum for even semester (II^{nd} semester) of the academic year 2016-17 or onward. He/she shall pass all the courses of odd semester (I^{st} semester) as per NMU, Jalgaon curriculum, if not. In addition; he/she shall register and pass all other courses of autonomous curriculum for which exemption is not granted as per above chart during even semester (II^{nd} semester) or whenever institute offers that subject.
   In any case; any student shall not be declared as pass in T.Y.B.Tech.(Electrical) without obtaining exemption or passing all courses of T.Y.B.Tech. (Electrical) as per above chart.

2. If any student who was admitted in third year engineering (Electrical) before the academic year 2016-17 and failed third year engineering as per NMU, Jalgaon curriculum shall pass all the courses of third year engineering as per NMU, Jalgaon curriculum. Such student shall be eligible to take admission in Final year B. Tech. for the academic year 2017-18 or onward if his/her result is pass/ATKT as per NMU, Jalgaon result. In addition; he/she shall register and pass all the courses of T.Y.B.Tech. of autonomous curriculum for which exemption cannot be granted as per above chart; during the academic year of final year .B.Tech. or whenever institute offers that course.
   To pass all such courses shall be the mandatory condition for the award of degree.

   To pass all such courses shall be the mandatory condition for the award of degree.

3. *The students who are likely to be admitted to T.Y. B.Tech.(Electrical) in academic year 2016-17 directly who were admitted to T.E.(Electrical)in the year 2015-16 or before as per N.M.U. Curriculum but failed or detained in any semester , shall register and pass EE304 Electrical Testing and Maintenance, EE309 Electrical testing and Maintenance Lab,EE351 Electrical Traction and Utilization, EE352 switchgear and Protection,EE355 Digital Signal Processing, EE356 Electrical Traction and Utilization Lab,EE357 Switchgear and Protection Lab, EE360 Digital Signal processing courses in addition if he/she has not passed the equivalent subjects as per N.M.U. curriculum specified in the above chart.
   To pass all such courses shall be the mandatory condition for the award of degree.

Chairman, Board of Studies (Electrical) is empowered to decide the equivalence in particular case as and when required for which the equivalence is not specified in curriculum.