Shri Shankaracharya Technical Campus, Bhilai

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SCHEME OF TEACHING AND EXAMINATION
B. Tech. Seventh Semester- ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Category	Course Code	Period per			Scheme of Examination			Total Marks	Credit
					L	T	P	Theory/Lab				
								ESE	CT	TA		
1.	Electrical and Electronics	Power System Protection	PEC	EEE103701	2	1	-	100	20	30	150	3
2.	Electrical and Electronics	Electrical Drives	OEC	EEE103702	2	1	-	100	20	30	150	3
3.	Electrical and Electronics	Computer Aided Power System	OEC	EEE103703	3	-	-	100	20	30	150	3
4.	Electrical and Electronics	Professional Elective-II (Refer Table-1)	HSMC	EEE103722	3	-	-	100	20	30	150	3
5.	Electrical and Electronics	Open Elective-1 (Refer Table-2)	HSMC	EEE103732	3	-	-	100	20	30	150	3
6.	Electrical and Electronics	Power System Protection Lab	PEC	EEE103791	-	-	2	25	-	25	50	1
7.	Electrical and Electronics	Electrical Drives Lab	PCC	EEE103792	-	-	2	25	-	25	50	1
8.	Electrical and Electronics	Capstone Project Phase I	PSI	EEE103793	-	-	4	50	-	50	100	2
9	Electrical and Electronics	Internship assessment/Industrial training	PSI	EEE103794	-	-	2		-	25	25	1
10.	Electrical and Electronics	Universal Human Values and Professional Ethics	NC	EEE103795	-	-	-	-	-	25	25	-
	Total				**13**	**2**	**8**	**600**	**100**	**300**	**1000**	**20**

L : Lecture, T: Tutorial, P : Practical, ESE : End Semester Exam CT : Class test TA: Teacher's assessment

Table IV : Professional Elective - III			
Sl. No.	**Board of Studies (BOS)**	**Course(Subject)**	**Course Code**
1.	Electrical & Electronics Engineering	Switched Mode Power Converter	EEE103721
2.	Electrical & Electronics Engineering	Power Apparatus System	EEE103722
3.	Electrical & Electronics Engineering	Flexible AC Transmission Systems	EEE103723
4.	Electrical & Electronics Engineering	Internet of Things	EEE103724
5.	Electrical & Electronics Engineering	Advance Control Theory	EEE103725

B. Tech. (Electrical and Electronics Engineering) Seventh Semester

Table V : Open Elective - II				
Sl. No.	**Board of Studies (BOS)**	**Course(Subject)**	**Course Code**	**Link**
1.	Electrical & Electronics Engineering	Soft Computing Techniques	EEE100741	
2.	Electrical & Electronics Engineering	Introduction to Machine Learning	EEE100742	https://onlinecourses.nptel.ac.in/noc23_ee87/preview

Note:

(a) Abbreviations used : L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Exam, CT- Class Test, TA- Teacher's Assessment

(b) 1/4th of total strength of students subject to minimum of 20 students is required to offer an elective in the department in a particular academic session.

(c) Choice of elective course once made for an examination cannot be changed in future examinations.

(d) The duration of end semester examination of all theory papers will be of three hours.

SYLLABUS

B.TECH. (DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING)

SEVENTH SEMESTER

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103701	Power System Protection	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To understand the principle of protective schemes and various faults in the Power System Scenario. 2. To study the various types of the circuit breakers, the arc quenching phenomena and the protection against over voltages. 3. Teach students the protection systems used for electric machines, transformers, bus bars.	**Students will be able to:** **CO1** Design the relevant protection systems for the main elements of a power system **CO2** Analyze with over current, differential, and ratio protection devices and their application in a coordinated protection scheme. **CO3** Do the stability problems and clearing of faults to mitigate these problems.

UNIT 1 **Protective relays :** Introduction to protective Relay, importance of protective relaying, primary and backup protection, desirable qualities of protective relaying, protective current transformer and voltage transformer, basic connection of trip circuit, principle, construction, working& torque equation of instantaneous overcurrent relay, IDMT relay, differential relay, directional relay, generalized torque expression, impedance relay, reactance relay, mho relay.	**CO1** **12 Hrs**
UNIT 2 **a) Generator protection**: Fault on generators, Differential protection of stator, inter turn fault protection, protection against unbalance loading, protection of rotor against ground fault, protection against field failure, protection against failure of prime mover, field suppression in alternators. **b) Transformer protection:** Difficulties in differential protection, mode of C.T. connection for differential protection of three phase transformer, protection against magnetizing inrush current, core balance earth leakage protection.	**CO1, CO2** **12 Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 3 **a) Transmission line protection**: Over current protection of lines, three step distance protection, effect of power swings on distance relay, Directional comparison carrier current protection, phase comparison carrier current protection, carrier aided distance protection. **b) Feeder protection**: protection of ring main feeder, protection of parallel feeders. **c) Bus bar protection:** Differential protection, frame leakage protection.	**CO3** **10Hrs**
UNIT 4 **Static relay:** Amplitude & phase comparators, duality between amplitude & phase comparators, circulating current amplitude comparators, coincidence technique in phase comparator, spike and block phase comparator, integrating phase comparator, Hall effect sine phase comparator, Design of directional relay, reactance relay, mho relay, impedance relay,quadrilateral characteristics relay using cosine phase comparator and amplitude comparator.	**CO3** **10 Hrs**
UNIT 5 **Circuit Breakers:** Initiation of Arc, Arc interruption theories, current chopping, Recovery voltage, Factor affecting recovery voltage, Restriking voltage, rate of rise of restriking voltage, Breaking of capacitive current, Resistance switching, Circuit Breaker rating, Circuit Breaker testing, Minimum oil circuit breaker, Air Blast circuit Breaker, SF-6 Circuit Breaker.	**CO3** **8 Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Power System Protection and Switchgear	Badri Ram, Vishwakarma D N.	2005	Tata McGraw Hill Publishing House Limited, New
2	Fundamentals of Power System Protection	Paithankar Y. G., Bhide S. R.	2nd	Prentice Hall of India Limited, New Delhi

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Electrical Power Systems	Wadhwa, C.L.	6th	New Age International Publishers Limited
2	A Text Book on Power Systems Engineering	Soni, M.L., Gupta, P.V., Bhatnagar, U.S. and Chakrabarti, A	2008	Dhanpat Rai & Sons Company Limited, New Delhi
3	Power system Protection And Switchgear	Oza, Nair, Mehta and Makwana		

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103702	Electrical Drives	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Describe the structure of Electric Drive systems and their role in various applications. 2. Describe the operation of dc motor drives to satisfy four-quadrant operation to meet mechanical load requirements. 3. Describe the operation of induction machines in steady state. 4. Describe speed control of induction motor drives in an energy efficient manner using power electronics. 5. Describe synchronous motor drive operation. 6. Describe operation of tractions Drives.	On successful completion of the course, the student will be able to: CO 1 Electric drive systems for different mode of operations. CO 2 Performance and ratings of drive on the basis of heating and cooling. CO 3 Speed control of DC machines using Power Electronics devices. CO 4 Speed control of DC and AC machines using Power Electronics devices. CO 5 Operation of tractions drive.

UNIT 1 **Electric Drives**: Basic concept of electric drives its advantages and types, choice of electric drives, Fundamental equations, speed torque conversions and multi quadrant operation, drive parameters, component of load torque, nature and classification of load torques, calculation of time and energy loss in transient operation ,steady state stability and load equalization.	**CO1** **12 Hrs**
UNIT 2 **Control and Rating of Electric Drives**: Modes of operation of electric drives, Closed loop control of drives, closed loop control of multi-motor drives, Selection of motor power rating-Heating and Cooling of motors, Selection of motor power rating under different loading conditions, Continuous ,Short and Intermittent periodic duty.	**CO2** **10 Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

UNIT 3 **DC Drives:** Review of dc motors and their performance, Braking: Regenerative braking, Dynamic braking, Plugging. Speed control, Controlled Rectifier fed dc drives: single phase and three phase half controlled and fully controlled, Multi quadrant operation of dc drives, Chopper Controlled dc drives	**CO3** **10Hrs**
UNIT 4 **Induction and Synchronous Motor Drives:** Review of conventional method of starting, and Speed control, Braking: Regenerative braking, Dynamic braking, Plugging. Speed control by stator voltage control, supply frequency control, Voltage source inverter (VSI) and current source inverter (CSI) fed three-phase induction motor drives, Static rotor resistance control induction motor drive, Slip power recovery drives. **Synchronous motor drives**: Speed control of synchronous motor using voltage and current source inverters, Self-controlled synchronous motor drives.	**CO4** **10 Hrs**
UNIT 5 **Traction Drives**: Electric Traction system, Nature of traction load, calculation of Traction drive rating and energy consumption, Important feature of traction drives, Motors employed in traction, Conventional method for AC and DC traction drives control, Semiconductor converter-controlled drives employing DC motors, AC motors for 25 KV AC traction.	**CO5** **8Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1)	Fundamentals of electrical drives	G K Dubey	2nd	Narosa Pb
2)	Electric Drives	Vedam Subramanyam	2nd	TMHP bs

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1)	Electric Motor Drives	R. Krishnan	1st edition 2001	PHI Pb
2)	Modern Power Electronics and AC Drives	B K Bose	12 October 2001	Pearson Education

Shri Shankaracharya Technical Campus, Bhilai

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SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103703	Computer Aided power System	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Modeling issues and analysis methods for the power flow, short circuit, contingency and stability analyses, required to be carried out for the power systems. 2. Necessary details of numerical techniques to solve nonlinear algebraic as well as differential equations will also be included. 3. Different types of stability phenomena have been observed hi the power systems, which need to be critically analyzed, utilizing appropriate dynamic model of the system.	On successful completion of the course, the student will be able to: **CO1:** Develop proper mathematical models for analysis of a selected problem like load flow study or fault analysis. **CO2:** Student able to analysis of different type fault in a power system. **CO3:** Student able to understands different load flow techniques. **CO4:** Student able to understand stability analysis of power system. **CO5:** Student able to understand the power system concepts of contingency analysis.

UNIT 1 **Network equations:** Network equations, graph theory. Bus admittance matrix by step by step method, primitive network, bus incidence matrix, formation of Y_{bus} by singular transformation, bus impedance matrix by inversion of Y_{bus} algorithm for bus impedance matrix, addition of a branch, addition of link, modification of Z_{bus} by changes in primitive network. Concept of using these matrices for load flow study and fault study.	**CO1** **10 Hrs**
UNIT 2 **Fault Analysis:** Fault Analysis, [ZBUS] Building algorithm, sequence matrices, Symmetrical and Unsymmetrical Short-Circuit Analysis of Large Power Systems, Phase Shift in sequence quantities due to transformers.	**CO2** **10 Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 3 **Load Flow Study:** Introduction, power system equations, solution technique ie Gauss Seidel, Newton Raphson and fast decoupled load flow.	**CO3** **10Hrs**
UNIT 4 **Transient Stability Studies:** Introduction, swing equation, machine equations, power system equations, solution techniques, example of transient stability calculations, exciter and governor control system, description of transient stability program.	**CO4** **12 Hrs**
UNIT 5 **Security Analysis:** Basic Concepts, Power System Security, Factors affecting Security Static Security Analysis at Control Centers, Contingency Analysis, Contingency Selection, Contingency Analysis Using Network Sensitivity Method and AC Power Flow Method.	**CO5** **7Hrs**

S. No.	Title	Authors	Edition	Publisher
1	Power System Analysis	H. Sadat	2000	McGraw Hill Co. Ltd
2	Computer methods in Power System Analysis	G. W. Stagg and A. H. El- Abiad	1968	Mc -Graw Hill Kogakusha Ltd

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1.	Computer Aided Power System Analysis & Control	A.K. Mahaianabis, D.P. Kothari, S.I. Ahson	1988	McGraw Hill, New Delhi
2	Electric Energy System Theory: An Introduction	O.I. Elgard	1982	McGraw Hill, New York

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103791	Power System Protection Lab	L =0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25		25	50	

List of Experiments

List of Experiments (At least ten experiments are to be performed by each student)

1. To study Over current Relay static type & draw characteristics.
2. To study under voltage relay Electromechanical type & draw characteristics.
3. To study over voltage relay Electromechanical type & draw characteristics.
4. To study IDMT Over current relay Electromechanical Type & draw current verses time characteristics.
5. To study IDMT earth fault relay electromechanical type draw current verses time characteristics.
6. To study operating characteristics of percentage-biased differential relays tp plot the characteristics of percentage biased differential relay for 30%, 40%, & 20%.
7. To determine the characteristics of instantaneous relays.
8. To study Bucholz Relays.
9. To study Solid State O.C.R.
10. To study Merz Price Protection of transformer (Simulation Model).
11. To study Static type negative sequence relay.
12. To study the time-grading protection of feeder [simulation Model].
13. To study the current-grading protection of feeder [simulation Model].
14. To study the time-current grading protection of feeder [simulation Model].
15. To study the simulation model for short, medium, & long transmission line.

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103792	Electric Drives Laboratory	L =0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25		25	50	

List of Experiments

List of experiments: (Minimum 10 experiments to be performed)

1. To study the heating time constant for a Continuous Duty Motor
2. To Study the heating time constant of a Short time Duty Motor
3. To Study the cooling time constant of a Short time Duty Motor
4. To Study the heating time constant of a Short Time Duty Motor
5. To Study the cooling time constant for an Intermittent Duty Motor
6. Performance and speed control of D.C drive using 3-phase full converter
7. Performance and operation of a four quadrant chopper on D.C drive
8. Study and performance of electrical Dynamic braking and Plugging of D.C shunt motor
9. Study of V/F control operation of 3-ϕ Induction motor
10. Simulation of PWM VSI/CSI fed 3-ϕ Induction motor control using MATLAB/PSPICE/PSIM software
11. Study of solid state stator voltage control of 3-ϕ Induction motor (using AC voltage regulator)
12. Performance and speed control of 3-ϕ Induction motor using 3-ϕ voltage source inverter
13. To study frequency control Synchronous motor drive
14. Study of AC motors for 25KV Ac traction
15. Study of Resistance wielding and Arc welding

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103721	Switched Mode Power Converter	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To understand various modes of operation of switched mode power converters 2. To analyze control aspects of switched mode power converters 3. To design various switched mode power converter and its components	On successful completion of the course, the student will be able to: **CO1:** Model and develop switching power converters topologies. **CO2**: Describe the role of switch mode power converters in various applications. **CO3**: Design magnetic components for DC-DC converters

UNIT 1 **Switching devices and control of switched mode power converters:** Power semiconductor devices for SMPS- static and switching characteristics, power loss evaluation, turn-on and turn-off characteristics, PWM control, Modeling and control of SMPS, duty cycle and current model control.	**CO1** **10 Hrs**
UNIT 2 **Non-Isolated switched mode power converters:** Non-isolated dc-dc converter- buck, boost, buck-boost, Cuk, Sepic; continuous conduction mode and discontinuous conduction mode analysis; non-idealities in the switched mode power converters.	**CO1,CO2** **10 Hrs**
UNIT 3 **Isolated switched mode power converters:** Isolated dc-dc converters- fly back, forward, push-pull, half bridge and full bridge topologies; transformer design for high frequency isolation.	**CO3** **10Hrs**
UNIT 4 **Resonant Converters:** Introduction, resonant switch ZCS converter, principle of operation and analysis, resonant switch ZVS converter, principle of operation and analysis, Series resonant inverter, series resonant DC-DC converter, parallel	**CO3 12 Hrs**

resonant DC-DC converter, series- parallel resonant DC-DC converter, resonant converters comparison.	
UNIT 5 **Design considerations:** Selection of output filter capacitor, Selection of energy storage inductor, Design of High Frequency Inductor and High frequency Transformer, Selection of switches, Snubber circuit design, Design of driver circuits.	**CO2,CO3 9Hrs**

Text Books:

S. No.	Title	Authors	Publisher
1	Switched Mode Power Supplies	H. W. Whittington, B. W. Flynn and D.	Universities Press
2	Power Electronics Converters, Application and Design	Mohan N. Undeland . T & Robbins W.,	Wiley, Third edition,
3	Design of magnetic components for switched Mode Power Converters	Umanand L., Bhat S.R.	newage publishers

Reference Books:

S. No.	Title	Authors	Publisher
1	Elements of Power Electronics	Krein P.T.	Oxford University Press

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103722	Power Apparatus System	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Acquire knowledge of overhead line insulator, string efficiency and sag and tension calculation of transmission line. 2. Describe different types of Distribution system. 3. Explain about various types of grounding system. 4. Explain insulation coordination and surge protection. 5. Correlate basic concept of reliability with Reliability of transmission and Distribution System.	On successful completion of the course, the student will be able to: **CO1:**Understand the concepts of microprocessors, their principles and practices. **CO2:** Write efficient programs in assembly language of the 8086 family of microprocessors. **CO3:** Organize a modern computer system and be able to relate it to real examples. **CO4:** Develop the programs in assembly language for 80286, 80386 and MIPS processors in **CO5:** real and protected modes. Implement embedded applications using ATOM processor.

UNIT 1 **Mechanical Design of Transmission Lines:** Types of Insulator , Conductors, Towers , Span, Conductor Configuration, Spacing, Clearance , Sag and Tension Calculation, Potential distribution over a string of suspension insulators, string efficiency, methods for equalizing the potential, Selection of Conductor Size, Number of Circuit , Ground Wire, Surge Impedance Loading.	**CO1** **6 Hrs**
UNIT 2 **Distribution System:** Types of Distribution System, Various types of AC & DC Distributors, Voltage Drop Calculation, Selection of Distribution Voltage, Size of Conductor, Kelvin's Law.	**CO1** **6 Hrs**

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 3 **Power System Grounding:** Different Methods of grounding : Neutral Grounding, Solid Grounding, Resistance Grounding, Reactance Grounding, Arc Suppression Coil Grounding, ZigZag Transformer Grounding, Effect of Grounding on System Over Voltages. Merits & Demerits of Various Grounding Systems.	**CO3** **8Hrs**
UNIT 4 **Surge Protection & Insulation coordination:** External & Internal Overvoltage Mechanism of Lightening Discharge , Wave Shapes of Stroke Current, Line Design on Direct Stroke Over Voltage Protection , Earth Wire, Rod Gap , TRF , Expulsion Tube , Surge Diverter Selection of BIL , International Recommendation , Selection of Arrestor Rating, Coordination of Protector Devices With Apparatus Insulation.	**CO3** **8 Hrs**
UNIT 5 **Reliability of Transmission and distribution System:** Definitions : Outage , Bath Tub Curve , Causes of Failures, Two State Model, Failure & Repair Rate, Probability Density Function, Reliability of Series / Parallel System , Reliability Planning , Preparation of Reliability Models. Numerical problems related to Reliability of Transmission and distribution system.	**CO5** **8Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Power System Analysis & Design	B.R. Gupta G. Zaky	2005	S.Chand Publications
2	A Course in Electrical Power	Soni, Gupta and Batnagar	2013	Dhanpat Rai and Sons.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1.	Electrical Power System Design	M. V. Deshpande	UK ed. edition (16 February 1985)	TMH

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE10723	Flexible AC Transmission System	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To understand the fundamentals of FACTS Controllers, Importance of controllable parameters and types of FACTS controllers & their benefits 2. To recall the objectives of Shunt and Series compensator. 3. To explain ccontrol of STATCOM and SVC and their comparison And the regulation of STATCOM 4. To analyze the functioning and control of GCSC, TSSC, TCSC and SSSC 5. To analyze the functioning and control of combined Compensators(IPFC& UPFC	On successful completion of the course, the student will be able to: **CO1:** Choose proper controller for the specific application based on system requirements and Understand various systems thoroughly and their requirements. **CO2:**. Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement. **CO3:** Detect the Power and control circuits of Series Controllers GCSC, TSSC , TCSC,SSSC and Detect the Power and control circuits of combined Compensators(IPFC& UPFC)

UNIT 1 **Facts Concepts** Fundamentals of AC power transmission, Transmission problems and needs, Overview of stability, Power Flow in AC System, FACTS Concept and General System Considerations , Definitions on FACTS, Basic types of FACTS Controllers.	**CO1** **10 Hrs**
UNIT 2 **Static Shunt Compensators** Concept of Static Shunt Compensators, variable impedance type shunt compensators (TCR, TSC, FC-TCR, TSC-TCR) - circuit diagram, principle of operation, working, waveforms / characteristics. Switched converter type shunt compensator (SVC and STATCOM) - circuit diagram, principle of operation, working, waveforms / characteristics SVC and STATCOM, and its control scheme .Comparison between SVC and STATCOM	**CO1, CO2** **10 Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 3 **Static Series Compensators** Concept of series compensation, variable impedance type series compensators (GCSC, TSSC, TCSC, SSSC), Switching converter type series compensators - circuit diagram, principle of operation, working, waveforms/characteristics, control schemes for series compensators.	**CO3** **8Hrs**
UNIT 4 Combined Series-Series FACTS compensators and other special purpose of Interline power flow controller (IPFC) - objectives and need, principle of operation. Combined Series-Shunt FACTS compensators and other special purpose of Unified Power flow Controller (UPFC) - objectives and need, principle of operation .	**CO3** **8 Hrs**
UNIT 5 Objectives of Static voltage and phase angle regulators, power flow control, improvement of transient stability, power oscillation damping, thyristor-controlled voltage and phase angle regulators.	**CO2,CO3** **9Hrs**

Text Books:

S. No.	Title	Authors	Publisher
1	Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems	.G. Hingorani & L. Gyugyi	IEEE Press, 2000.
2	Reactive Power Control in Electric Systems	T.J.E Miller	John Wiley & Sons, 2003

ReferenceBooks:

S. No.	Title	Authors	Publisher
1	Thyristor-based FACTS controller for electrical transmission system, IEEE series on power Engineering	R. Mohan Mathur and Rajiv K. Varma	Wiley Interscience, 2002
2	FACTS Controllers and applications, course book	Dr Ashok S & K S Suresh Kumar	SUP, 2003.
3.	FACTS controllers in power transmission and distribution	Padiyar K. R	New Age Publishers, India, 2007.

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103724	Internet of Things	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To prepare the students to understand the Internet of Things. 2. To make students understand the applications of IoT. 3. To make students understand the difference between IoT and WoT	On successful completion of the course, the student will be able to: **CO1:** Understand the meaning of IOT **CO2:** Apply IoT in various applications in day to day life. **CO3:** Able to understand architecture of Internet of Things and characteristics

UNIT 1 **IOT** What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	**CO1** **4 Hrs**
UNIT 2 **IOT PROTOCOLS** Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security.	**CO2** **5 Hrs**
UNIT 3 **IOT ARCHITECTURE** IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview-	**CO3** **12Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

IoTivity stack architecture- Resource model and Abstraction.	
UNIT 4 **WEB OF THINGS** Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.	**CO1 ,** **CO2** **8 Hrs**
UNIT 5 **IOT APPLICATIONS** IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	**CO1** **7Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	The Internet of Things in the Cloud: A Middleware Perspective	Honbo Zhou,	2012	CRC Press
2	Architecting the Internet of Things	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds),	2011	Springer
3	Networks, Crowds, and Markets: Reasoning About a Highly Connected World	David Easley and Jon Kleinberg	2010	Cambridge University Press

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and ArshdeepBahga	1st Ed	VPT
2	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything	Francis da Costa	1st Ed 2013	Apress Publications

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

Shri Shankaracharya Technical Campus, Bhilai

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SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103725	Advance Control Theory	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: **1.** To provide a strong concept on the compensator design and on advanced control system analysis and design techniques **2.** To analyse the behaviour of discrete time systems and nonlinear control systems.	**Students will be able to:** **CO4** Design compensators using classical techniques. **CO5** Analyze both linear and nonlinear system using state space methods. **CO6** Design state feedback controller for a given system **CO7** Explain the characteristics of nonlinear systems **CO8** Analyze the stability of discrete and non-liner control system

UNIT 1 **Types of controller-** Feedforward-feedback-cascade-P, PI and PID. Compensator design: Realization of compensators – lag, lead and lag-lead -Design of compensator using bode plot. **Compensator design:** Realization of compensators – lag, lead and lag-lead. Design of compensator using rootlocus. Design of P, PI and PID controller using Ziegler-Nichols tuning method.	**CO1** **10 Hrs**
UNIT 2 **STATE SPACE ANALYSIS OF SYSTEMS**: Introduction to state concept - state equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonical forms of state representation-controllable, observable, and diagonal and Jordan canonical forms- solution of time invariant autonomous systems, forced system-state transition matrix-relationship between state equations	**CO2** **9 Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

and transfer function.	
UNIT 3 **State feedback controller design:** Controllability & observability. State feed-back design via pole placement technique. Sampled data control system: Pulse Transfer function-Stability of sampled data system -Routh Hurwitz criterion and Jury's test. Introduction to state-space representation of sampled data systems.	**CO3** **10 Hrs**
UNIT 4 **Nonlinear systems:** Introduction - characteristics of nonlinear systems. Types of nonlinearities. Analysis through harmonic linearisation - Determination of describing function of nonlinearities (relay, dead zone and saturation only) – application of describing function for stability analysis of autonomous system with single nonlinearity.	**CO4** **8 Hrs**
UNIT 5 **Phase Plane Analysis: Concepts-** Construction of phase trajectories for nonlinear systems and linear systems with static nonlinearities - Singular points – Classification of singular points. **Definition of stability-** asymptotic stability and instability Liapunov methods to stability of linear and nonlinear, continuous time systems.	**CO5** **8Hrs**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Control System Engineering	Nagarath I. J. and Gopal M	5/e, New Age Publishers, 2007
2	Modern Control Engineering	Ogata K	5/e, Prentice Hall of India, 2010
3.	Nonlinear Automatic Control	Gibson J.E	Mc Graw Hill, 1963

Reference Books:

S. No.	Title	Author(s)	Publisher

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

1	Modern Control System Theory	Gopal M	2/e, New Age Publishers, 1984
2	Analysis and Synthesis of Sampled Data Systems	Kuo B.C	Prentice Hall Publications, 2012

Shri Shankaracharya Technical Campus, Bhilai

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SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE100741	Soft Computing Techniques	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. The main objective of the course is to familiarize students with the underlying principle of soft computing with its usage in various applications to solve real life problems. 2. This course provides knowledge on electrical traction systems.	On successful completion of the course, the student will be able to: **CO1:** Identify and describe soft computing techniques and their roles in building intelligent machines. **CO2:** Describe Artificial Neural Networks and Applications. **CO3:** Describe Fuzzy Systems and Applications. **CO4:** Describe Neuro-Fuzzy Systems and Applications **CO5:** Discuss applications of soft computing to solve real life problems

UNIT 1 **Introduction:** Introduction to soft computing; introduction to biological and artificial neural network, introduction to fuzzy sets and fuzzy logic systems.	**CO1** **4 Hrs**
UNIT 2 **Artificial Neural Networks and Applications:** Different artificial neural network models, learning in artificial neural networks, neural network applications in control systems.	**CO2** **5 Hrs**
UNIT 3 ***Fuzzy Systems and Applications:*** Fuzzy sets; fuzzy reasoning, fuzzy inference systems, fuzzy control, fuzzy clustering, applications of fuzzy systems.	**CO3** **12Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 4 **Neuro-Fuzzy Systems:** Neuro-fuzzy modeling, Neuro-fuzzy control. Genetic Algorithms- Simple GA, crossover and mutation, genetic algorithms in search and optimization.	**CO4** **10 Hrs**
UNIT 5 **Applications:** Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Analysis language processing.	**CO5** **8Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Fuzzy Logic And Soft Computing	Chen, Guoging, Ving, Mingsheng & Cai, Kai Yuan		Ed – Kluwar Academic
2	Soft Computing and Intelligent Systems Design Theory Tools and Applications	Karray F O & Desilva C	3rd Edition	Pearson, New Delhi

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	A Computational intelligence: principles, techniques, and applications	Konar	10th Edition	Springer
2	Neuro-fuzzy and soft computing: a computational approach to learning and machine intelligence	Jang, J S R, Sun, C T, & Mizutani E	2004	Prentice Hall

Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE100472	Introduction to Machine Learning	L = 3	T = 3	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To understand fundamental concepts of machine learning and its various algorithms. 2. To understand various strategies of generating models from data and evaluating them. 3 To apply ML algorithms on given data and interpret the results obtained 4.Explore supervised/unsupervised machine learning algorithms for classification/prediction/clustering	On successful completion of the course, the student will be able to: **CO1:** Develop a good understanding of fundamental principles of machine learning. **CO2:**.To compare and contrast pros and cons of various machine learning techniques. **CO3:** Evaluate performance of various machine learning algorithms on various data sets of a domain.

UNIT 1 **Machine Learning**- Machine Learning and its applications, Life cycle of Machine Learning, Supervised Machine Learning ,Unsupervised Machine Learning, Supervised Vs Unsupervised Learning, Examples of Machine Learning	**CO1** **10 Hrs**
UNIT 2 **Regression Analysis**- Linear Regression, Simple Linear Regression, Multiple Linear Regression, Backward Elimination, Polynomial Regression, Logistic Regression, Linear Regression Vs Logistic Regression	**CO1,CO2** **10 Hrs**
UNIT 3 **Classification**- Classification Algorithm, Classification Vs Regression, Classification Algorithms- K-NN, Support Vector Machine ,Naïve Bayes Classifier, Decision Tree, RandomForest	**CO3** **10Hrs**

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 4 **Clustering-** Clustering in Machine Learning, Hierarchical Clustering in Machine Learning, K-Means Clustering Algorithm, Machine Learning Vs A.I Vs Data Science Vs Deep Learning	**CO3** **8 Hrs**
UNIT 5 **Mathematics & Coding in Machine Learning** - Semi-Supervised Learning, Precision and Recall in Machine Learning, Overfitting in Machine Learning, Types of Encoding Techniques , Feature Selection Techniques in Machine Learning.	**CO2, CO3** **9Hrs**

Text Books:

S. No.	Title	Authors	Publisher
1	Machine Learning	Tom.M.Mitchell	McGraw Hill International Edition
2	Introduction to Machine Learning	E. Alpaydin	PHI, 2005.
3.	Machine Learning for Absolute Beginners	Oliver Theobald	Scatterplot Press, 2017

ReferenceBooks:

S. No.	Title	Authors	Publisher
1	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Geron Aurelien	Shroff/O'Reilly;
2	Deep Learning	Ian Goodfellow, Yoshua Bengioand Aaron Courville	MIT Press

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

Shri Shankaracharya Technical Campus, Bhilai

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SYLLABUS

B. Tech. Seventh Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	