AKHIL BHARATIYA MARATHA SHIKSHAN PARISHAD'S
ANANTRAO PAWAR COLLEGE OF ENGINEERING & RESEARCH
Sr. No. 103, Parvati, Pune - 411 009.
Tel.: 020-24218901/8959/3929
Web.: http://www.abmspcoerpune.org • Email : office@abmspcoerpune.org
Accredited by NAAC NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL
Approved by AICTE & Govt. of Maharashtra, Affiliated to Savitribai Phule Pune University
DTE CODE :- EN 6794, AISHE CODE :- C-41484
Savitribai Phule Pune University id : CEGP019670
ISO CERTIFIED

Ref. No. APCOER/Office/2019-20/3996

Date: 05/02/2020

To,
Dr. S.B. Thakare,
BOS Member,
Faculty of Civil Engineering,
Savitribai Phule Pune University, Ganeshkhind,
Pune-411007

Subject: Suggestion for up gradation of S.E. 2015 Pattern Civil Engineering Syllabus.

Dear Sir,

With reference to the above cited subject, currently we are revising SE 2015 pattern Syllabus. For the up gradation of SE 2015 pattern syllabus, we have taken curriculum feedback from our Students, Alumni, Industry Experts and Teachers.

We have analyzed all the feedback and prepared a report for the subject of Structural Analysis. The report is attached here with for your information and necessary action for the up gradation of SE 2015 pattern into SE 2019 pattern syllabus w. e. f. June 2020.

Thank You.

Prof. S. B. Shinde
Subject In-charge

Prof. A. B. Shelar
HOD, Civil Dept

Prof. S. S. Hajare 05/02/2020
IQAC Coordinator

Received
Dr. S. B. Thakare

Anantrao Pawar College of Engineering & Research IQAC Pune-9

Anantrao Pawar College of Engineering & Research Pune Pune-9

AKHIL BHARATIYA MARATHA SHIKSHAN PARISHAD'S
ANANTRAO PAWAR COLLEGE OF ENGINEERING & RESEARCH
Sr. No. 103, Parvati, Pune - 411 009.
Tel.: 020-24218901/8959/3929
Web.: http://www.abmspcoerpune.org • Email : office@abmspcoerpune.org
Accredited by NAAC NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL
Approved by AICTE & Govt. of Maharashtra, Affiliated to Savitribai Phule Pune University
DTE CODE :- EN 6794, AISHE CODE :- C-41484
Savitribai Phule Pune University id : CEGP019670
ISO CERTIFIED

Feedback was taken from stakeholders such as Students, Teachers, Employers, Alumni and Industry Experts and suggestion on up grading of curriculum of SE Civil 2015 pattern into SE civil 2019 Pattern w.e. f. from June 2020.

Suggestion for the same is given below:

Sr. No	Course Name	Topics to be added
1	Structural Analysis I Unit No. 6 – Plastic Analysis (201008)	1. Plastic modulus of section 2. Plastic moment 3. shape factor

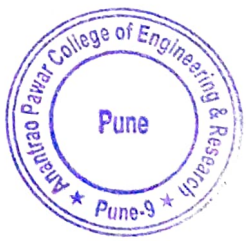
Thank You.

Date: 05/02/2020

Prof. S. B. Shinde
Subject In-charge

Prof. A. B. Shelar
HOD, Civil Dept

05/02/2020
Prof. S. S. Hajare
IQAC Coordinator



Savitribai Phule Pune University, Pune
S.E. (Civil Engineering) 2015 Course

201008: Structural Analysis I
Credits : 04

Teaching Scheme:
Theory : 03 hrs/week
Tutorial : 01 hrs/week

Examination Scheme :
In-Semester (Online) : 50 Marks
End-Semester : 50 Marks

Prerequisites : Fundamentals of Physics, Mathematics, Engineering Mechanics and Strength of Materials.

Course Objectives:

1) To understand the basics configuration and classification of structures.
2) To analyze the determinate and indeterminate structures.

Course Outcomes:

On completion of the course, learner will be able to:

1) Understand the basic concept of static and kinematic indeterminacy, slope and deflection of determinate and indeterminate beams for analysis of structures.
2) Analyze indeterminate beams structures and frames.
3) Evaluate determinate and indeterminate trusses and its application in the field.
4) Apply influence line diagrams for the analysis of structures under moving load.
5) Analyze two and three hinged arches and its application.
6) Apply plastic analysis for indeterminate steel structures by limits state method.

Course Contents

Unit I: Fundamentals of Structure, Slope and Defection (08 Hrs)

a) Types and classification of structures based on structural forms, concept of indeterminacy, static and kinematics degree of indeterminacy.

b) Slope and deflection of determinate beams by Macaulay's method, concept of moment area method and conjugate beam method and its application.

c) Strain energy, Castigliano's first theorem, application to determine slope and deflection of determinate beams and frames.

Unit II: Analysis of Indeterminate Beams and Frames. (08 Hrs)

a) Propped cantilever and fixed beams by strain energy method, analysis of continuous beams by three moment theorem (Clapeyron theorem) up to three unknowns.

b) Castigliano's second theorem, analysis of beams and rectangular portal frames with indeterminacy up to second degrees.

Unit III: Analysis of Pin Jointed Plane Trusses. **(08 Hrs)**

a) Joint displacement of determinate trusses by Castigliano's first theorem.

b) Analysis of redundant trusses by Castigliano's second theorem, lack of fit, sinking of support, temperature changes (indeterminacy up to second degrees).

Unit IV: Influence Line Diagram. **(08 Hrs)**

a) Basic concept, Muller: Braslau's principle, influence line diagram for reaction, shear and moment to simply supported and overhanging beams, application of influence line diagram to determine reaction, shear and moment in beams.

b) Influence line diagram for axial force in trusses, application of influence line diagram to determine of axial forces in the members of plane determinate trusses under dead load and live load.

Unit V: Analysis of Arches **(08 Hrs)**

a) Three hinged arches – Concepts, types of arches, analysis of parabolic arch with supports at same and different levels, semicircular arches with support at same level, determination of horizontal thrust, radial shear and normal thrust for parabolic and circular arch.(04 hours)

b) Two hinged arches – analysis of parabolic and semicircular arches with supports at same level, determination of horizontal thrust, radial shear and normal thrust.

Unit VI: Plastic Analysis of Structure. **(08 Hrs)**

a) True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage, concept of plastic hinge and collapse mechanism, statical and kinematical method of analysis, upper, lower bound and uniqueness theorem.

b) Plastic analysis of determinate and indeterminate beams, single bay single storied portal frame

Books:

Text:

1. Structural Analysis: A matrix approach by G.S. Pandit and S. P. Gupta, Tata Mc Graw Hill.
2. Analysis Structures: Strength and behavior by T. S. Thandavamoorthy, Oxford University Press.
3. Mechanics of solids and Structures Volume I by R. Vaidynathan, P. Perumal and S Lingedwari, Scitech Publication (India) Pvt Ltd.
4. Structural Analysis Vol-1, third edition, By S S Bhavikatti, Vikas publishing House, PVT, LTD.

Savitribai Phule Pune University, Pune
Second Year Civil Engineering (2019 Course)
201011: Structural Analysis
Credits : 03

Teaching Scheme:
Theory : 03 hrs/week
Tutorial : 01 hrs/week

Examination Scheme :
In-semester : 30 Marks
End-semester : 70 Marks

Prerequisites:

Fundamentals of Physics, Mathematics, Engineering Mechanics andMechanics of Structures

Course Objectives:

1. This subject will build on the concepts from Engineering Mechanics and Mechanics of Structures.
2. This will create a foundation for analyzing real life structures by imparting knowledge about various methods involved in the analysis of indeterminate structures.

Course Outcomes:

On completion of the course, learner will be able to:

1. Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
3. Implement application of the slope deflection method to beams and portal frames.
4. Analyze beams and portal frames using moment distribution method.
5. Determine response of beams and portal frames using structure approach of stiffness matrix method.
6. Apply the concepts of plastic analysis in the analysis of steel structures.

Course Contents

Unit I: Fundamentals of structure and analysis of redundant beams. **(07 Hours)**

a)Types and classification of structures based on structural forms, concept of indeterminacy, static and kinematics degree of indeterminacy.

b) Analysis of propped cantilever, fixed beam and continuous beams with indeterminacy up to second degree by strain energy method.

Unit II: Analysis of redundant pin jointed frames and multi-storied multi-bay 2-D rigid jointed frames. **(07Hours)**

a) Analysis of redundant trusses by unit load method for external loading, lack of fit, sinking of support and temperature changes (indeterminacy up to second degree).

b) Approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by Cantilever method and Portal method.

Unit III: Slope-Deflection Method. **(07 Hours)**

a) Slope-deflection equations, equilibrium equation of Slope-deflection method, application of Slope deflection method to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

b) Sway analysis of rigid joint rectangular single bay single storey portal frames using Slope-deflection method. (Involving not more than three unknowns)

Unit IV: Moment Distribution Method. **(07 Hours)**

a) Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method (Involving not more than three unknowns).

Unit V: Stiffness method. **(07Hours)**

a) Fundamental concepts of flexibility and stiffness, relation between them. Stiffness method of analysis- Structure approach only. Application to beams (Involving not more than three unknowns).

b) Application of Stiffness structure approach to rigid jointed rectangular portal frames (Involving not more than three unknowns).

Unit VI: Plastic Analysis of Structure. **(07Hours)**

True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage, concept of plastic hinge and collapse mechanism, static and kinematic methods of analysis, upper bound, lower bound and uniqueness theorem. Plastic modulus of section, Plastic moment, shape factor. Plastic analysis of determinate and indeterminate beams, single bay single storied portal frame.

Books:

Text Books:

1. Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company (P) Ltd.
2. Structural Analysis-I & II by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd.
3. Structural Analysis: A Matrix Approach by G.S.Pandit and S. P. Gupta, Tata McGraw Hill Education Pvt. Limited.

Reference Books:

1. Intermediate Structural Analysis by C. K. Wang, Tata McGraw Hill Education Pvt. Ltd.
2. Mechanics of Structures Vol. II (Theory and Analysis of Structures) by Dr. H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
4. Structural Analysis by R. C. Hibbler, Pearson Education.
5. The Plastic Methods of Structural Analysis by B. G. Neal, Champman& Hall.
6. Structural Analysis by AslamKassimali, Cengage Learning India Private Limited
7. Matrix Analysis of Framed Structures by William Weaver Jr. and James M. Gere, Springer US.

AKHIL BHARATIYA MARATHA SHIKSHAN PARISHAD'S
ANANTRAO PAWAR COLLEGE OF ENGINEERING & RESEARCH
Sr. No. 103, Parvati, Pune - 411 009.
Tel.: 020-24218901/8959/3929
Web.: http://www.abmspcoerpune.org • Email : office@abmspcoerpune.org

Accredited by NAAC
Approved by AICTE & Govt. of Maharashtra, Affiliated to Savitribai Phule Pune University
DTE CODE :- EN 6794, AISHE CODE :- C-41484
Savitribai Phule Pune University id : CEGP019670
ISO CERTIFIED

Ref. No. APCOER/Office/ 2020-21/4570/ **Date:** 06/04 / 2021

To,

Dr. S.D. Lokhande,

Principal, SCOE, Pune,

BOS Member,

Faculty of Electronics and Telecommunication Engineering,

Savitribai Phule Pune University, Ganeshkhind,

Pune-411007

Subject: Suggestion for up gradation of T.E. 2015 Pattern Syllabus

Dear Sir,

With reference to the above cited subject, currently we are revising TE 2015 pattern Syllabus. For the up gradation of TE 2015 pattern syllabus, we have taken curriculum feedback from our Students, Alumni, Industry Experts and Teachers.

We have analysed all the feedback and prepared a report for the subject of Power Electronics. The report is at attached herewith for your information and necessary action for the up gradation of TE 2015 pattern into TE 2019 pattern syllabus w.e.f. June 2021.

Thank You

Prof. S.S. Jagtap
Asst. Prof.
E & TC Engg., APCOER

HOD,
E & TC, APCOER

Dr. S.B. Thakare
Principal,
APCOER, Pune

Anantrao Pawar College of Engineering & Research Pune

Revised

Sinhgad College of Engineering Pune-41

AKHIL BHARATIYA MARATHA SHIKSHAN PARISHAD'S
ANANTRAO PAWAR COLLEGE OF ENGINEERING & RESEARCH
Sr. No. 103, Parvati, Pune - 411 009.
Tel.: 020-24218901/8959/3929
Web.: http://www.abmspcoerpune.org • Email : office@abmspcoerpune.org
Accredited by NAAC
Approved by AICTE & Govt. of Maharashtra, Affiliated to Savitribai Phule Pune University
DTE CODE :- EN 6794, AISHE CODE :- C-41484
Savitribai Phule Pune University id : CEGP019670
ISO CERTIFIED

Date: 06/04/21

Feedback was taken from stakeholders such as Students, Teachers, Employers, Alumni and Industry Experts and suggestion on upgrading of curriculum of TE E & TC 2015 pattern into TE E & TC 2019 Pattern w.e.f. from June 2021.

Sr. No.	Course Name	Topic to be added
1	Power Electronics Unit-02	Single Phase PWM Rectifier using IGBT
2		Three Phase Controlled Rectifier Using IGBT
3		Difference between SCR based conventional rectifiers and IGBT based rectifier

Prof. S.S. Jagtap
Asst. Prof.
E & TC Engg., APCOER

HOD,
E & TC, APCOER

Dr. S.B. Thakare
Principal,
APCOER, Pune

Anantrao Pawar College of Engineering & Research ★ Pune

304186 Power Electronics

Credits: TH-03

Teaching Scheme:

Lecture : 03 hr/week

Examination Scheme:

In-Sem : 30 Marks

End-Sem : 70 Marks

Course Objectives:

- To introduce students to different power devices to study their construction, characteristics and turning on circuits.
- To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.
- To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

On completion of the course, student will be able to

1) Design & implement a triggering / gate drive circuit for a power device
2) Understand, perform & analyze different controlled converters.
3) Evaluate battery backup time & design a battery charger.
4) Design & implement over voltage / over current protection circuit.

Course Contents

Unit I : Power Devices **(8 Hrs)**

Construction, Steady state characteristics & Switching characteristics of SCR, Construction, Steady state characteristics of Power MOSFET & IGBT. SCR ratings: IL, IH, VBO, VBR, dv/dt, di/dt, surge current & rated current. Gate characteristics, Gate drive requirements, Gate drive circuits for Power MOSFET & IGBT,opto isolator driving circuits for SCR. Series and parallel operations of SCR's. Applications of above power devices as a switch .

Unit II :AC-DC Power Converters **(8 Hrs)**

Concept of line & forced commutation, Single phase Semi & Full converters for R, R-L loads, Performance parameters, Effect of freewheeling diode, Three phase Semi & Full converters for R load, effect of source inductance, Power factor improvement techniques, Diode based boost converter. Single Phase dual converter with inductive load.

Unit III : DC-AC Converters (8 Hrs)

Single phase bridge inverter for R and R -L load using MOSFET / IGBT, performance Parameters, single phase PWM inverters. Three Phase voltage source inverter for balanced star R load with 120° and 180 mode of operation, Device utilization factor, Harmonics Elimination/Modulation Techniques.

Unit IV : DC-DC converters & AC Voltage Controller (8 Hrs)

Working Principle of step down chopper for R-L load (highly inductive), control strategies. Performance parameters, Step up chopper, 2-quadrant & 4-quadrant choppers, SMPS: Fly back/ Half Bridge/ LM3524 based or equivalent Circuit. Single-Phase full wave AC voltage controller by using IGBT with R load.

Unit V : Resonant Converters & Protection of Power Devices & Circuits (8 Hrs)

Need for Resonant converters, Concept of Zero current switching (ZCS) and Zero voltage switching (ZVS) resonant converters. Cooling & heat sinks, over voltage conditions, over voltage protection circuits, metal oxide varistors, over current fault conditions, Over current protection. Electromagnetic interference, sources, minimizing techniques, shielding techniques for EMI.

Unit VI : Power Electronics Applications (8 Hrs)

ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic Ballast, LED Lamp with Driver Circuit, fan Regulator. Single phase separately excited DC motor drive, stepper motor drive, BLDC motor drive. Variable voltage & variable frequency three phase induction motor drive.

Text Books:

1) M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition, 2004 edition, New Delhi.

2) M. S. Jamil Asghar, "Power Electronics", PHI, 2004, New Delhi

Reference Books:

1) Ned Mohan, T. Undeland & W. Robbins, "Power Electronics Converters Applications and Design" 2nd edition, John Willey & sons, Singapore, Oxford University Press, New Delhi, 2005

2) P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi

3) "GE SCR MANUAL" 6th edition, General Electric, New York, USA

4) Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi.

5) M D Singh, K B Khanchandani "Power Electronics" TMH

Savitribai Phule Pune University
Third Year of E & Tc Engineering (2019 Course)
304194: Power Devices & Circuits

Teaching Scheme:	Credit	Examination Scheme:
Theory: 03 hrs. / week	03	In-Sem (Theory): 30 Marks End Sem (Theory): 70 Marks

Prerequisite Courses, if any:

1. Basic Electrical Engineering
2. Basic Electronics Engineering
3. Electronic Circuits
4. Electrical Circuits

Companion Course, if any: Power Devices & Circuits Lab

Course Objectives:

- To introduce different power devices viz. SCR, GTO, MOSFET and IGBT with construction, characteristics, repetitive and non repetitive ratings and typical triggering/driver circuits.
- To understand working, design and performance analysis and applications of various power converter circuits such as ac to dc converters, inverter and chopper
- To know various protection circuit requirements of power electronic devices.

Course Outcomes: On completion of the course, learner will be able -

CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

CO2: To design triggering / driver circuits for various power devices.

CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.

CO4: To understand significance and design of various protections circuits for power devices.

CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

Course Contents

Unit I	Study of Power Devices	(06 Hrs.)

Construction, VI characteristics (input, output and transfer if any), switching characteristics of SCR, GTO, Power MOSFET and IGBT, Performance overview of Silicon, Silicon Carbide & GaN based MOSFET and IGBT, various repetitive and non-repetitive ratings of SCR, GTO , Power MOSFET & IGBT and their significance, requirement of a typical triggering / driver (such as opto isolator) circuits for various power devices, importance of series and parallel operations of various power devices **(no derivation and numerical).**

Mapping of Course Outcomes for Unit I	**CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.** **CO2: To design triggering / driver circuits for various power devices**

Unit II	AC to DC Power Converters	(06 Hrs.)

Concept of line & forced commutation, Single phase Semi & Full converters using SCR for R and R-L loads and its performance analysis and numerical, Effect of source inductance, Significance of power factor and its improvement using PWM based techniques, Three phase Full converters using SCR for R load and its performance analysis, Single Phase PWM Rectifier using IGBT, Three Phase Controlled Rectifier Using IGBT, Difference between SCR based conventional rectifiers and IGBT based rectifiers.

Mapping of Course Outcomes for Unit II	**CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.**

Unit III	DC to AC Converters	(06 Hrs.)

Single phase half and full bridge square wave inverter for R and R-L load using MOSFET / IGBT and its performance analysis and numerical, Cross conduction in inverter, need of voltage control and strategies in inverters, classifications of voltage control techniques, control of voltage using various PWM techniques and their advantages, concept and need of harmonic elimination / reduction in inverters, Three Phase voltage source inverter for balanced star R load with 120 and 180 degree mode of operation, device utilization factor, Advanced Converters like matrix inverter, multi-level inverters and their topologies and its driver circuits (no derivation and numerical).

Mapping of Course Outcomes for Unit III	**CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.**

Unit IV	DC to DC Converters	(06 Hrs.)

Classification of choppers, Step down chopper for R and RL load and its performance analysis, Step up chopper, various control strategies for choppers, types of choppers (isolated and non isolated) such as type A, B, C, D & E, switch mode power supply (SMPS) viz buck, boost and buck-boost, Fly back, Half and full Bridge isolated and non-isolated interleaved bidirectional topologies, and concept of integrated converter and design of LM3524 based choppers, concept of maximum power point tracking (MPPT).

Mapping of Course Outcomes for Unit IV	**CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.**

Unit V	Power Devices Protection and Circuits	(06 Hrs.)
Over voltage, over current, di/dt and dv/dt protection circuits and their design, Various cooling techniques and heat sink design, Resonant converters such as Zero current switching (ZCS) and Zero voltage switching (ZVS), Electromagnetic interference such as radiated and conducted EMI, Difference between EMI and EMC, EMI sources and soft switching and minimizing / shielding techniques for EMI, Various EMI and EMC standards, Importance of isolation transformer.		
Mapping of Course Outcomes for Unit V	**CO4: To understand significance and design of various protections circuits for power devices.**	
Unit VI	**Power Electronics Applications**	**(06 Hrs.)**
AC Voltage Controller using IGBT & SCR, Fan Regulator, Electronic Ballast, LED Lamp driver, DC motor drive for single phase separately excited dc motor, BLDC motor drive, Variable voltage & variable frequency three phase induction motor drive, On-line and Off- line UPS, study of various selection criteria and performance parameters of batteries in battery operated power systems, battery charging models and modes for EVs, Architecture of EVs battery charger, PFC stage circuit topologies with details of Full-bridge boost rectifier and Full-bridge interleaved for EV battery charger, case study of power electronics in electric vehicle and photovoltaic solar system		
Mapping of Course Outcomes for Unit VI	**CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.** **CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.**	

Learning Resources

Text Books:

1. M. H. Rashid, "Power Electronics Circuits Devices and Applications", PHI, 4th Edition 2017 New Delhi.
2. M. D. Singh and K. B. Khanchandani, "Power Electronics", TMH, 2nd Edition 2006.