Criterion 2: Teaching Learning & Evaluation

Key Indicator: 2.6 – Student Performance and Learning Outcomes

2.6.1 – Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution.

Response

The programs offered by the Institution such as the Program Outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs) are communicated to the teachers and students on online mode and are stated and displayed on website.

Well defined Program outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs) are given to every program. Students must achieve course outcomes given to them at the end of the course.

In respect of the Vision and Mission of the department, the PSOs are defined at the departmental level. Faculties are also involved in formation of CO's & PSO's and are permitted to modify CO's.

Program Specific Outcomes (PSO's), Program Outcomes (PO's), and Course Outcomes (CO's) are displayed and conveyed as below.

1. In HOD meeting HOD's discuss the PSO's, POs, and CO's.
2. PO's and PSO's are published through documents like Course files, Lab Manuals & displayed on college website.
3. PO's are displayed at places like Department office, Department entrance, etc.
4. PSO's are published in laboratories and Respective HOD's cabin etc.
5. PO's and PSO's are communicated through the meeting to students and parents.
6. CO's are displayed at the respective laboratories.
7. CO's are discussed with the students.

INDEX

Sr No.	Contents	
1.	**VISION MISSION OF INSTITUTE**	
2	**VISION MISSION OF DEPARTMENT**	
	A	E& TC Department
	B	Mechanical Department
	C	Computer Department
	D	Civil Department
3.	**PROGRAM OUTCOMES**	
4.	**PROGRAM SPECIFIC OUTCOMES**	
	A	E& TC Department
	B	Mechanical Department
	C	Computer Department
	D	Civil Department
5.	**COURSE OUTCOMES**	
	A	First year Department
	B	E& TC Department
	C	Mechanical Department
	D	Computer Department
	E	Civil Department

For more details click on following link
https://www.rajgad.edu.in/AQAR22-23/Cr2/2.6.1.pdf

Principal
Rajgad Dnyanpeeth's
Shri Chhatrapati Shivajiraje College of Engg.
Dhangawadi, Pune-412206

Rajgad Dnyanpeeth's

Shri Chhatrapati Shivajiraje College of Engineering

S.No.237, Dhangwadi, Tal-Bhor, Dist-Pune

VISION & MISION OF INSTITUTE

VISION

Excellent Institution for Education, Training and Research in Engineering.

MISSION

1. Develop competent engineers along with professional skill and responsible citizen.

2. Foster knowledge and technical skill of the highest standards to develop sustainable engineering solution.

3. Prepare engineers to respond to needs if the industry, higher studies and research through industry and institute interaction.

Rajgad Dnyanpeeth's

Shri Chhatrapati Shivajiraje College of Engineering

S.No.237, Dhangwadi, Tal-Bhor, Dist-Pune

DEPARTMENT OF ELECTRONICS &TELECOMMUNICATION ENGINEERING

VISION & MISION OF DEPARTMENT

VISION

Excellence in Electronics and Telecommunication Engineering to fulfill expectation of Industries and Society.

MISSION

1. Develop zealous Electronics and Telecommunications engineer with good communication skill, social and ethical values for development of society.

2. Promote quality technical education to reach at the highest standard.

3. Prepare and nurture the mind for civil services, higher studies and research activity.

4. Endorse exposure to advanced network standards for sustainable developments.

Rajgad Dnyanpeeth's
SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING
S. No. 237, Satara-Pune, NH-4, Dhangawadi, Tal: Bhor, Dist: Pune -412205 (MS), India.

DEPARTMENT OF MECHANICAL ENGINEERING

Vision

Excellence in Mechanical Engineering to accept the global challenges.

Mission

1. Develop spirited Mechanical Engineers with good communication skill, social and ethical values for development of society.
2. Impart continuously quality technical education of the highest standards.
3. Prepare and nurture the mind set for civil services, higher studies and research activity.
4. Promote exposure to green technology for sustainable development.

Rajgad Dnyanpeeth's
SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING
S. No. 237, Satara-Pune, NH-4, Dhangawadi, Tal: Bhor, Dist: Pune -412205 (MS), India

DEPARTMENT OF COMPUTER ENGINEERING

VISION AND MISSION OF DEPARTMENT

Vision

- Excellence in Computer Engineering to meet Industrial and societal needs.

Mission

- Develop competent Computer Engineers with good communication skill, social and ethical values for development of society.
- Cultivate quality technical education to reach at the highest standard.
- Prepare and nurture the mind set for all civil services, higher studies and research activity.
- Promote exposure to green computing for developing sustainability standards.

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING

Gat No. 237, Pune Bangalore Highway, Dhangawadi, Tal – Bhor, Dist- Pune (Maharashtra)

Department of Civil Engineering

VISION:

Excellence in Civil Engineering to develop smarter and sustainable infrastructure.

MISSION:

1. Develop passionate Civil Engineers with good communication skill, social and ethical values for development of society.

2. Inculcate quality technical education of the highest standards.

3. Prepare and nurture the mind set for civil services, higher studies and research activity.

4. Promote exposure to green technology for eco-friendly environment.

Rajgad Dnyanpeeth's
Shri Chhatrapati Shivajiraje College of Engineering
S.No.237, Dhangwadi, Tal-Bhor, Dist-Pune

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

Programme Outcomes (PO's)

Graduate will be able to:

PO1: Apply knowledge of mathematics, science and engineering with focus on electronics and telecommunication engineering.

PO2: Design and conduct experiments, analyze and interpret data and document the result.

PO3: To identify, formulate and solve the electronics and telecommunication engineering problems.

PO4: Lead and manage multidisciplinary teams by applying engineering management and finance principles to handle the projects.

PO5: Realize and follow the ethical principles, responsibilities and norms of engineering practice.

PO 6: Communicate effectively and present technical information in oral and written forms.

PO7: Apply engineering solution in society and global contest and evaluate the impact of engineering solution on society, health, safety, legal, cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO8: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO9: Make use of modern engineering software and equipments to apply in electronics and telecommunication.

PO10: Have knowledge of contemporary issue.

PO11: To engage in lifelong learning this maintains continuous professional development.

PO12: Participate and succeed in competitive examinations.

Rajgad Dnyanpeeth's

Shri Chhatrapati Shivajiraje College of Engineering

Gat. No. 237, Pune- Bangalore Highway, Dhangawadi, Tal- Bhor, Dist- Pune (Maharashtra)

DEPT. OF ELECTRONICS AND TELECOMMUNICATION ENGG.

Program Specific Outcomes (PSO'S) of Department

PSO 1: Should be able to understand the fundamental concepts in electronics circuit/ product design, networking techniques, IC design, embedded systems, and signal processing.

PSO 2: Should be able to apply the learning, analyze the communication systems with the help of hardware and software design tools.

PSO 3: Should be able to handle the project work and prepare engineering project module.

Rajgad Dnyanpeeth's

Shri Chhatrapati Shivajiraje College of Engineering

Gat. No. 237, Pune- Bangalore Highway, Dhangawadi, Tal- Bhor, Dist- Pune (Maharashtra)

DEPARTMENT OF MECHANICAL ENGINEERING

Programme Specific Outcomes (PSO's)

PSO 1: Apply their knowledge in the domain of engineering Design, Production and Thermal fluid sciences to solve engineering problems utilizing advanced technology.

PSO 2: Successfully apply the principles of design, analysis and implementation of mechanical systems which have been learned as a part of the curriculum.

PSO 3: Develop and implement new ideas on product design and development with the help of modern CAD/CAM/CAE tools ensuring best practices.

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING

Gat No. 237, Pune Bangalore Highway, Dhangawadi, Tal – Bhor, Dist- Pune (Maharashtra)

DEPARTMENT OF COMPUTER ENGINEERING

Program Specific Outcomes:

PSO1: Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING

Gat No. 237, Pune Bangalore Highway, Dhangawadi, Tal – Bhor, Dist- Pune (Maharashtra)

Department of Civil Engineering

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: The ability to create innovative designs with new materials of minimum embodied energy through research and development focusing on global quality of life by observing professional ethics.

PSO 2: The ability to recognize the need of the hour like housing, sanitation, transportation, waste management, irrigation, use of renewable energy etc. for a sustainable environment.

PSO 3: Function effectively in multi-disciplinary teams.

Rajgad Dnyanpeeth's

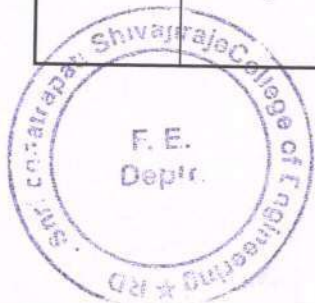# SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING

Gat No. 237, Satara-Pune, NH-4, Dhangawadi, Tal: Bhor, Dist: Pune

Department of First Year Engineering
Course Outcomes (COs)   SEM-I
FE - 2019 Pattern

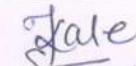| Course Code	Name of Subject/ Course	Course Outcome (COs)
107001	Engineering Mathematics – I	CO1: Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems. CO2: the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems. CO3: to deal withderivative of functions of several variables that are essential in various branches of Engineering. CO4: to apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function. CO5: the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems
107002	Engineering Physics	CO1: Develop understanding of interference, diffraction and polarization; connect it to few engineering applications. CO2: Learn basics of lasers and optical fibers and their use in some applications. CO3: Understand concepts and principles in quantum mechanics. Relate them to some applications. CO4: Understand theory of semiconductors and their applications in some semiconductor devices. CO5: Summarize basics of magnetism and superconductivity. Explore few of their technological applications. CO6: Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.
102003	Systems in Mechanical Engineering	CO1: Describe and compare the conversion of energy from renewable and non-renewable energy sources CO2: Explain basic laws of thermodynamics, heat transfer and their applications CO3: List down the types of road vehicles and their specifications CO4: Illustrate various basic parts and transmission system of a road vehicle CO5: Discuss several manufacturing processes and identify the suitable process CO6: Explain various types of mechanism and its application

Course Code	Name of Subject/ Course	Course Outcome (COs)
103004	Basic Electrical Engineering	CO1: Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
		CO2: Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
		CO3: Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.
		CO4: Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
		CO5: Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.
		CO6: Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
110005	Programming and Problem Solving	CO1: Inculcate and apply various skills in problem solving.
		CO2: Choose most appropriate programming constructs and features to solve the problems in diversified domains.
		CO3: Exhibit the programming skills for the problems those require the writing of well- documented programs including use of the logical constructs of language, Python.
		CO4: Demonstrate significant experience with the Python program development environmen
111006	Workshop Practice	CO1: Familiar with safety norms to prevent any mishap in workshop.
		CO2: Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
		CO3: Able to understand the construction, working and functions of machine tools and their parts.
		CO4: Able to know simple operations (Turning and Facing) on a centre lathe.
101007	Environmental Studies-I (Mandatory Non-Credit Course)	CO1:Demonstrate an integrative approach to environmental issues with a focus on sustainability.
		CO2: Explain and identify the role of the organism in energy transfers in different ecosystems.
		CO3: Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
		CO4: Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings

Course Outcomes (COs)   SEM-II

FE - 2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
107008	Engineering Mathematics – II	CO1: the effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.
		CO2: advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
		CO3: to trace the curve for a given equation and measure arc length of various curves.
		CO4: the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
		CO5: evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

Course Code	Name of Subject/ Course	Course Outcome (COs)
107009	Engineering Chemistry	CO1: Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
		CO2: Select appropriate electro-technique and method of material analysis.
		CO3: Demonstrate the knowledge of advanced engineering materials for various engineering applications.
		CO4: Analyze fuel and suggest use of alternative fuels.
		CO5: Identify chemical compounds based on their structure.
		CO6: Explain causes of corrosion and methods for minimizing corrosion.
104010	Basic Electronics Engineering	CO1: Explain the working of P-N junction diode and its circuits.
		CO2: Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
		CO3: Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.
		CO4: Use different electronics measuring instruments to measure various electrical parameters.
		CO5: Select sensors for specific applications.
		CO6: Describe basic principles of communication systems.
101011	Engineering Mechanics	CO1: Determine resultant of various force systems
		CO2: Determine centroid, moment of inertia and solve problems related to friction
		CO3: Determine reactions of beams, calculate forces in cables using principles of equilibrium
		CO4: Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
		CO5: Calculate position, velocity and acceleration of particle using principles of kinematics
		CO6: Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy
102012	Engineering Graphics	CO1: Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
		CO2: Construct the various engineering curves using the drawing instruments.
		CO3: Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
		CO4: Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
		CO5: Draw the development of lateral surfaces for cut section of geometrical solids.
		CO6: Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
110013	Project Based Learning	CO1: Project based learning will increase their capacity and learning through shared cognition.
		CO2: Students able to draw on lessons from several disciplines and apply them in practical way.
		CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.
101014	Environmental Studies-II (Mandatory Non-Credit Course)	CO1: Have an understanding of environmental pollution and the science behind those problems and potential solutions.
		CO2: Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
		CO3: Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
		CO4: Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues.

Head of Department
First Year Engineering
Shri Chh. Shivajiraje College of Engg.
Dhangawadi, Pune-412206

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJI RAJE COLLEGE OF ENGINEERING

S.No 237, Pune-Banglore Highway,Dhangwadi,Tal-Bhor Dist:Pune(Maharashtra)

Department of Electronics and Telecommunication
Course Outcomes (COs) SEM-I
SE (Electronics and Telecommunication) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
207005	Engineering Mathematics III	CO1:.Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
		CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
		CO3: Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
		CO4:Perform vector differentiation & integration, analyze the vector fields and apply to electromagnetic fields & wave theory
		CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.
204181	Electronic Circuits	CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
		CO2:Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
		CO3:Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies
		CO4: Explain internal schematic of Op-Amp and define its performance parameters
		CO5:Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications
		CO6:Understand and compare the principles of various data conversion techniques and PLL with their applications
204182	Digital Circuits	CO1: Identify and prevent various hazards and timing problems in a digital design.
		CO2:Use the basic logic gates and various reduction techniques of digital logic circuit.
		CO3:Analyze, design and implement combinational logic circuits.
		CO4: Analyze, design and implement sequential circuits.
		CO5:Differentiate between Mealy and Moore machines.
		CO6: Analyze digital system design using PLD.

204183	Electrical Circuits	CO1:Analyze the simple DC and AC circuit with circuit simplification techniques
		CO2: Formulate and analyze driven and source free RL and RC circuits.
		CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
		CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
		CO5:Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
		CO6: Analyze and select a suitable motor for different applications.
204184	Data Structures	CO1: Solve mathematical problems using C programming language
		CO2: Implement sorting and searching algorithms and calculate their complexity.
		CO3:Develop applications of stack and queue using array.
		CO4: Demonstrate applicability of Linked List.
		CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity
		CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

Course Outcomes (COs) SEM-II
SE (Electronics and Telecommunication) -2019 Pattern

204191	Signals & Systems	CO1:Identify, classify basic signals and perform operations on signals.
		CO2:Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
		CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
		CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
		CO5:Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF
		CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.
204192	Control Systems	CO1:Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
		CO2:Determine the (absolute) stability of a closed-loop control system.
		CO3:Perform time domain analysis of control systems required for stability analysis.
		CO4: Perform frequency domain analysis of control systems required for stability analysis.
		CO5:Apply root-locus, Frequency Plots technique to analyze control systems.
		CO6: Express and solve system equations in state variable form.
		CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation

E&TC
Engg.
Deptt.

204193	Principles of Communication Systems	CO1:To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
		CO2:Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
		CO3:Explain generation and detection of FM systems and compare with AM systems
		CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).
		CO5:Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
		CO6:Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.
204194	Object Oriented Programming	CO1:Describe the principles of object oriented programming.
		CO2:Apply the concepts of data encapsulation, inheritance in C++.
		CO3:Understand Operator overloading and friend functions in C++.
		CO4:Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
		CO5:Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
		CO6:Describe and use of File handling in C++.
204199	Employbility Skills Development	CO1:Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
		CO2:Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
		CO3:Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
		CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
		CO5:Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.
204200	Project Based Learning	CO1:Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
		CO2:Contribute to society through proposed solution by strictly following professional ethics and safety measures.
		CO3:Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
		CO4: Analyze the results and arrive at valid conclusion.
		CO5:Use of technology in proposed work and demonstrate learning in oral and written form
		CO6:Develop ability to work as an individual and as a team member.

Course Outcomes (COs) SEM-I

TE (Electronics and Telecommunication) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
304181	Digital Communication	CO1:Apply the statistical theory for describing various signals in a communication system.
		CO2:Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
		CO3:Describe and analyze the digital communication system with spread spectrum modulation.
		CO4: Analyze a communication system using information theoretic approach
		CO5:Use error control coding techniques to improve performance of a digital communication system.
304182	Electromagnetic Field Theory	CO1:Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
		CO2:Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
		CO3:State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
		CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
		CO5:Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
		CO6:Carry out a detailed study, interpret the relevance and applications of Electromagnetics
304183	Database Management	CO1:Ability to implement the underlying concepts of a database system.
		CO2:Design and implement a database schema for a given problem-domain using data model.
		CO3:Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
		CO4: Implement transactions, concurrency control, and be able to do Database recovery.
		CO5:Able to understand various Parallel Database Architectures and its applications.
		CO6:Able to understand various Distributed Databases and its applications.
304184	Microcontrollers	CO1:Understand the fundamentals of microcontroller and programming.
		CO2:Interface various electronic components with microcontrollers.
		CO3:Analyze the features of PIC 18F XXXX.
		CO4: Analyze the features of PIC 18F XXXX.
		CO5:Develop interfacing models according to applications.
		CO6:Evaluate the serial communication details and interfaces

Course Code	Name of Subject/ Course	Course Outcome (COs)
304185	Elective -I (Digital Signal Processing)	CO1:Interpret and process discrete/ digital signals and represent DSP system.
		CO2:Analyze the digital systems using the Z-transform techniques.
		CO3:Implement efficient transform and its application to analyze DT signals.
		CO4: Design and implement IIR filters.
		CO5:Design and implement FIR filters
		CO6:Apply DSP techniques for speech/ biomedical/ image signal processing.
304190	Skill Development	CO1:Student should recognize the need to engage in independent and life-long learning in required skill sets
		CO2:Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.
		CO3:Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
		CO4: Student would be able to communicate effectively at different technical and administrative levels.
		CO5:Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

Course Outcomes (COs) SEM-II
TE (Electronics and Telecommunication) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
304192	Cellular Networks	CO1:Understand fundamentals of wireless communications.
		CO2:Discuss and study OFDM and MIMO concepts.
		CO3:Elaborate fundamentals mobile communication.
		CO4: Describes aspects of wireless system planning.
		CO5:Understand of modern and futuristic wireless networks architecture.
		CO6:Summarize different issues in performance analysis.
304193	Project Management	CO1:Apply the fundamental knowledge of project management for effectively handling the projects
		CO2:Identify and select the appropriate project based on feasibility study and undertake its effective planning.
		CO3:Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
		CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.
		CO5:Identify and assess the project risks and manage finances in line with Project Financial Management Process.
		CO6:Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

Course Code	Name of Subject/ Course	Course Outcome (COs)
304194	Power Devices & Circuits	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.
304195	Elective-II (Digital Image Processing)	CO1:Apply knowledge of mathematics for image understanding and analysis.
		CO2:Implement spatial domain image operations.
		CO3:Design and realize various algorithms for image segmentation.
		CO4: Design and realize various algorithms for image Compression
		CO5:Apply restoration to remove noise in the image.
		CO6:Describe the object recognition system.
304200	Mini Project	CO1:Understand, plan and execute a Mini Project with team.
		CO2:Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
		CO3:Prepare a technical report based on the Mini project.
		CO4: Deliver technical seminar based on the Mini Project work carried out.

Course Outcomes (COs) SEM-I
BE (Electronics and Telecommunication) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
404181	Radiation and Microwave Theory	CO1: Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna
		CO2: Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same
		CO3: Explore construction and working of principles passive microwave devices/components.
		CO4:Explore construction and working of principles active microwave devices/components.
		CO5: Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
		CO6: Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.

404182	VLSI Design and Technology	CO1: Develop effective HDL codes for digital design.
		CO2: Apply knowledge of real time issues in digital design.
		CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
		CO4:Design CMOS circuits for specified applications.
		CO5: Analyze various issues and constraints in design of an ASIC.
		CO6: Apply knowledge of testability in design and Build In Self Test (BIST) circuit.
404183	Cloud Computing	CO1:Understand the basic concepts of Cloud Computing.
		CO2:Describe the underlying principles of different Cloud Service Models.
		CO3: Classify the types of Virtualization.
		CO3:Examine the Cloud Architecture and understand the importance of Cloud Security.
		CO4:Develop applications on Cloud Platforms.
		CO5: Evaluate distributed computing and the Internet of Things.
404184 (E)	Modernized IoT (Elective - III)	CO1:Comprehend and analyze concepts of sensors, actuators, IoT and IoE.
		CO2: : Interpret IoT Architecture Design Aspects.
		CO3: Comprehend the operation of IoT protocols.
		CO4:Describe various IoT boards, interfacing, and programming for IoT.
		CO5:Illustrate the technologies, Catalysts, and precursors of IIoT using suitable use cases.
		CO6:Provide suitable solution for domain specific applications of IoT.
		CO1: Understand and explain design flow of design of electronics product.
		CO2: Associate with various circuit design issues and testing.

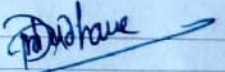| 404185 (B) | Electronics Product Design (Elective - IV) | CO3:Inferring different software designing aspects and the Importance of product test & test specifications. |
| | | CO4: Summarizing printed circuit boards and different parameters. |

Course Code	Name of Subject/ Course	Course Outcome (COs)
		CO5:Estimating assorted product design aspects.
		CO6:Exemplifying special design considerations and importance of documentation.

Course Outcomes (COs) SEM-II

BE (Electronics and Telecommunication) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
404190	Fiber Optic Communication	CO1: Explain the working of components and measurement equipments in optical fiber networks
		CO2: Calculate the important parameters associated with optical components used in fiber optic telecommunication systems.
		CO3: Compare and contrast the performance of major components in optical links.
		CO4: Evaluate the performance viability of optical links using the power and rise time budget analysis.
		CO5: Design digital optical link by proper selection of components and check its viability using simulation tools.
		CO6: : Compile technical information related to state of art components, standards, simulation tools and current technological trends by accessing the online resources to update their domain knowledge.
404191(D)	Elective - 5 Embedded System Design	CO1: Apply the design aspects of Embedded system.
		CO2: Create and debug a firmware for the Embedded System using ARM Cortex M4.
		CO3: Develop a specific software code for the functionality of the Embedded System.
		CO4: Utilize an open source RTOS for embedded system design.
		CO5: Design an advanced embedded system.
		CO6: Explore Embedded Android system

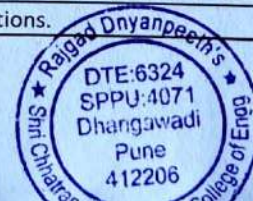|		
404192 (D)	Elective - 6 Digital Marketing	CO1: Design websites using free tools like Wordpress and explore it for digital marketing.
		CO2: Apply various keywords for a website & to perform SEO.
		CO3: Understand the various SEM Tools and implement the Digital Marketing Tools
		CO4: Illustrate the use of Facebook, Instagram and Youtube for Digital Marketing in real life.
		CO5: Use Linked in platform for various campaigning.
		CO6: Understand the importance of recent trends in digital marketing.
404193	Innovation and Entrepreneurship	CO1: Understand Innovation, Entrepreneurship and characteristics of an entrepreneur.
		CO2: Develop a strong understanding of the Design Process and its application in variety of business settings.
		CO3: Generate sustainable ideas.
		CO4: Explore various processes required to be an entrepreneur.
		CO5: Understand patents and its process of filing
		CO6: Choose and use appropriate social media for marketing.
404194	Digital Business Management	CO1: Identify drivers of digital business.
		CO2:Illustrate various approaches and techniques for E-business and management.
		CO3: Prepare E-business plan.

Head of Department
Dept. of E& TC Engineering
Shri Chh. Shivajiraje College of Engg.
Dhangawadi, Pu. - 412 6

Rajgad Dnyanpeeth's
SHRI CHHATRAPATI SHIVAJI RAJE COLLEGE OF ENGINEERING
S.No 237, Pune-Banglore Highway, Dhangwadi, Tal-Bhor Dist:Pune(Maharashtra)

Department of Mechanical Engineering
Course Outcomes (COs) SEM-I
SE (Mechanical Engineering) -2019 Pattern

Course	Name of	Course Outcome (COs)
202041	Solid Mechanics	CO1-Define various types of stresses and strain Developed on determinate and indeterminate members.
		CO2-Draw Shear force and bending moment diagram for various types of transverse loading and support.
		CO3- Compute the slope & deflection, bending stresses and shear stresses on a beam.
		CO4- Calculate torsional shear stress in shaft and buckling on the column.
		CO5- Apply the concept of principal stresses and theories of failure to Determine stresses on a 2-D element.
		CO6- Utilize the concepts of SFD & BMD, torsion and principal stresses to Solve combined loading application based problems.
202042	Solid Modeling and Drafting	CO1 - Understand basic concepts of CAD system, need and scope in Product Lifecycle Management.
		CO2 - Utilize knowledge of curves and surfacing features and methods to create complex solid geometry.
		CO3 - Construct solid models, assemblies using various modeling techniques & Perform mass property analysis, including creating and using a coordinate system.
		CO4 - Apply geometric transformations to simple 2D geometries.
		CO5 - Use CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
		CO6 - Use PMI & MBD approach for communication
202043	Engineering Thermodynamics	CO1 - Describe the basics of thermodynamics with heat and work interactions.
		CO2 - Apply laws of thermodynamics to steady flow and non-flow processes.
		CO3 - Apply entropy, available and non available energy for an Open and Closed System.
		CO4 - Determine the properties of steam and their effect on Performance of vapour power cycle.
		CO5 - Analyse the fuel combustion process and products of combustion.
		CO6 - Select various instrumentations required for safe and efficient operation of steam generator.
202044	Engineering Materials and Metallurgy	CO1 - Compare crystal structures and ASSESS different lattice parameters.
		CO2 - Correlate crystal structures and imperfections in crystals with mechanical behaviour of materials.
		CO3 - Differentiate and Determine mechanical properties using destructive and nondestructive testing of materials.
		CO4 - Identify & Estimate different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
		CO5 - Analyse effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
		CO6 - Select appropriate materials for various applications.

Rajgad Dnyanpeeth's
DTE:6324
SPPU:4071
Dhangawadi
Pune
412206
Shri Chhatra... College of Engg

Course	Name of	Course Outcome (COs)
203156	Electrical and Electronics Engineering	CO1 - Apply programming concepts to Understand role of Microprocessor and Microcontroller in embedded systems.
		CO2 - Develop interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board.
		CO3 - Understand the operation of DC motor, its speed control methods and braking.
		CO4 - Distinguish between types of three phase induction motor and its characteristic features.
		CO5 - Explain about emerging technology of Electric Vehicle (EV) and its modular subsystems.
		CO6 - Choose energy storage devices and electrical drives for Evs.
202045	Geometric Dimensioning and Tolerancing Lab	CO1 - Select appropriate IS and ASME standards for drawing.
		CO2 - Read & Analyse variety of industrial drawings.
		CO3 - Apply geometric and dimensional tolerance, surface finish symbols in drawing.
		CO4 - Evaluate dimensional tolerance based on type of fit, etc.
		CO5 - Select an appropriate manufacturing process using DFM, DFA, etc.

Course Outcomes (COs) SEM-II
SE (Mechanical Engineering) -2019 Pattern

Course	Name of	Course Outcome (COs)
207002	Engineering Mathematics - III	CO1 - Solve higher order linear differential equations and its applications to model and Analyze mass spring systems.
		CO2 - Apply Integral transform techniques such as Laplace transform and Fourier transform to Solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
		CO3 - Apply Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
		CO4 - Perform Vector differentiation & integration, Analyze the vector fields and Apply to fluid flow problems.
		CO5 - Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.
202047	Kinematics of Machinery	CO1 - Apply kinematic analysis to simple mechanisms.
		CO2 - Analyze velocity and acceleration in mechanisms by vector and graphical method.
		CO3 - Synthesize a four bar mechanism with analytical and graphical methods.
		CO4 - Apply fundamentals of gear theory as a prerequisite for gear design.
		CO5 - Construct cam profile for given follower motion.
202048	Applied Thermodynamics	CO1 - Determine COP of refrigeration system and Analyze psychrometric processes.
		CO2 - Discuss basics of engine terminology, air standard, fuel air and actual cycles.
		CO3 - Identify factors affecting the combustion Performance of SI and CI engines.
		CO4 - Determine Performance parameters of IC Engines and emission control.
		CO5 - Explain working of various IC Engine systems and Use of alternative fuels.
		CO6 - Calculate Performance of single and multi stag.

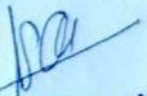| Course	Name of	Course Outcome (COs)
202049	Fluid Mechanics	CO1 - Determine various properties of fluid.
		CO2 - Apply the laws of fluid statics and concepts of buoyancy.
		CO3 - Identify types of fluid flow and terms associated in fluid kinematics.
		CO4 - Apply principles of fluid dynamics to laminar flow.
		CO5 - Estimate friction and minor losses in internal flows and Determine boundary layer formation over an external surface.
		CO6 - Construct mathematical correlation considering dimensionless parameters, also ABLE to predict the Performance of prototype using model laws.
202050	Manufacturing Processes	CO1 - Select appropriate moulding, core making and melting practice and Estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process.
		CO2 - Understand mechanism of metal forming techniques and Calculate load required for flat rolling.
		CO3 - Demonstrate press working operations and Apply the basic principles to DESIGN dies and tools for forming and shearing operations.
		CO4 - Classify and Explain different welding processes and Evaluate welding characteristics.
		CO5 - Differentiate thermoplastics and thermosetting and Explain polymer processing techniques.
		CO6 - Understand the principle of manufacturing of fibre-reinforce composites and metal matrix composites.
202051	Machine Shop	CO1 - Perform welding using TIG/ MIG/ Resistance/Gas welding technique
		CO2 - Make Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques.
		CO3 - Perform cylindrical/surface grinding operation and Calculate its machining time.
		CO4 - Determine number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine.
		CO5 - Prepare industry visit report.
		CO6 - Understand procedure of plastic processing.
202052	Project Based Learning - II	CO1 - Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
		CO2 - Analyze the results and arrive at valid conclusions.
		CO3 - Propose a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge.
		CO4 - Contribute to society through Proposed solutions by strictly following professional ethics and safety measures.
		CO5 - Use of technology in Proposed work and Demonstrate learning in oral and written form.
		CO6 - Develop ability to work as an individual and as a team member.

Course Outcomes (COs) SEM-I
TE (Mechanical Engineering) -2019 Pattern

Course	Name of	Course Outcome (COs)
302041	Numerical and Statistical Methods	CO1: SOLVE system of equations using direct and iterative numerical methods.
		CO2: ESTIMATE solutions for differential equations using numerical techniques.
		CO3: DEVELOP solution for engineering application and numerical integration.
		CO4: DESIGN and CREATE a model using a curve fitting and regression analysis.

		Methods	
		CO5: APPLY statistical Technique for quantitative data analysis.	
		CO6: DEMONSTRATE the data, using the concepts of probability and linear algebra.	

Head of Department
Dept. of Mechanical Engineering
Shri Chh. Shivajiraje College of Engg.
Dhangawadi, Pune-412206

Course	Name of	Course Outcome (COs)
302042	Heat and Mass Transfer	CO1. ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system.
		CO2. DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction.
		CO3. EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results.
		CO4. INTERPRET heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
		CO5. ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
		CO6. DESIGN & ANALYSIS of heat transfer equipments and investigation of its performance.
302043	Design of Machine Elements	CO1. DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading.
		CO2. DESIGN shafts, keys and couplings under static loading conditions.
		CO3. ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
		CO4. EVALUATE dimensions of machine components under fluctuating loads.
		CO5.EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints.
		CO6.APPLY the design and development procedure for different types of springs.
302044	Mechatronics	CO1. DEFINE key elements of mechatronics, principle of sensor and its characteristics.
		CO2. UTILIZE concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O.
		CO3. DETERMINE the transfer function by using block diagram reduction technique.
		CO4. EVALUATE Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
		CO5. APPLY the concept of different controller modes to an industrial application.
		CO6. DEVELOP the ladder programming for industrial application.
302045-B	Machining Science &Technology	CO1. DEFINE metal cutting principles and mechanics of metal cutting and tool life.
		CO2. DESCRIBE features of gear and thread manufacturing processes.
		CO3. SELECT appropriate grinding wheel and demonstrate the various surface finishing processes.
		CO4. SELECT appropriate jigs/fixtures and to draw the process plan for a given component. CO5. SELECT & EVALUATE various parameters of process planning.
		CO5. SELECT & EVALUATE various parameters of process planning.
		CO6. GENERATE CNC program for Turning / Milling processes and generate tool path using CAM software.

Course Outcomes (COs) SEM-II
TE (Mechanical Engineering) -2019 Pattern

Course	Name of	Course Outcome (COs)
302049	Artificial Intelligence &Machine Learning	CO1. DEMONSTRATE fundamentals of artificial intelligence and machine learning.
		CO2. APPLY feature extraction and selection techniques.
		CO3. APPLY machine learning algorithms for classification and regression problems.
		CO4. DEVISE AND DEVELOP a machine learning model using various steps.
		CO5. EXPLAIN concepts of reinforced and deep learning.
		CO6. SIMULATE machine learning model in mechanical engineering problems.

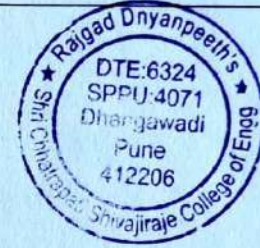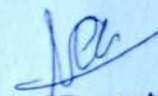| Course Code	Name of Subject/Course	Course Outcome (COs)
302050	Computer Aided Engineering	CO1: DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
		CO2: APPLY the various meshing techniques for better evaluation of approximate results.
		CO3: APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
		CO4: ANALYZE and APPLY various numerical methods for different types of analysis.
		CO5: EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.
		CO6: GENERATE the results in the form of contour plot by the USE of CAE tools.
302051	Design of Transmission Systems	CO1.APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.
		CO2.EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards.
		CO3.SELECT&DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design
		CO4.DEFINE and DESIGN various types of Clutches, Brakes, used in automobile.
		CO5.APPLY various concept to DESIGN Machine Tool Gear box, for different applications
		CO6.ELABORATE various modes of operation, degree of hybridization and allied terms
302052-A	Composite Materials	CO1. DEFINE & COMPARE composites with traditional materials.
		CO2. IDENTIFY & ESTIMATE different parameters of the Polymer Matrix Composite
		CO3. CATEGORISE and APPLY Metal Matrix Process from possessions landscape.
		CO4. DETERMINE volume/weight fraction and strength of Composites.
		CO5. SELECT appropriate testing and inspection method for composite materials. CO6. SELECT composites materials for various applications.

Course Outcomes (COs) SEM-I
BE (Mechanical Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
402041	Heating, Ventilation, Air Conditioning and Refrigeration	CO1 -.ANALYSE different air-craft refrigeration systems and EXPLAIN the properties, applications and environmental issues of different refrigerants.
		CO2 -ANALYSE multi pressure refrigeration system used for refrigeration applications.
		CO3 -.DISCUSS types of compressors, condensers, evaporators and expansion valves along with regulatory and safety controls and DESCRIBE Transcritical and ejector refrigeration systems.
		CO4 -ESTIMATE cooling load for air conditioning systems used with concern of designconditions and indoor quality of air.
		CO5 -.DESIGN air distribution system along with consideration of ventilation and infiltration.
		CO6- EXPLAIN the working of types of desiccants, evaporative, thermal storage, radiantcooling, clean room and heat pump systems.
402043	Dynamics of	CO1 - APPLY balancing technique for static and dynamic balancing of multi cylinder inline andradial engines.
		CO2 - ANALYZE the gyroscopic couple or effect for stabilization of Ship, Airplane and Fourwheeler vehicles.
		CO3 - ESTIMATE natural frequency for single DOF undamped & damped free vibratorysystems.
		CO4 -DETERMINE response to forced vibrations due to harmonic excitation, base excitation andexcitation due to unbalance forces.

	Machinery	CO5 - ESTIMATE natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems.
		CO6 -DESCRIBE noise and vibration measuring instruments for industrial / real life applications along with suitable method for noise and vibration control.

Head of Department
Dept. of Mechanical Engineering
Shri Chh. Shivajiraje College of Engg.
Dhangawadi. Pune-412206

402043	Turbomachinery	CO1 - VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
		CO2 - DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.
		CO3 -MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
		CO4- EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.
402044D:	Industrial Engineering	CO1 -EVALUATE the productivity and IMPLEMENT various productivity improvement techniques.
		CO2 - APPLY work study techniques and UNDERSTANDS its importance for better productivity.
		CO3 - DEMONSTRATE the ability to SELECT plant location, appropriate layout and material handling equipment.
		CO4 - USE of Production planning and control tools for effective planning, scheduling and managing the shop floor control.
		CO5 - PLAN inventory requirements and EXERCISE effective control on manufacturing requirements.
		CO6 -APPLY Ergonomics and legislations for human comfort at work place and UNDERSTANDS the role of value engineering in improving productivity.
402045A	Product Design and Development	CO1 - UNDERSTAND Product design and Product development processes
		CO2 - UNDERSTAND Processes, tools and techniques for Market Survey & Product Specification Finalization
		CO3 -UNDERSTAND Processes, tools and techniques for Concept Inception, Verification and selection
		CO4 - UNDERSTAND Processes, tools and techniques for Concept Exploration & Development
		CO5 - UNDERSTAND Processes, tools and techniques for Design Verification and Validation
		CO6 -UNDERSTAND Processes, tools and techniques for Robust Design and Development

Course Outcomes (COs) SEM-II
BE (Mechanical Engineering) -2019 Pattern

402048	Computer Integrated Manufacturing	CO1-EXPLAIN CIM and factory automation
		CO2 - UNDERSTAND the integration of hardware and software elements for CIM
		CO3 -APPLY CNC program for appropriate manufacturing techniques.
		CO4 -ANALYZE processes planning, quality and MRP integrated with computers.
		CO5 -INTERPRET flexible, cellular manufacturing and group technology
		CO6 -ANALYZE the effect of IOT, Industry-4.0 and cloud base manufacturing.
402049	Energy Engineering	CO1-:EXPLAIN the power generation scenario, the layout components of thermal power plant and ANALYZE the improved Rankine cycle.
		CO2 - ANALYZE the performance of steam condensers, cooling tower system; RECOGNIZE an environmental impact of energy systems and methods to control the same.
		CO3 -EXPLAIN the layout, component details of diesel engine plant, hydel and nuclear energy systems.
		CO4 -ANALYZE gas and improved power cycles.
		CO5 -EXPLAIN the fundamentals of renewable energy systems
		CO6 -:EXPLAIN basic principles of energy management, storage and economics of power generation.

402050A	Quality & Reliability Engineering	CO1-UNDERSTAND basic concepts of quality and RELATE various quality tools
		CO2 -DEVELOP analytical competencies to SOLVE problems on control charts and processcapability.
		CO3 -UNDERSTAND fundamental concepts of reliability.
		CO4 -EVALUATE system reliability.
		CO5 -IDENTIFY various failure modes and CREATE fault tree diagram.
		CO6-UNDERSTAND the concept of reliability centered maintenance and APPLY reliability testsmethods
402051B	Renewable Energy Technologies	CO1-DESCRIBE fundaments, needs and scopes of renewable energy systems.
		CO2 -EXPLAIN performance aspects of flat and concentric solar collectors along withapplications.
		CO3 -DESIGN solar photovoltaic system for residential applications
		CO4 -DESIGN AND ANALYSIS of wind energy conversion system.
		CO5 -APPLY Installation practices of Wind and Solar Photovoltaic Systems for grid connection
		CO6 -DETERMINE performance parameters of bio-energy conversion systems.

Raigad Dnyanpeeth's
DTE:6324
SPPU:4071
Dhangawadi
Pune
412206
Shri Chhatrapati Shivajiraje College of Engg.

Head of Department
Dept. of Mechanical Engineering
Shri Chh. Shivajiraje College of Engg.
Dhangawadi, Pune-412206

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJI RAJE COLLEGE OF ENGINEERING

S.No 237, Pune-Banglore Highway,Dhangwadi,Tal-Bhor Dist.Pune(Maharashtra)

Department of Computer Engineering

Course Outcomes (COs) SEM-I

SE (Computer Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
210241	Discrete Mathematics	CO1: Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
		CO2: Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
		CO3: Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
		CO4: Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
		CO5: Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
		CO6: Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
		CO7: Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	Fundamentals of Data Structures	CO1: Design the algorithms to solve the programming problems, identify appropriate algorithmicstrategy for specific application, and analyze the time and space complexity.
		CO2: Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.
		CO3: Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
		CO4: Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application
		CO5: Compare and contrast different implementations of data structures (dynamic and static).
		CO6: Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.
210243	Object Oriented Programming(OOP)	CO1: Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software
		CO2: Design object-oriented solutions for small systems involving multiple objects.
		CO3: Use virtual and pure virtual function and complex programming situations.
		CO4: Apply object-oriented software principles in problem solving.
		CO5: Analyze the strengths of object-oriented programming.
		CO6: Develop the application using object oriented programming language(C++).

210244	Computer Graphics	CO1: Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
		CO2: Apply mathematics to develop Computer programs for elementary graphic operations.
		CO3: Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
		CO4: Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
		CO5: Understand the concepts of color models, lighting, shading models and hidden surface elimination.
		CO6: Create effective programs using concepts of curves, fractals, animation and gaming.
210245	Digital Electronics and Logic Design	CO1: Simplify Boolean Expressions using K Map.
		CO2: Design and implement combinational circuits.
		CO3: Design and implement sequential circuits.
		CO4: Develop simple real-world application using ASM and PLD.
		CO5: Differentiate and Choose appropriate logic families IC packages as per the given design specifications.
		CO6: Explain organization and architecture of computer system

Course Outcomes (COs) SEM-II

SE (Computer Engineering) -2019 Pattern

207003	Engineering Mathematics III	CO1: Solve Linear differential equations, essential in modelling and design of computer-based systems.
		CO2: Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
		CO3: Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
		CO4: Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
		CO5: Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
210252	Data Structures and Algorithms	CO1: Identify and articulate the complexity goals and benefits of a good hashing scheme for realworld applications.
		CO2: Apply non-linear data structures for solving problems of various domain.
		CO3: Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
		CO4: Analyze the algorithmic solutions for resource requirements and optimization
		CO5: Use efficient indexing methods and multiway search techniques to store and maintain data
		CO6: Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.
210253	Software Engineering	CO1: Analyze software requirements and formulate design solution for a software.
		CO2: Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
		CO3: Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
		CO4: Model and design User interface and component-level.
		CO5: Identify and handle risk management and software configuration management
		CO7: Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

Course Code	Name of Subject/ Course	Course Outcome (COs)
210254	Microprocessor	CO1: Exhibit skill of assembly language programming for the application.
		CO2: Classify Processor architectures.
		CO3: Illustrate advanced features of 80386 Microprocessor.
		CO4: Compare and contrast different processor modes.
		CO5: Use interrupts mechanism in applications
		CO6: Differentiate between Microprocessors and Microcontrollers.
		CO7: Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.
210255	Principles of Programming Languages	CO1: Make use of basic principles of programming languages.
		CO2: Develop a program with Data representation and Computations.
		CO3: Develop programs using Object Oriented Programming language : Java.
		CO4: Develop application using inheritance, encapsulation, and polymorphism.
		CO5: Demonstrate Multithreading for robust application development.
		CO6: Develop a simple program using basic concepts of Functional and Logical programming paradigm

Course Outcomes (COs) SEM-I
TE (Computer Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
310241	Database Management System	CO1: Analyze and design Database Management System using ER model
		CO2: Implement database queries using database languages
		CO3: Normalize the database design using normal forms
		CO4: Apply Transaction Management concepts in real-time situations
		CO5: Use NoSQL databases for processing unstructured data
		CO6: Differentiate between Complex Data Types and analyze the use of appropriate data types
310242	Theory of Computation	CO1: Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
		CO2: Construct regular expression to present regular language and understand pumping lemma for RE
		CO3: Design Context Free Grammars and learn to simplify the grammar
		CO4: Construct Pushdown Automaton model for the Context Free Language
		CO5: Design Turing Machine for the different requirements outlined by theoretical computer science
		CO6: Analyze different classes of problems, classify and analyze them and study concepts of NP completeness
310243	Systems Programming and Operating System	CO1: Analyze and synthesize basic System Software and its functionality.
		CO2: Identify suitable data structures and Design & Implement various System Software
		CO3: Compare different loading schemes and analyze the performance of linker and loader
		CO4: Implement and Analyze the performance of process scheduling algorithms
		CO5: Identify the mechanism to deal with deadlock and concurrency issues
		CO6: Demonstrate memory organization and memory management policies

310244	Computer Networks and Security	CO1: Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
		CO2: Illustrate the working and functions of data link layer
		CO3: Analyze the working of different routing protocols and mechanisms
		CO4: Implement client-server applications using sockets
		CO5: Illustrate role of application layer with its protocols, client-server architectures
		CO6: Comprehend the basics of Network Security
310245(A)	Internet of Things and Embedded Systems	CO1: Understand the fundamentals and need of Embedded Systems for the Internet of Things
		CO2: Apply IoT enabling technologies for developing IoT systems
		CO3: Apply design methodology for designing and implementing IoT applications
		CO4: Analyze IoT protocols for making IoT devices communication
		CO5: Design cloud based IoT systems
		CO6: Design and Develop secured IoT applications

Course Outcomes (COs) SEM-II
TE (Computer Engineering) -2019 Pattern

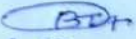|		
310251	Data Science and Big Data Analytics	CO1: Analyze needs and challenges for Data Science Big Data Analytics
		CO2: Apply statistics for Big Data Analytics
		CO3: Apply the lifecycle of Big Data analytics to real world problems
		CO4: Implement Big Data Analytics using Python programming
		CO5: Implement data visualization using visualization tools in Python programming
		CO6: Design and implement Big Databases using the Hadoop ecosystem
310252	Web Technology	CO1: Implement and analyze behavior of web pages using HTML and CSS
		CO2: Apply the client side technologies for web development
		CO3: Analyze the concepts of Servlet and JSP
		CO4: Analyze the Web services and frameworks
		CO5: Apply the server side technologies for web development
		CO6: Create the effective web applications for business functionalities using latest webdevelopment platforms
310253	Artificial Intelligence	CO1: Identify and apply suitable Intelligent agents for various AI applications
		CO2: Build smart system using different informed search / uninformed search or heuristic approaches
		CO3: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
		CO4: Apply the suitable algorithms to solve AI problems
		CO5: Implement ideas underlying modern logical inference systems
		CO6: Represent complex problems with expressive yet carefully constrained language of representation
310254(A)	Information Security	CO1: Model the cyber security threats and apply formal procedures to defend the attacks
		CO2: Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
		CO3: Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms
		CO4: Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
		CO5: Demonstrate the use of standards and cyber laws to enhance Information Security in thedevelopment process and infrastructure protection

Course Outcomes (COs) SEM-I
BE (Computer Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
410241	Design and Analysis of Algorithms	CO1:Formulate the problem
		CO2: Analyze the asymptotic performance of algorithms
		CO3: Decide and apply algorithmic strategies to solve given problem
		CO4: Find optimal solution by applying various methods
		CO5: Analyze and Apply Scheduling and Sorting Algorithms.
		CO6:Solve problems for multi-core or distributed or concurrent environments
410242	Machine Learning	CO1: Identify the needs and challenges of machine learning for real time applications.
		CO2: Apply various data pre-processing techniques to simplify and speed up machinelearning algorithms.
		CO3: Select and apply appropriately supervised machine learning algorithms forreal timeapplications.
		CO4:Implement variants of multi-class classifier and measure its performance.
		CO5: :Compare and contrast different clustering algorithms.
		CO6: Design a neural network for solving engineering problems.
410243:	Blockchain Technology	CO1: Interpret the fundamentals and basic concepts in Blockchain
		CO2: Compare the working of different blockchain platforms
		CO3: Use Crypto wallet for cryptocurrency based transactions
		CO4: Analyze the importance of blockchain in finding the solution to the real-worldproblems
		CO5:Illustrate the Ethereum public block chain platform
		CO6: Identify relative application where block chain technology can be effectively usedandimplemented.
410244(C)	Cyber Security and Digital Forensics	CO1: Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
		CO2: Build appropriate security solutions against cyber-attacks
		CO3: Underline the need of digital forensic and role of digital evidences.
		CO4: Explain rules and types of evidence collection
		CO5: Analyze, validate and process crime scenes
		CO6: Identify the methods to generate legal evidence and supporting investigation reports.
410245 (D)	Software Testing and Quality Assurance	CO1: Describe fundamental concepts in software testing such as manual testing, automation testingand software quality assurance.
		CO2: Design and Develop project test plan, design test cases, test data, and conduct testoperations.
		CO3: Apply recent automation tool for various software testing for testing software.
		CO4: Apply different approaches of quality management, assurance, and quality standard tosoftwaresystem.
		CO5: Apply and analyze effectiveness Software Quality Tools.
		CO6:Apply tools necessary for efficient testing framework.

Course Outcomes (COs) SEM-II
BE (Computer Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
410250:	High Performance Computing	CO1: Understand various Parallel Paradigm
		CO2: Design and Develop an efficient parallel algorithm to solve given problem
		CO3: Illustrate data communication operations on various parallel architecture
		CO4: Analyze and measure performance of modern parallel computing systems
		CO5: Apply CUDA architecture for parallel programming
		CO6: Analyze the performance of HPC applications
410251	Deep Learning	CO1: Understand the basics of Deep Learning and apply the tools to implement deeplearningapplications
		CO2: Evaluate the performance of deep learning models (e.g., with respect to the bias-variance tradeoff, overfitting and underfitting, estimation of test error).
		CO3: : To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) forimplementing Deep Learning models
		CO4: To implement and apply deep generative models
		CO5: Construct and apply on-policy reinforcement learning algorithms
		CO6: To Understand Reinforcement Learning Process
410252(A):	Natural Language Processing	CO1: Describe the fundamental concepts of NLP, challenges and issues in NLP
		CO2: Analyze Natural languages morphologically, syntactical and semantically OR Describe the concepts of morphology, syntax, semantics of natural language
		CO3: Illustrate various language modelling techniques
		CO4: Integrate the NLP techniques for the information retrieval task
		CO5: Demonstrate the use of NLP tools and techniques for text-based processing of naturallanguages
		CO6: Develop real world NLP applications
410253(C):	Business Intelligence	CO1: Differentiate the concepts of Decision Support System & Business Intelligence
		CO2: Use Data Warehouse & Business Architecture to design a BI system
		CO3: Build graphical reports
		CO4: Apply different data preprocessing techniques on dataset
		CO5: Implement machine learning algorithms as per business need
		CO6: Identify role of BI in marketing, logistics, and finance and telecommunication sector

Head of Department
Dept. Computer Engineering
Shri Chh. Shivajiraje College of Engg
Dhangawadi, Pune-412206

Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJI RAJE COLLEGE OF ENGINEERING

S.No 237, Pune-Banglore Highway, Dhangwadi, Tal-Bhor Dist:Pune(Maharashtra)

Department of Civil Engineering
Course Outcomes (COs) SEM-I
SE (Civil Engineering) -2019 Pattern

Course Code	Name of	Course Outcome (COs)
201001	Building Technology & Materials	CO1 - Identify types of building and basic requirements of building components.
		CO2 -Make use of Architectural Principles and Building byelaws for building construction.
		Building Code.
		CO4 - Plan effectively various types of Public Buildings according to their utility functions withreference to National Building Code.
		CO5 -Make use of Principles of Planning in Town Planning. Different Villages and Safety aspects
		CO6 - Understand different services and safety aspects
201002	Mechanics of structure	homogeneous and composite structures.
		and bending moment diagram.
		diagram.
		CO4 -Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
		CO5 -Analyze axially loaded and eccentrically loaded column.
		CO6 - Determine the slopes and deflection of determinate beams and trusses.
201003	Fluid Mechanics	pressure, buoyancy & floatation and its application for solving practical problems.
		Modified Bernoulli's equation and its application to practical problems of fluid flow
		layer theory and apply it for solving practical problems of fluid flow.
		minor losses and analyze pipe network using Hardy Cross method.
		the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
		profile and calculate drag and lift force on fully submergedbody.
207001	Engineering Mathematics III	such as bending of beams, whirling of shafts and mass spring systems.
		differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
		engineering.
		CO4 - Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems.
		CO5 -Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.
207009	Engineering Geology	inherent characteristics and their uses in civil engineering constructions.
		engineering projects and its implications on environment and sustainability.
		CO3 - Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
		foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
		reservoirs, and tunnels.
		CO6 - Explain geological hazards and importance of ground water and uses of common building stones.
201007	Awareness to civil Engineering Practices	CO1 - Describe functioning/working of different types of industries/sectors in Civil Engineering.
		CO2 - Describe drawings and documents required and used in different Civil Engineering works.
		responsibilities as a Civil Engineer.
		CO4 -Understand different health and safety practices on the site.

Course Outcomes (COs) SEM-II
SE (Civil Engineering) -2019 Pattern

201008	Geotechnical Engineering	CO1 - Identify and classify the soil based on the index properties and its formation process
		CO2 - Explain permeability and seepage analysis of soil by construction of flow net.
		CO3 - Illustrate the effect of compaction on soil and understand the basics of stress distribution.
		CO4 - Express shear strength of soil and its measurement under various drainage conditions.
		CO5 - Evaluate the earth pressure due to backfill on retaining structures by using different theories.
		CO6 - Analysis of stability of slopes for different types of soils.
201009	Survey	CO1-Define and Explain basics of plane surveying and differentiate the instruments used for it.
		CO2-Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
		CO3-Describe different methods of surveying and find relative positions of points on the surface of earth.
		CO4-Execute curve setting for civil engineering projects such as roads, railways etc
		CO5-Articulate advancements in surveying such as space based positioning systems
		CO6-Differentiate map and aerial photographs, also interpret aerial photographs
201010	Concrete Technology	CO1 - Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
		CO2 -Able to check the properties of concrete in fresh and hardened state.
		CO3 - Get acquainted to concreting equipments, techniques and different types of special concrete.
		CO4 - Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.
201011	Structural Analysis	CO1 - Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
		CO2 - Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
		CO3 - Implement application of the slope deflection method to beams and portal frames
		CO4 - Analyze beams and portal frames using moment distribution method.
		CO5 - Determine response of beams and portal frames using structure approach of stiffness matrix method.
		CO6 - Apply the concepts of plastic analysis in the analysis of steel structures
201012	Project management	CO1 - Describe project life cycle and the domains of Project Management.
		CO2 -Explain networking methods and their applications in planning and management
		CO3 - Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
		CO4 -Understand economical terms and different laws associated with project management
		CO5 - Understand economical terms and different laws associated with project management
		CO6 - Apply the methods of project selection and recommend the best economical project
201017	Project Based Learning	CO1 - Identify the community/ practical/ societal needs and convert the idea into a product/ process/service
		CO2 - Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
		CO3 - Create, work in team and applying the solution in practical way to specific problem.

Course Outcomes (COs) SEM-I
TE (Civil Engineering) -2019 Pattern

Course Code	Subject/	Course Outcome (COs)
301001	Hydrology and Water Resources Engineering	CO1-Understand government organizations, apply & analyze precipitation & its abstractions.
		CO2-Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
		CO3-Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
		CO4-"Understand, apply & analyze reservoir planning, capacity of reservoir & reservoireconomics."
		CO5-"Understand water logging & water management, apply & analyze ground water hydrology"
		CO6-"Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement."
301002	Water Supply Engineering	CO1- Define identify, describe reliability of water sources, estimate water requirement for various sectors
		CO2 -Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
		CO3 - Design various components of water treatment plant and distribution system.
		including packaged water treatment plants.
		CO5 - Design elevated service reservoir capacity and understand the rainwater harvesting
		CO6- Understand the requirement of water treatment plant for infrastructure and Government scheme.
301003	Design of Steel Structures	design of the adequate steel section subjected to tensile force.
		CO2 - Determine the adequate steel section subjected to compression load and design of builtup columns along with lacing and battening.
		CO3 - Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
		CO4 - Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
		CO5 - Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
		stiffeners and its connections.
301004	Engineering Economics and Financial Management	CO1 - Understand basics of construction economics
		CO2 - Develop an understanding of financial management in civil engineering projects.
		CO3 - Prepare and analyze the contract account.
		CO4 - Decide on right source of fund for construction projects.
		CO5 - Understand working capital and its estimation for civil engineering projects.
		CO6- Illustrate the importance of tax planning & understand role of financial regulatory bodies
301005	Elective I	CO1 - Understand the overview of construction sector.
		CO2 - Illustrate construction schedulling, work study and work measurement.
		CO3 - Acquiant various labour laws and finicial aspects on construction projects.
		CO4 - Explain elements of risk management technoques in construction.
		CO5 - State material and human resource management techniques in construction.
		CO6-Understand basics of artifical intelligence techniques in civil Engineering
301006	Seminar	CO1 - Appraise the current civil engineering research / techniques / developments / interdisciplinary areas.
		CO2 - Review and organize literature survey utilizing technical resources, journals etc.
		CO3 - Evaluate and draw conclusions related to technical content studied.
		CO4 - Demonstrate the ability to perform critical writing by preparing a technical report.
		CO5 - Develop technical writing and presentation skills.

		Course Outcomes (COs) SEM-II
		TE (Civil Engineering) -2019 Pattern
Course	**Name of**	**Course Outcome (COs)**
301001	Hydrology and Water Resources Engineering	CO1-Understand government organizations, apply & analyze precipitation & its abstractions.
		CO2-Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
		CO3-Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
		CO4-"Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics."
		CO5-"Understand water logging & water management, apply & analyze ground water hydrology"
		CO6-"Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement."
301002	Water Supply Engineering	CO1- Define identify, describe reliability of water sources, estimate water requirement for various sectors
		CO2 -Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
		CO3 - Design various components of water treatment plant and distribution system.
		including packaged water treatment plants.
		CO5 - Design elevated service reservoir capacity and understand the rainwater harvesting
		CO6- Understand the requirement of water treatment plant for infrastructure and Government scheme.
301003	Design of Steel Structures	subjected to tensile force.
		CO2 - Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
		CO3 - Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
		CO4 - Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
		CO5 - Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
		stiffeners and its connections.
301004	Engineering Economics and Financial Management	CO1 - Understand basics of construction economics
		CO2 - Develop an understanding of financial management in civil engineering projects.
		CO3 - Prepare and analyze the contract account.
		CO4 - Decide on right source of fund for construction projects.
		CO5 - Understand working capital and its estimation for civil engineering projects.
		CO6- Illustrate the importance of tax planning & understand role of financial regulatory bodies
301005	Elective I	CO1 - Understand the overview of construction sector.
		CO2 - Illustrate construction schedulling, work study and work measurement.
		CO3 - Acquiant various labour laws and finicial aspects on construction projects.
		CO4 - Explain elements of risk management technoques in construction.
		CO5 - State material and human resource management techniques in construction.
		CO6-Understand basics of artifical intelligence techniques in civil Engineering
301006	Seminar	CO1 - Appraise the current civil engineering research / techniques / developments / interdisciplinary areas.
		CO2 - Review and organize literature survey utilizing technical resources, journals etc.
		CO3 - Evaluate and draw conclusions related to technical content studied.
		CO4 - Demonstrate the ability to perform critical writing by preparing a technical report.
		CO5 - Develop technical writing and presentation skills.

Course Outcomes (COs) SEM-II

TE (Civil Engineering) -2019 Pattern

Course	Name of	Course Outcome (COs)
301012	Waste Water Engineering	CO1 - Recall sanitation infrastructure, quantification and characterization of wastewater,natural purification of streams
		CO2 - Design preliminary and primary unit operations in waste water treatment plant
		CO3 - Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
		CO4 - Understand and design suspended and attached growth wastewater treatment systems
		CO5 - Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
		CO6-Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
301013	Design of RC Structures	behavior of materials: steel & concrete
		CO2 - Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections
		CO3 - Design & detailing of rectangular one way and two-way slab with different boundary conditions
		CO4 - Design & detailing of dog legged and open well staircase
		CO5 - Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion
		CO6-Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bendingand their footings.
301014	Remote Sensing and GIS	CO1 - To comprehend fundamentals and principles of RS and GIS techniques
		multi-scale level.
		CO3 - To develop skills of Image processing and GIS
		CO4 - To utilize RS and GIS techniques in Engineering Geology and civil engineering.
		CO5 - To study satellite image processing, satellite image interpretation, digitization and generation of thematic maps in a GIS.
		CO6-To learn buffering and layer analysis for civil engineering applications
301015	Elective II Solid Waste Management	sampling, characteristics and regulatory/legal requirements.
		CO2 - Explain and suggest relevant method of storage, collection and transportation of solid waste for the given site condition with justification.
		economics and design composting system for organic waste.
		digester and incineration system.
		digester and incineration system.
		for the given type of waste in the given situation
301016	Internship	CO1 - To develop professional competence through industry internship
		CO2 - To apply academic knowledge in a personal and professional environment
		CO3 - To build the professional network and expose students to future employees
		CO4 - Apply professional and societal ethics in their day to day life
		CO5 - To become a responsible professional having social, economic and administrative considerations
		CO6- To make own career goals and personal aspirations
301021	Audit Course II: Leadership and Personality Development/	CO1 - To develop inter personal skills and bean effective goal oriented team player.
		CO2 - To develop professionals with idealistic, practical and moral values.
		CO3 - To develop communication and problem solving skills.
		CO4 - Tore-engineer attitude and understand its influence on behavior

Course Outcomes (COs)   SEM-I
BE (Civil Engineering) -2019 Pattern

Code	Subject/	Course Outcome (COs)
401001	Foundation Engineering	CO1 - Perform subsurface investigations for foundations using different methods.
		CO2 -Estimate the bearing capacity of shallow foundations.
		CO3 - Calculate immediate and primary consolidation settlement of shallow foundations
		CO4 - Decide the capacity of a pile and pile group.
		CO5 - Understand the steps in geotechnical design of shallow foundations and well foundations.
		CO6 - Analyze problems related to expansive soil and overcome them using design principles, construction techniques in black cotton soil.
401002	Transportation Engineering	CO1- Understand principles and practices of transportation planning.
		CO2-Demonstrate knowledge of traffic studies, analysis and their interpretation
		CO3- Design Geometric Elements of road pavement
		CO4- Evaluate properties of highway materials as a part of road pavement
		CO5- Appraise different types of pavements and their design
		CO6- Understand the fundamentals of Bridge Engineering and Railway Engineering
401 003 c	Integrated Water Resources Planning and Management	approaches & principles in a case study.
		CO2-Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production
		quality standards as per CPCB
		CO4-Understand water economics and funding, application & analysis of planning for a sustainable water future
		CO5-Understand legal regulatory settings of IWRP & M, application & analysis of inter-basin water transfers and IWRP & M
		CO6-Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M
401 004 a	Air Pollution and Control	CO1 -Recall air pollution, legislation and regulations
		CO2 - Evaluate air pollutant concentrations as a function of meteorology
		CO3 - Interpret sampling results with prescribed standards
		CO4 - Assess emission inventory and air quality models.
		CO5 - Compare the air pollution control equipments.
		CO6 - Infer indoor air pollution and its mitigation.
401 009	Computer Programming in Civil Engineering	CO1 - Understand basics of Python Programming
		CO2 - Write Python codes for variety of problems in civil Engineering
401006	Project Stage I	CO1-Appraise the current Civil Engineering research/techniques/developments/interdisciplinary areas
		CO2-Review and organize literature survey utilizing technical resources, journals etc
		CO3-Evaluate and draw conclusions related to technical content studied.
		CO4-Demonstrate the ability to perform critical writing by preparing a technical report.
		CO5-Develop technical writing and presentation skills.

Course Outcomes (COs)   SEM-II
BE (Civil Engineering) -2019 Pattern

401011	Dams and Hydraulics Structure	topographic and social factors also the importance of dam safety and instrumentation required to assess the health of dam.
		gravity dam
		devices, spillway gates
		CO4-Acquire knowledge about Design and Failure aspect of erathen dam and Design of Diversion Head Works
		CO5-Able to Design Canal and Canal Structure
		CO6-Undertsand the cross drainage works and River training structure
401012	Quantity Surveying	CO1 - Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
		CO2 - Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents.
		CO3 - Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule
		CO4 - Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
		CO5 - Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
		CO6 - Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend.
401013 e	Hydro Power Engineering (ELE-V)	world.
		CO2 - Explain the types of hydro power plants.
		CO3 - Explain the load assessment and estimation of hydro power potential.
		CO4 - Explain the planning of layout of hydro power plant.
		CO5 - Design of the penstocks and surge shaft.
		CO6 - Discuss the economic conditions, legal conditions and consequences of hydro power.
401014 a	TQM and MIS (ELE-VI)	CO1 - Recognize quality and contribution of quality gurus for evaluation of best practices
		CO2 - Relate the functioning and application of TQM & Six Sigma in the domain of construction sector
		CO3 - Recommend ISO 9001 principles in preparation of quality manual to construction business
		CO4 - Apply management control & certification systems for construction industry
		CO5 - Choose TQM process implementation and various quality awards for construction sector
		CO6- Propose MIS for allied fields in construction sector
401016	Project Stage II	CO1-Appraise the current Civil Engineering research/techniques/developments/interdisciplinary areas
		CO2-Review and organize literature survey utilizing technical resources, journals etc
		CO3-Evaluate and draw conclusions related to technical content studied.
		CO4-Demonstrate the ability to perform critical writing by preparing a technical report.
		CO5-Develop technical writing and presentation skills.

Head of Department
Dept. of Civil Engineering
Shri Chh. Shivajiraje College of Engg
Dhangawadi, Pune-412206