Swarrnim Startup and Innovation University

Swarrnim Institute of Technology

Program Outcomes as defined by NBA (PO) for all B. Tech.

Program Outcomes (PO's):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Ability to acquire and apply fundamental principles of scienceand engineering to address the issues and challenges of Electrical Engineering and Technology.
2. **Problem analysis:** Ability to analyze and solve practical problems related to Electrical Engineering and Technology.
3. **Design/development of solutions:** Ability to design, develop and evaluate Electrical Engineering works to meet the desired need.
4. **Conduct investigations of complex problems:** Ability to conduct, analyze and interpret experiments and apply experimental results to improve the process in Electrical Engineering.
5. **Modern tool usage:** Ability to use current technology, skills and modern techniques in practices of Power Electronics and power system in Electrical Engineering field.
6. **The engineer and society:** Ability to assess the impact of global, social and cultural changes on Power projects and Infrastructure projects.
7. **Environment and sustainability**: Ability to understand the importance of sustainability and environmental impact in design and development of Infrastructure projects.
8. **Ethics:** Ability to exhibit professional, legal and ethical behavior.

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9. **Individual and team work:** Ability to work effectively as an individual and as a member/leader in a team.
10. **Communication:** Ability to communicate and present effectively.
11. **Project management and finance:** Ability to employ effective project management skills to develop a project plan, monitor and track development efforts.
12. **Life-long learning:** Ability to enhance self-improvement through continuous professional development and life- long learning

SWARNIM INSTITUTE OF TECHNOLOGY

B. Tech. (Electrical Engineering)

Program Educational Objectives (PEOs):

Graduates will be able to:

1. **PEO-1:** To prepare highly competent graduates with strong foundation in engineering and technology for successful career in industries, academics and research organizations.

2. **PEO-2:** To prepare the graduates with ability to identify, analyze, design and solve complex electrical engineering problems, based on application of basic sciences, mathematics and fundamentals of electrical engineering.

3. **PEO-3:** To prepare fundamentally strong graduates having broad knowledge in electrical engineering that can become innovators or entrepreneur to solve industrial and societal challenges.

4. **PEO-4:** To prepare graduates with holistic education approach that they should contribute ethically in multicultural and multidisciplinary groups to develop sustainable solutions for global, environmental and social issues.

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Program Specific Outcomes (PSOs)

1. **PSO-1:** To identify, formulate, design and investigate various problems related to electrical circuits, power electronics, electrical machines and power systems by applying fundamental knowledge of engineering and science.

2. **PSO-2:** To demonstrate proficiency in usage of modern hardware & software tools to model, design, simulate and analyze electrical systems for solving real world multi- disciplinary problems.

3. **PSO-3:** To contribute in development of smart systems, modern grid and clean energysystem for societal and environmental benefits.

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Object Oriented Programming with JAVA	**Course code**	**23040501**
Course type:	Engineering Science	**Course Credit**	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	-	High	-	-
CO- 2	Medium	-	-	High	High	-	-	-	-	Low	Medium	-
CO- 3	High	-	Medium	-	Medium	-	Medium	Medium	-	-	Medium	-
CO- 4	-	Medium	High	-	Low	-	-	-	Medium	-	-	High
CO- 5	-	Medium	Medium	High	High	-	-	-	Medium	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Theory of Computation	**Course code**	**23040502**
Course type:	Engineering Science	**Course Credit**	6

CO 1	To give an overview of the theoretical foundations of computer science from
CO 2	the perspective of formal languages
CO 3	To illustrate finite state machines to solve problems in computing
CO 4	To explain the hierarchy of problems arising in the computer sciences.
CO 5	To familiarize Regular grammars, context frees grammar

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High		-	Medium	-	-	High	-	Medium
CO- 2	Medium	-	-	High		-	High	-	-	Low	Medium	Medium
CO- 3	High	-	Medium		Medium	-	Medium	Medium	-	-	Medium	-
CO- 4	-	Medium	High		Low	High	-	-		-	Medium	-
CO- 5	-	Medium	Medium	High	High	High	-	-		-	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Information Network & Cyber Security	**Course code**	**23040503**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	-	Medium	Medium	-	-	High	-	Medium
CO- 2	Medium	-	-	High	-	High	High	-	-	Low	Medium	Medium
CO- 3	High	-	Medium	-	Medium	-		-	-	-	Medium	-
CO- 4	-	Medium	High	-	Low	High	Medium	--	Medium	-	-	Medium
CO- 5	-	Medium	Medium	High	High	High	Medium	-	Medium	-	-	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Web Technology	**Course code**	**23040504**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Students are able to develop a dynamic webpage by the use of java script and
CO 2	DHTML.
CO 3	Students will be able to write a well formed / valid XML document.
CO 4	Students will be able to connect a java program to a DBMS and perform insert,
CO 5	DHTML update and delete operations on DBMS table.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium		-	High	Medium	-	-	-	-	High	-	-
CO- 2	-	-	-	High	High	-	-	-	-	Low		-
CO- 3	Low	-	Medium		Medium	-	Medium	Medium	-	High		-
CO- 4	High	Medium	High		Low	Medium	Medium	-	Medium	High	Medium	Medium
CO- 5	-	Medium	Medium	High	High	Medium	Medium	-	Medium	High	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Computer Graphics and Visulization	**Course code**	**23040506**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	-	High	-	Medium
CO- 2	Medium	Medium	-	High	High	-	-	-	-	Low	Medium	Medium
CO- 3	High	Medium	Medium	-	-	-	Medium	Medium	-	-	Low	-
CO- 4	--	-	High	-	-	High	-	-	Medium	-	-	-
CO- 5	-	-	Medium	High	High	High	-	-	Medium	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	**CE**
Year:	3 Year	**Semester:**	**6**
Course title:	Wireless Network	**Course code**	**23040601**
Course type:	Engineering Science	**Course Credit**	**4**

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile devices with
CO 5	latest network strategies

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	-	High	Medium	-	-	-	-	High	-	-
CO- 2	High	Medium	-	High	High	Medium	-	-	-	Low	Medium	-
CO- 3	-	Medium	-	-	Medium	Medium	Medium	Medium	-	-	Medium	-
CO- 4	-	-	-	-	Low	-	--	Medium	Medium	-	Medium	Medium
CO- 5	High	-	Medium	High	High	-	-	Medium	Medium	-	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	6
Course title:	Compiler Design	**Course code**	**23040602**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	-	High	-	-
CO- 2		-	-	High	High	-	-	-	-	Low	Medium	-
CO- 3	High	-	Medium	-	Medium	-	Medium	Medium	-	-	Medium	Medium
CO- 4	-	Medium	High	-	Low	High	-	-	Medium	-	-	-
CO- 5	-	Medium	Medium	High	High	High	-	-	Medium	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	6
Course title:	Cloud Computing	**Course code**	**23040603**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	-	Medium	High	-	-	-	High	-	-
CO- 2	-	-	-	-	High	High	-	-	-	Low	Medium	-
CO- 3	-	-	-	-	Medium	-	Medium	Medium	-	-	Medium	Medium
CO- 4	High	Medium	-	-	Low	Medium	-	-	Medium	-	-	High
CO- 5	High	Medium	Medium	High	High	High	-	-	Medium	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	6
Course title:	Data Mining and Warehousing	**Course code**	**23040604**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Be familiar with mathematical foundations of data mining tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	data mining discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	data mining, classification and clustering.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	-	High	-	Medium
CO- 2	-	-	-	High	High	-	-	-	-	Low	Medium	Medium
CO- 3	Medium	-	Medium		Medium	Medium	Medium	Medium	High	-	Medium	-
CO- 4	Medium	Medium	High		Low	High	-	-	High	Medium	-	
CO- 5	-	Medium	Medium	High	High	-	-	-		Medium	-	

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Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	6
Course title:	Advance JAVA	**Course code**	**23040606**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	Medium	-	High	Medium	-	-	-	Medium	High	-	-
CO- 2	-	-	-	High	High	-	-	-	Medium	Low	Medium	-
CO- 3	Medium	-	Medium	Medium	-	High	Medium	Medium	-	-	Medium	-
CO- 4	Medium	Medium	-	Low	-	High	-	-		-	-	High
CO- 5	-	Medium	-	High	High	High	-	-		-	-	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	5
Course title:	Power Electronics	**Course code**	23050501
Course Type:	Professional Core	**Course credit:**	4

Course Outcome: -

CO - STATEMENTS

CO 1	Explain the construction and characteristics of Power semiconductor devices
CO 2	Analyze, operate and design ac-to-dc converters.
CO 3	Analyze, operate and design dc-to-dc converters.
CO 4	Apply the knowledge of power electronic converter for speed control of DC motors.
CO 5	Simulate power electronic converters and their control scheme.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	5
Course title:	Microprossessor & Microcontroller archietechture & interfacing	**Course code**	23050505
Course type:	Professional Core	**Course credit:**	5

Course Outcome: -

CO STATEMENTS

CO 1	Apply the concept of buses, microprocessor architecture and interrupts.
CO 2	Interface memory and I/O devices with 8 bit microprocessor/microcontroller
CO 3	Describe 8 bit microcontroller architecture-of MCS -51 family
CO 4	Program assembly language programming/ C programming of 8051
CO 5	Design microcontroller based small system

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	5
Course title:	Power System - I	**Course code**	23050502
Course type:	Professional Core	**Course credit:**	3

Course Outcome: -

CO STATEMENTS

CO 1	Understand Supply Systems. Explain mechanical design of transmission line
CO 2	Calculation of line parameters (Resistance, inductance and capacitance
CO 3	Describe underground cables
CO 4	Compare DC and AC distribution
CO 5	Explain the representation of different power system components and loading capability of a generator

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	5
Course title:	Elements of Electrical Design	**Course code**	23050504
Course type:	Professional Core	**Course credit:**	3

Course Outcome: -

CO STATEMENTS

CO 1	Explain the basic concepts related to design of electrical equipments.
CO 2	Design the starters, field regulators, small transformers and choke coils.
CO 3	Draw and explain the winding diagrams for AC and DC machines.
CO 4	Estimate the cost of wirings.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

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Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	5
Course title:	Control System Engineering	**Course code**	23050503
Course type:	Professional core	**Course credit:**	5

Course Outcome: -

CO STATEMENTS

CO 1	Apply systems theory to complex real world problems in order to obtain models that are expressed using differential equations, transfer functions, and state space equations .
CO 2	Predict system behavior based on the mathematical model of that system where the model may be expressed in time or frequency domain
CO 3	Analyze the behavior of closed loop systems using tools such as root locus, Routh Hurwitz, Bode, Nyquist, and Matlab
CO 4	Design controllers using classical PID methods, root locus methods, and frequency domain methods
CO 5	Devise a safe and effective method of investigating a system identification problem in the lab
CO-6	Write a report that effectively communicates the results of an analysis or design.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low
CO- 6	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Utilization of electrical energy & traction	**Course code**	23050605
Course type:	Professional core	**Course credit:**	3

Course Outcome: -

CO STATEMENTS

CO 1	Understand the power electronics technology in efficient utilization of electrical power
CO 2	Apply power electronics technology in efficient utilization of electrical power
CO 3	Analyze effective utilization of Power Electronic Technologies in Electrical Traction.
CO 4	Evaluate the use of Power Electronic Technologies in various process control.
CO 5	Create lighting system using LED Technologies.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Industrial automation	**Course code**	23050601
Course type:	Professional core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	To identify potential areas for automation and justify need for automation
CO 2	To select suitable major control components required to automate a process or an activity
CO 3	To translate and simulate a real-time activity using modern tools and discuss the benefits of automation.
CO 4	To identify suitable automation hardware for the given application.
CO 5	To recommend appropriate modeling and simulation tool for the given manufacturing application

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	High voltage Engineering	**Course code**	23050604
Course type:	Professional core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand the basic generation and measurement of High voltage
CO 2	Analyze High current for testing purposes
CO 3	Comprehend Breakdown phenomenon in air, solid and liquid insulation
CO 4	Test high voltage electrical Equipment with various testing devices

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Electrical Power System - II	**Course code**	23050602
Course type:	Professional core	**Course credit:**	3

Course Outcome: -

CO STATEMENTS

CO 1	Analyze the performance of Short and Medium transmission line.
CO 2	Describe the symmetrical components and its applications.
CO 3	Analyze Symmetrical and Unsymmetrical faults in power systems.
CO 4	Describe transients in power systems.
CO 5	Describe corona effect

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Design of DC machine & Transformer	**Course code**	23050603
Course type:	Professional core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Design the DC machine of given specifications.
CO 2	Design the transformers of given specifications.
CO 3	Prepare the detailed sketches of the designed machines.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Control of Electrical Drives	**Course code**	**23050607**
Course type:	Department Elective -I	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Select a drive for a particular application based on power rating.
CO 2	Select a drive based on mechanical characteristics for a particular drive application.
CO 3	Operate and maintain solid state drives for speed control of DC and AC machines.
CO 4	Operate and maintain solid state drives for speed control of various special electrical machines.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	3rd Year	**Semester:**	6
Course title:	Advance Microcontroller	**Course code**	**23050606**
Course type:	3rd Year	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand how microcontroller and its peripherals function.
CO 2	Interface to external peripherals
CO 3	Program an embedded system in assembly and C
CO 4	Design, implement and test a single-processor embedded systems for real-time applications
CO 5	Optimizing embedded software for speed and size for industrial applications

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Bachelor of Engineering	**Semester:**	5
Year:	3rd Year	**Course code**	23030501
Course title:	Highway Engineering	**Course credit:**	4

CO 1	Design a flexible pavement for a highway
CO 2	Select a suitable alignment for a highway
CO 3	Evaluate a highway link in terms of its impact on the existing network
CO 4	Forecast future traffic flows along highway links
CO 5	Demonstrate an understanding of the appraisal process for a highway
CO 6	Analyze highway links and intersections in terms of their capacity
CO 7	Geometrically design the alignment of a highway
CO 8	Plan an earthworks programme
CO 9	Describe different highway structures, the methods by which they are analysis and constructed
CO 10	Design a highway drainage system

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Gandhinagar,Gujarat, INDIA 382420 Phone: 095123 43333

CO	CO – PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Low	Low	High	High	Medium	High	Low	Low	High	High
CO- 2	Medium	High	Medium	Low	Medium	Low	Low	Medium	High	Medium	Low	Low
CO- 3	High	High	Low	Low	High	Medium	High	High	Low	Low	Medium	Medium
CO- 4	Medium	Medium	High	Medium	Low	High	Medium	High	Medium	Low	High	Low
CO- 5	Low	High	Low	Low	High	High	High	Low	Low	Medium	High	Medium
CO- 6	High	High	Low	Medium	Medium	Medium	High	Low	Medium	High	High	Medium
CO- 7	Medium	High	Low	High	Low	Low	High	High	Low	Low	High	High
CO- 8	High	Medium	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low
CO- 9	Medium	Medium	Low	Medium	High	Medium	High	Low	Medium	High	High	Medium
CO- 9	High	High	Low	Low	High	High	High	Low	Medium	High	High	High

Asst. Prof. Dhwani Joshi

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	5
Year:	3rd Year	**Course code**	23030502
Course title:	Environmental Engineering	**Course credit:**	4

CO 1	Know the role of microorganisms in various components of environments
CO 2	Understand the quality and characteristics of waste water
CO 3	Understand and design solid waste management system
CO 4	Understand various types of pollution
CO 5	Understand various environmental Acts.
CO 6	Determine various water/air quality parameters

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	Medium	High	Low	Medium	Medium	Medium	High	Low	Medium	Low
CO- 2	Medium	High	Low	Medium	High	High	Medium	Low	Medium	High	High	Low
CO- 3	Medium	Low	Medium	Low	Medium	Medium	High	Medium	Low	Medium	High	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	Low	Medium	Low
CO- 5	Medium	High	Low	Medium	Medium	Medium	High	Low	Low	Medium	High	Medium
CO- 6	Low	Medium	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Medium

Ass. Prof. Dhwani Joshi

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	5
Year:	3rd Year	**Course code**	23030503
Course title:	Theory of Structure-II	**Course credit:**	5

CO 1	Apply equilibrium and compatibility equations to determine response of statically determinate and indeterminate structures.
CO 2	Determine displacements and internal forces of statically indeterminate structures by classical, iterative and matrix methods.
CO 3	Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	Medium	High	Low	High	Medium	Medium	Medium	Medium	Medium	Medium
CO- 2	Low	High	Low	Low	Medium	Medium	Low	Low	Low	Medium	High	Medium
CO- 3	Low	High	Low	High	Medium	Low	High	Low	High	Low	Low	High

Ass. Prof. Dhwani Joshi

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	5
Year:	3rd Year	**Course code**	23030504
Course title:	Geotechnical Engineering	**Course credit:**	4

CO 1	To know various index (preliminary) and engineering properties of soil, its determination through various methodology and application for design of shallow and deep foundation systems for various civil engineering structures.
CO 2	Give Knowledge of various topics like compaction, shear strength, consolidation, earth pressure, stress distribution which gives insight to students to analyise soil parameters based on application and need of project site.
CO 3	The course will also develop understanding about soil testing procedures, experimentation techniques and related issues. Simulation of mechanics on soil as a material to understand its behaviour before failure and estimating its permissible values.
CO 4	The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	Medium	Low	Medium	High	Medium	Medium	Low	Medium	High	Medium
CO- 2	High	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	Low	Medium	Low
CO- 3	Medium	High	Low	High	Medium	Medium	High	Low	High	Medium	High	Medium
CO- 4	Low	Medium	High	High	Low	Low	High	Medium	High	Low	Medium	Medium

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Program:	Bachelor of Engineering	**Semester:**	5
Year:	3rd Year	**Course code**	23030505
Course title:	Hydrology and Water Resource Engineering	**Course credit:**	4

CO 1	Compute mean precipitation from a catchment
CO 2	Compute mean precipitation from a catchment
CO 3	Calculate runoff from a catchment
CO 4	Compute peak flood flow
CO 5	Compute reservoir capacity using mass curve
CO 6	Compute dependable flow using flow duration curve for the requirement of irrigation, power generation etc.
CO 7	Basic idea about reservoir sedimentation and its control
CO 8	Compute the capacity of well
CO 9	Estimation of design flood for the design of hydraulic structure
CO 10	Measures of water conservation to battle drought

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CO	CO – PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	Low	Medium	High	High	Medium	High	Medium	Low	High	High
CO- 2	Low	Medium	High	Medium	Low	Low	Low	Medium	High	Medium	Low	Low
CO- 3	High	High	Medium	Low	Medium	Medium	High	High	Low	Low	Medium	High
CO- 4	Medium	High	Medium	Low	High	Low	Medium	High	Medium	Low	High	Low
CO- 5	High	Low	Low	Medium	High	Medium	High	Low	Low	Medium	High	High
CO- 6	High	High	Medium	Medium	Medium	Medium	High	High	Low	Low	High	High
CO- 7	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	High	Low
CO- 8	High	Medium	Medium	High	High	Low	High	High	Low	Low	High	Medium
CO- 9	Medium	Medium	Low	High	High	Medium	Medium	Medium	High	Medium	Low	High
CO- 9	High	High	Low	Low	High	High	Low	High	Low	Low	High	High

Ass. Prof. Dhwani Joshi

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Bachelor of Engineering	**Semester:**	6
Year:	3rd Year	**Course code**	23030601
Course title:	Water and Waste water Engineering	**Course credit:**	4

CO 1	Design the water supply and wastewater treatment systems.
CO 2	Determine the treatment efficiency of treatment units

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Medium	Medium	Medium	Medium	High	High	Low	Low	High	High
CO- 2	High	Medium	Medium	High	High	Low	High	High	Low	Low	High	Medium

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Program:	Bachelor of Engineering	**Semester:**	6
Year:	3rd Year	**Course code**	23030602
Course title:	Design of Reinforced Concrete Structure	**Course credit:**	5

CO 1	Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
CO 2	Design and draw flat slab as per code provisions
CO 3	Design and draw reinforced concrete and steel water tanks
CO 4	Apply the concept of earthquake resistant design in the building.
CO 5	Assess loads, prepare layout, analyse, design and detail of various structural elements for RC framed structure up to G+3.
CO 6	Identify the typical failure modes of RC building, retaining walls, water tanks, flat slabs & prestressed concrete sections.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Low	Medium	Medium	High	Low	Low	Medium	Medium	Low	Low	Medium	Medium
CO- 2	High	High	Low	Medium	High	High	Medium	Low	Medium	High	High	Low
CO- 3	Medium	Low	Medium	Low	Medium	High	High	High	Low	High	Low	Medium
CO- 4	High	Medium	Low	Medium	Low	High	Low	Medium	Low	Low	Medium	Low
CO- 5	Low	High	Medium	Low	Medium	Medium	High	Low	Low	Medium	High	Medium
CO- 6	Low	Medium	High	High	Low	Low	Medium	High	High	Low	Low	Medium

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Program:	Bachelor of Engineering	**Semester:**	6
Year:	3rd Year	**Course code**	23030603
Course title:	Railway Bridge and Tunnel Engineering	**Course credit:**	3

CO 1	Identify the components of railway tracks.
CO 2	Maintain the railway tracks.
CO 3	The students will gain an experience in the implementation of Railway, Bridge and Tunnel Engineering on engineering concepts which are applied in field of Transportation Engineering.
CO 4	Diagnose the condition of bridge.
CO 5	Maintain different types of railway bridges and their components.
CO 6	Maintain different types of tunnels.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	Medium	Low	Low	High	High	Medium	Low	Medium	Medium	High
CO- 2	Low	High	Low	Medium	High	High	Medium	Low	Medium	High	High	Low
CO- 3	Medium	Low	Medium	Low	High	High	High	High	Low	High	Low	Low
CO- 4	Low	Medium	Low	Medium	Low	High	Low	Medium	Low	Low	Medium	Low
CO- 5	High	Low	Medium	Low	Medium	Medium	Low	Low	Low	Low	High	High
CO- 6	High	Medium	High	High	Low	Low	Medium	High	High	Low	Low	Medium

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SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	6
Year:	3rd Year	**Course code**	23030604
Course title:	Advanced Construction Equipment	**Course credit:**	3

CO 1	Supervise the heavy construction sites.
CO 2	Understand the working principle and use of various equipments
CO 3	Select appropriate construction equipments for desired construction works.
CO 4	Execute the operations of Demolition of structures with safety.
CO 5	Erect the false work for Bridges and form work for Heavy structures

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Low	High	Medium	High	Medium	Medium	High	Low	High	Medium	Medium
CO- 2	High	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	Low	Medium	Low
CO- 3	High	Medium	High	Low	Medium	Medium	Low	Medium	High	High	Low	Low
CO- 4	Low	Medium	High	High	Low	Low	High	Medium	High	Low	Medium	Medium
CO- 5	Low	Medium	High	High	Low	Low	High	Medium	High	Low	Medium	Medium

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SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	6
Year:	3rd Year	**Course code**	23030605
Course title:	Professional Practice and Valuation	**Course credit:**	4

CO 1	Calculate the estimated cost of any proposed civil engineering structure and The value of any old structure
CO 2	Apply the software for working out quantities of items of civil works.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	Medium	Medium	Medium	Medium	Medium	High	Low	Low	Medium	High
CO- 2	Low	High	Medium	High	High	Low	Low	High	Low	Low	High	High

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SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Object Oriented Programming with JAVA	**Course code**	**23040501**
Course type:	Engineering Science	**Course Credit**	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	-	-	-
CO- 2	Medium	Medium	Low	-	High	-	Medium	Medium	-	-	High	-
CO- 3	-	-	-	Medium	Medium	-	High	Medium	-	-	High	-
CO- 4	-	-	-	Medium	Low	-	-	-	-	-	-	High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Computer Graphics and Visualization	**Course code**	**23040506**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	-	-	High
CO- 2	-	Medium	Low	-	-	High	Medium	-	Medium	-	High	High
CO- 3	Medium	-	-	Medium	-	Medium	High	-	Medium	-	High	-
CO- 4	-	-	-		-	Low	-	-	-	Medium	-	-
CO- 5	High	Medium	Medium		High	-	-	-	-	High	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Information Network & Cyber Security	**Course code**	**23040503**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	-	High	-	-	-	-	-	-	-	-	-
CO- 2	Medium	-	Low	-	-	-	Medium	Medium	Medium	-	High	High
CO- 3	-	-	-	Medium	Medium	-	High	Medium	High	-	High	High
CO- 4	-	High	-	Medium	Low	-	-	-	-	Medium	-	-
CO- 5	-	Medium	Medium	High	High	-	-	-	-	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	IT Industry Management with ERP	**Course code**	**23080501**
Course type:	Engineering Science	**Course Credit**	3

CO 1	Identify some of the factors driving the need for IT Industry Managementwith ERP.
CO 2	Identify and classify particular examples of IT Industry Managementwith ERP.
CO 3	Define the terms IT Industry Managementwith ERP.
CO 4	Identify physical points IT Industry Managementwith ERP in simple web technology.
CO 5	Identify the need for IT Industry Managementwith ERP.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High		Medium	-	-	Medium	-	Medium	-	-
CO- 2	- Medium	Medium	Low		Medium	-	Medium	Medium	-	-	High	High
CO- 3	-			Medium		-	High	Medium	-	-	High	High
CO- 4	-			Medium	Low	-	-	-	High	-	-	--
CO- 5	High	Medium	Medium	High	High	-	-	-	Medium	-	High	-

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Year:	3 Year	**Semester:**	5
Course title:	Image Processing	**Course code**	**23040507**
Course type:	Engineering Science	**Course Credit**	4

CO 1	To provide a contemporary and forward-looking on the theory and practice of
CO 2	Enterprise Resource Planning Technology.
CO 3	To focus on a strong emphasis upon practice of theory in Applications and Practical-
CO 4	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
CO 5	To train the students to develop the basic understanding of how ERP enriches the

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	Low	-	-		High
CO- 2	Medium	Medium	Low	Medium	High	-	Medium	Medium	-	Medium	High	High
CO- 3	High	-	-	Low	-	Low	High	Medium	-	Medium	High	
CO- 4	--	-	-	-	-	-	-	-	-	High		
CO- 5	-	Medium	Medium	-	High	Low	-	-	-	-		Low

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Program:	Bachelor of Engineering	**Branch:**	**IT**
Year:	3 Year	**Semester:**	**6**
Course title:	Wireless Network	**Course code**	**23040601**
Course type:	Engineering Science	**Course Credit**	**4**

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile deviITs with
CO 5	latest network strategies

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1		Medium	High	Medium	Medium	-	-	-	-	-		High
CO- 2		Medium	Low	Medium	High	-	Medium	Medium	-	-	High	High
CO- 3	Medium	-	-	-	Medium	-	High	Medium	-	-	High	
CO- 4	Medium	-	-	-	-	-	-	-	Low	-		
CO- 5	High	Medium	Medium	High	-	-	-	-	High	-		

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Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Compiler Design	**Course code**	**23040602**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	High		Medium	-	-	-	-	-	-	-
CO- 2	-	Medium	Low	High	-	-	Medium	Medium	-	-	High	-
CO- 3	-	Medium	-	Medium	-	-	High	Medium	-	-	High	High
CO- 4	-	-	-	-	Low	-	-	-	Medium	-	-	High
CO- 5	High	Medium	Medium	High	High	-	-	-	Medium	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Cloud Computing	**Course code**	**23040603**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	Medium	-	-	-
CO- 2	Medium	Medium	-	Low	High	-	Medium	Medium	Low	-	High	
CO- 3	-	-	Medium	-	-	-	High	Medium	-	-	High	
CO- 4	-	-	Medium	-	-	-	-	-	-	-		High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-		High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Data Mining and Warehousing	**Course code**	**23040604**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Identify some of the factors driving the need for data mining.
CO 2	Identify and classify particular examples of data mining.
CO 3	Define the terms data mining.
CO 4	Identify physical points data mining in simple web technology.
CO 5	Identify the need for data mining.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	-	Medium	Medium	-	-	-	-	-	-
CO- 2	Medium	Medium	Low	-	High	Medium	Medium	Medium	Medium	-	High	-
CO- 3	-	-	-	Medium	Medium	-	High	Medium	Medium	-	High	-
CO- 4	-	-	-	Medium	Low	-	-	-	-	Medium		High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	Medium		High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Advance JAVA	**Course code**	**23040606**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	Medium	-	-
CO- 2	Medium	Medium	Low	-	High	-	Medium	Medium	-	High	High	High
CO- 3	-	-	-	Medium	Medium	-	High	Medium	Medium	-	High	High
CO- 4	-	-	-	Medium	Low	-	-	-	Medium	-		-
CO- 5	High	Medium	Medium	High	High	-	-	-		-		-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Object Oriented Programming with JAVA	**Course code**	**23040501**
Course type:	Engineering Science	**Course Credit**	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	-	-	-
CO- 2	Medium	Medium	Low	-	High	-	Medium	Medium	-	-	High	-
CO- 3	-	-	-	Medium	Medium	-	High	Medium	-	-	High	-
CO- 4	-	-	-	Medium	Low	-	-	-	-	-	-	High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Computer Graphics and Visualization	**Course code**	**23040506**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	-	-	High
CO- 2	-	Medium	Low	-	-	High	Medium	-	Medium	-	High	High
CO- 3	Medium	-	-	Medium	-	Medium	High	-	Medium	-	High	-
CO- 4	-	-	-		-	Low	-	-	-	Medium	-	-
CO- 5	High	Medium	Medium		High	-	-	-	-	High	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	Information Network & Cyber Security	**Course code**	**23040503**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	-	High	-	-	-	-	-	-	-	-	-
CO- 2	Medium	-	Low	-	-	-	Medium	Medium	Medium	-	High	High
CO- 3	-	-	-	Medium	Medium	-	High	Medium	High	-	High	High
CO- 4	-	High	-	Medium	Low	-	-	-	-	Medium	-	-
CO- 5	-	Medium	Medium	High	High	-	-	-	-	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	5
Course title:	IT Industry Management with ERP	**Course code**	**23080501**
Course type:	Engineering Science	**Course Credit**	3

CO 1	Identify some of the factors driving the need for IT Industry Managementwith ERP.
CO 2	Identify and classify particular examples of IT Industry Managementwith ERP.
CO 3	Define the terms IT Industry Managementwith ERP.
CO 4	Identify physical points IT Industry Managementwith ERP in simple web technology.
CO 5	Identify the need for IT Industry Managementwith ERP.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High		Medium	-	-	Medium	-	Medium	-	-
CO- 2	- Medium	Medium	Low		Medium	-	Medium	Medium	-	-	High	High
CO- 3	-			Medium		-	High	Medium	-	-	High	High
CO- 4	-			Medium	Low	-	-	-	High	-	-	--
CO- 5	High	Medium	Medium	High	High	-	-	-	Medium	-	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Year:	3 Year	**Semester:**	5
Course title:	Image Processing	**Course code**	**23040507**
Course type:	Engineering Science	**Course Credit**	4

CO 1	To provide a contemporary and forward-looking on the theory and practice of
CO 2	Enterprise Resource Planning Technology.
CO 3	To focus on a strong emphasis upon practice of theory in Applications and Practical-
CO 4	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
CO 5	To train the students to develop the basic understanding of how ERP enriches the

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	Low	-	-		High
CO- 2	Medium	Medium	Low	Medium	High	-	Medium	Medium	-	Medium	High	High
CO- 3	High	-	-	Low	-	Low	High	Medium	-	Medium	High	
CO- 4	--	-	-	-	-	-	-	-	-	High		
CO- 5	-	Medium	Medium	-	High	Low	-	-	-	-		Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	**IT**
Year:	3 Year	**Semester:**	**6**
Course title:	Wireless Network	**Course code**	**23040601**
Course type:	Engineering Science	**Course Credit**	**4**

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile deviITs with
CO 5	latest network strategies

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1		Medium	High	Medium	Medium	-	-	-	-	-		High
CO- 2		Medium	Low	Medium	High	-	Medium	Medium	-	-	High	High
CO- 3	Medium	-	-	-	Medium	-	High	Medium	-	-	High	
CO- 4	Medium	-	-	-	-	-	-	-	Low	-		
CO- 5	High	Medium	Medium	High	-	-	-	-	High	-		

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Compiler Design	**Course code**	**23040602**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	High		Medium	-	-	-	-	-	-	-
CO- 2	-	Medium	Low	High	-	-	Medium	Medium	-	-	High	-
CO- 3	-	Medium	-	Medium	-	-	High	Medium	-	-	High	High
CO- 4	-	-	-	-	Low	-	-	-	Medium	-	-	High
CO- 5	High	Medium	Medium	High	High	-	-	-	Medium	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Cloud Computing	**Course code**	**23040603**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	-	-	Medium	-	-	-
CO- 2	Medium	Medium	-	Low	High	-	Medium	Medium	Low	-	High	
CO- 3	-	-	Medium	-	-	-	High	Medium	-	-	High	
CO- 4	-	-	Medium	-	-	-	-	-	-	-		High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-		High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Data Mining and Warehousing	**Course code**	**23040604**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Identify some of the factors driving the need for data mining.
CO 2	Identify and classify particular examples of data mining.
CO 3	Define the terms data mining.
CO 4	Identify physical points data mining in simple web technology.
CO 5	Identify the need for data mining.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	-	Medium	Medium	-	-	-	-	-	-
CO- 2	Medium	Medium	Low	-	High	Medium	Medium	Medium	Medium	-	High	-
CO- 3	-	-	-	Medium	Medium	-	High	Medium	Medium	-	High	-
CO- 4	-	-	-	Medium	Low	-	-	-	-	Medium		High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	Medium		High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	3 Year	**Semester:**	6
Course title:	Advance JAVA	**Course code**	**23040606**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	Medium	High	-	Medium	-	-	-	-	Medium	-	-
CO- 2	Medium	Medium	Low	-	High	-	Medium	Medium	-	High	High	High
CO- 3	-	-	-	Medium	Medium	-	High	Medium	Medium	-	High	High
CO- 4	-	-	-	Medium	Low	-	-	-	Medium	-		-
CO- 5	High	Medium	Medium	High	High	-	-	-		-		-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	5
Course title:	Chemical Engineering Thermodynamics-II	**Course code**	23020501
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** bubble point, dew point, Azeotrope and flash condition in vapour -liquid system
CO2	Compute phase equilibrium data and **interpret** P-x-y, T-x-y diagram for ideal vapour-liquid systems.
CO3	**Identify**dew point and bubble point surfaces, the critical locus, and pure species vapor-pressure curves that make up a vapor/liquid phase envelope when presented in a *PT xy* diagram.
CO4	**Analyze**phase equilibrium using activity coefficient models and/or Equation of state models.
CO5	**Determine** equilibrium composition of a mixture of gases undergoing one or more chemical reactions
CO6	**Estimate**equilibrium conversion in reversible reactions and solve problems related to reaction equilibria.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Low	–	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	5
Course title:	Mass Transfer Operation-I	**Course code**	23020502
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** the basic principles of diffusion, mass transfer theories and interphase mass transfer
CO2	**Explain** the principles of diffusion and mass transfer operations like distillation, absorption and stripping
CO3	**Apply** principles related to diffusion, distillation, absorption and stripping.
CO4	**Analyze** the problems related to diffusion, distillation, absorption and stripping
CO5	**Justify** the applications of theory learned in industrial practices regarding diffusion, distillation and absorption.
CO6	**Design** columns related to diverse mass transfer operations like distillation, absorption and stripping.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Low	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	5
Course title:	Instrumentation and Process Control	**Course code**	23020503
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Defining** and identifying dynamical processes and their block diagram representation using transfer functions
CO2	**Explain** Laplace transforms, inverse Laplace transforms of various signals, and, expressing response of first and second order processes using Laplace transformation
CO3	**Develop** the knowledge of Process control with Instrumentation with main focus on various sensors such as flow, pressure and temperature sensors.
CO4	Integrating complex block diagram systems to a simple form and **examining** the controller actions such as Proportional (P), Proportional-integral (PI) and Proportional-integral-derivative (PID).
CO5	**Explaining** the stability of control processes and estimating the stability by Routh's test and tuning of controllers using stability criterion
CO6	Measuring frequency response problems and **predicting** stability in frequency domain by means of Bode plots.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	5
Course title:	Mechanical Operation	**Course code**	23020504
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Choose** the techniques of mechanical operations to meet the need of chemical Industries.
CO2	**Understanding** fluid flow through packed and fluidized beds.
CO3	Able to **identify** the different types of mixing, agitation and conveying of solids and estimating the power requirement.
CO4	Ability to **classify** suitable size reduction equipment and solid-solid separation method.
CO5	**Determination** of the static and dynamic principles of separation for ores in chemical industries.
CO6	**Design** of filtration equipment by considering constant and variable pressure governing equations.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Low	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	–	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Mass Transfer Operation-II	**Course code**	23020602
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** the basic principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO2	**Explain** the principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO3	**Apply** principles related to extraction, adsorption, humidification, de-humidification and drying.
CO4	**Analyze** the problems related to extraction, adsorption, humidification, de-humidification and drying.
CO5	**Justify** the applications of theory learned in industrial practices regarding extraction, adsorption, humidification, and dehumidification and drying.
CO6	**Design** mass transfer equipments based upon the conditions given in the problem statement.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Low	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Process Equipment Design-I	**Course code**	23020601
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** the basics of chemical process equipment design
CO2	**Explain** the sizing calculations of pipes, heat transfer and mass transfer equipment
CO3	**Apply** the fundamental understanding the complexity of the design
CO4	**Analyze** critically the design criteria for the optimum design
CO5	**Recommend** the international standards, fabrication and testing methods
CO6	**Design** the various equipments used in chemical process industries.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Low	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	High	-	-	-	-	-	High	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Pollution Control and Safety Management	**Course code**	23020604
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Define** the safety principles & standards, loss statistics, toxic substance & hazard and industrial hygiene.
CO2	**Classify** measures to diminish risk and execution of safety and industrial hygiene.
CO3	**Apply** knowledge in risk analysis through FTA, ETA, QRA, LOPA and BTA.
CO4	**Examine** industrial safety & hygiene identification, evaluation and control
CO5	**Assess** characteristic sources of risk in a process plant by learning from case studies
CO6	**Estimate** fire & explosion hazard and their evaluation and prevention & control.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Low	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Chemical Reaction Engineering - I	**Course code**	23020605
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Relate** to the basics of kinetics and basic theories to get the underlying mechanisms
CO2	**Interpret** and evaluate the rate data and get the kinetics parameters
CO3	**Select** proper design equations and perform reactor sizing for ideal reactors
CO4	**Examine** the suitable combinations of ideal reactors for optimal performance
CO5	**Decide** the reactor sequencing for single and multiple reactions towards desired products
CO6	**Design** ideal reactor systems based on experimental data and optimize its performance.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	High	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	High	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Advanced Separation Techniques	**Course code**	23020606
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** the basic principles of different separation processes.
CO2	**Explain** the complete details including problem-solving approach and the applications of theory learned regarding SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO3	**Apply** the principles of separation processes like SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO4	**Analyze** the problems related to SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO5	**Estimate** desired separation from the give separation processes.
CO6	**Design** separation modules based upon the conditions given in the problem statement.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	–	High	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	3rd Year	**Semester:**	6
Course title:	Biochemical Engineering	**Course code**	23020603
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Define** various mass transfer and reaction engineering aspects of enzyme inhibition and immobilization
CO2	**Illustrate** the different mechanism of separation of soluble and insoluble biochemical products
CO3	**Identify** and outline the various modelling strategies to express the kinetics of enzyme catalyzed reaction.
CO4	**List** the various applications of biochemical engineering in allied chemical and energy sector
CO5	**Determine** the various reactor configurations as well as to implement the design fundamentals of bioreactors.
CO6	**Discuss** the conversion processes of the various industrially important biochemical products.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Low	-	-	-	-	-	-	-	-	-	-

B. Tech CO mapping from academic year 2019-2020

Environmental engineering

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	V
Course title:	Advanced Environmental Instrumentation	**Course code**	24100501
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Show** that you can use a high-tech analytical instrument to measure contaminants at the micro level.
CO2	**Demonstrate** the ability to use and calibrate analytical tools such as an Ion selective meter and TOC analyzer.
CO3	**Analyze** the data using statistical methods.
CO4	**Apply** the instrumental analysis method.

CO-PO Mapping: -

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	V
Course title:	Physico - Chemical Treatment Technologies	**Course code**	**24100502**
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Choose** the most effective amount of chemical coagulation and disinfectants.
CO2	**Relate** the parameter with types of treatment required and identify the type of treatment required.
CO3	**Identify** the physical and chemical treatment units.
CO4	**Evaluate** the removal efficiency of physic-chemical treatment units.
CO5	**Justify** the type of disinfection process for treatment of water.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	High	-	-	-	Low	-	-	-	Medium	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	V
Course title:	Municipal and Industrial Solid Waste Management	**Course code**	**24100503**
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** solid waste's predicament and the useful component of a system for managing hazardous and solid waste**.**
CO2	**Classify** the sources, types, composition and quantities of solid waste.
CO3	**Identify** the physical, biological and chemical properties of solid waste.
CO4	**Take** measure to collection, transfer, transport, separated and process of solid and hazardous waste.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	V
Course title:	Municipal Engineering	**Course code**	24100504
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Identify** the source of water and evaluate resource in term of quantity and quality.
CO2	**Identify** the type of sewers and sewer appurtenances.
CO3	**Determine** the water demand by projecting future population growth.
CO4	**Plan** the components of water supply scheme including pipe network, distribution system, valves and fitting.
CO5	**Determine** the amount of storm and sanitary sewage.
CO6	**Design** the components of sewer system.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Biological Processes For Wastewater Treatment	**Course code**	24100601
Course type:	Engineering Science	**Course credit:**	5

Course outcome:

No.	Outcome
CO1	**Define** the basic principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO2	**Explain** the principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO3	**Apply** principles related to extraction, adsorption, humidification, de-humidification and drying.
CO4	**Analyze** the problems related to extraction, adsorption, humidification, de-humidification and drying.
CO5	**Justify** the applications of theory learned in industrial practices regarding extraction, adsorption, humidification, and dehumidification and drying.
CO6	**Design** mass transfer equipments based upon the conditions given in the problem statement.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	medium	medium	medium	-	-	-	-	-	-	medium	Low	-	-
CO-4	-	-	medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	medium	-	-	-	-	-	medium	--	-
CO-6	Low	-	-	-	medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Process Equipment Design-I	**Course code**	24100602
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Apply** fundamental concepts of microbiology in biological treatment process of waste water.
CO2	**Develop** the reaction rate kinetics for biological treatment.
CO3	**Determine** the size of the biological treatment units.
CO4	**Determine** the amount of organic pollutants that are found in waste water.
CO5	**Give** differences between aerobic and anaerobic treatment, process suspended growth and attached growth process.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Environmental Resources	**Course code**	24100604
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Utilize** and arrange environmental resources sustainably and optimally.
CO2	Disseminates learnt **information** related to subject orally and in written from through presentation and report.
CO3	**Utilize** population theories and various population forecasting formulas to project the population.
CO4	**Discuss** the concern and appreciate importance of depletion of resource and their sustainability.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Ground water contamination	**Course code**	24100605
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Explain** the groundwater conservation mechanisms.
CO2	**Apply** the laws of ground water hydraulic and solve the difference equation for different types of aquifer.
CO3	**Identify** the resource of ground water contaminate and suggest the remedial and preventive measures to overcome ground water contaminate.
CO4	**Utilize** the groundwater flow models and implement them to reduce or eliminate contamination of groundwater and its conveyance.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	medium	medium	medium	-	-	-	-	-	-	medium	Low	-	-
CO-4	-	-	medium	-	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Fundamentals of air pollution	**Course code**	24100603
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Relate** the various atmospherics stability condition with different plume behaviors.
CO2	**Relate** historic air pollution events, air quality legislation and relevant international protocols.
CO3	**Develop** plans to monitor, control, and reduce pollution.
CO4	**Examine** the effects of air pollution on materials, vegetation, and human health.
CO5	**Determine** the relative concentrations of various air pollutants in ambient air and stack gases.
CO6	**Calculated** the atmospheric dispersion of discharge from both point and area side sources.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	3rd Year	**Semester:**	VI
Course title:	Design of water treatment unit	**Course code**	24100602
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Choose** the flow measuring device.
CO2	**Identify** the source of water and select the treatment scheme based on the source selected.
CO3	**Identify** the different type of aeration system, rapid mixers, and flocculation and choose the relevant type for water treatment.
CO4	Decide the layout and hydraulic profile of water treatment plants.
CO5	**Design** sedimentation tank, clariflocculator, and filtration system and disinfection units for conventional water treatment plan.
CO6	Prepare a detailed working drawing of the **designed** units and **Design** treatment units for special water treatment.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	5

Course title:	Fluid Mechanics	**Course code**	23090501
Course type:	Core	**Course credit:**	5

CO-1	To understand fluids and its properties.
CO-2	Understand laminar and turbulent flow through pipes and parallel plates.
CO-3	Understand various types of flow, Mass Momentum and energy conservation and related equations.
CO-4	Explain various applications of Bernoulli's Equation, Notches and Weirs, Orifices and Mouthpieces
CO-5	Understand different types of flow through pipes, Viscous and turbulent flow.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO-12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

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Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	5

Course title:	Design of Machine Elements	**Course code**	23090502
Course type:	Core	**Course credit:**	4

CO-1	Introduction to design, material and its properties.
CO-2	To design against fluctuating loads, S-N diagram, Soderberg and Gerber criteria.
CO-3	To design thin and spherical vessels.
CO-4	To understand design procedure of belt and chain drives.
CO-5	To understand different types of springs, stresses and different loading condition of spring.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	5

Course title:	Heat Transfer	**Course code**	23090503
Course type:	Core	**Course credit:**	3

CO-1	Explain the governing laws and modes of heat transfer
CO-2	Compute temperature distribution and heat transfer rate in steady and unsteady state heat conduction
CO-3	Interpret and analyse natural and forced convective heat transfer with dimensional analysis
CO-4	Analyse the performance of heat exchangers under different flow conditions using LMTD and NTU method.
CO-5	Analyse radiative heat transfer between two or more black/gray bodies

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	5

Course title:	Theory of Machines	**Course code**	23090504
Course type:	Core	**Course credit:**	3

CO-1	Explain Kinematic Chain, Mechanisms and their Inversions; analyze velocity and acceleration of various mechanisms.
CO-2	Solve problem-related to friction. Explain the principle and applications of clutch and brake.
CO-3	Explain the principle and applications of a gyroscope.
CO-4	To understand different types of Flywheel.
CO-5	To study about different types Governors and their force analysis.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	5

Course title:	Control Engineering	**Course code**	23090505
Course type:	Core	**Course credit:**	3

CO-1	Understand basic concepts of control system
CO-2	Modelling of Translational and rotational, mechanical, electrical and thermal system.
CO-3	To understand time response analysis and state space analysis.
CO-4	To understand different types of hydraulic and pneumatic control systems.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	High
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	High
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	Medium
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	5

Course title:	Case Study	**Course code**	23000027
Course type:	Core	**Course credit:**	3

CO-1	By analyzing case studies, students develop strategies to address complex problems.
CO-2	Students enhance their ability to gather, assess, and learn how to conduct thorough investigations into specific issues.
CO-3	Students learn to evaluate and synthesize information from various sources.
CO-4	Presenting findings and writing reports.
CO-5	Engaging in discussions are integral parts of case studies, helping students improve their ability to articulate their analysis and recommendations clearly.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High		
CO- 2	-	-	-	-	-	-	Medium	High	High	High		
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium		
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium		
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium		

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Dynamics of Machinery	**Course code**	23090601
Course type:	Core	**Course credit:**	3

CO-1	To understand about Balancing of Rotating Mass and Reciprocating Engines
CO-2	To describe free and forced vibration of systems.
CO-3	To derive equations of motion for two degree system and multidegree system.
CO-4	Introduction and understanding of vibration measurement and analysis devices/
CO-5	Dynamic analysis of force-closed cam follower.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Fluid Power Engineering	**Course code**	23090602
Course type:	Core	**Course credit:**	3

CO-1	Analyze and evaluate the performance of pumps and turbine.
CO-2	Analyze the performance curve and Cavitation in Pumps and Turbine
CO-3	Analysis of impact of jet.
CO-4	To understand components and working of reciprocating pumps.
CO-5	To understand, classify, and design different types of compressors.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Production Technology	**Course code**	23090603
Course type:	Core	**Course credit:**	3

CO-1	To understand basic principle of metal cutting and handson training on lathe machine.
CO-2	Understanding of Thermal aspects in machining, Gear and thread manufacturing techniques.
CO-3	Classification of presses, Jigs and fixtures and their applications.
CO-4	To study about different non-conventional machining techniques.
CO-5	Use appropriate instruments and techniques to measure the cutting forces during turning, milling and drilling

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Refrigeration and Airconditioning	**Course code**	23090604
Course type:	Core	**Course credit:**	3

CO-1	Analyze the reversed Carnot cycle and vapour compression refrigeration cycle (VCR).
CO-2	Select the air-refrigeration systems for aircraft, and vapour absorption refrigeration system for rural and remote areas
CO-3	Identify the Psychrometric processes for different applications and design the parameters of air-conditioning system as per standards.
CO-4	Understand the human comfort, ASHRAE chart and concept of effective temperature.
CO-5	Estimate cooling load and heating load considering human comfort and optimize the air conditioning system as per requirements.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Industrial Engineering	**Course code**	23090605
Course type:	Core	**Course credit:**	3

CO-1	To understand location, selection of plant layout.
CO-2	Describe production planning and control.
CO-3	To demonstrate productivity, applications, work and motion study.
CO-4	To understand job evaluation, wage plan, industrial legislation and statistical quality control.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Seminar	**Course code**	23000026
Course type:	Core	**Course credit:**	3

CO-1	Present the latest technologies and recent advancements in technical field.
CO-2	Identify grey areas of his/ her interpersonal skills by critical evaluation of presentation techniques and further
CO-3	Communicate effectively verbally and or non-verbally for knowledge enhancement.
CO-4	Use the internet, books, resource persons and library effectively to retrieve the required information.
CO-5	Cite the references of the originating sources of concept, data and information.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO- 5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Internal Combustion Engines	**Course code**	23090606
Course type:	Core	**Course credit:**	3

CO-1	Understanding of engine constructions, operations, fuel air and actual cycle.
CO-2	To demonstrate combustion in SI and CI engines.
CO-3	To describe Ignition and supercharging system.
CO-4	Basic understanding of Engine lubrication, cooling, emission and their control.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO- 2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO- 3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO- 4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	3rd Year	**Semester:**	6

Course title:	Oil Hydraulics & Pneumatics	**Course code**	23090607
Course type:	Core	**Course credit:**	3

CO-1	Basic understanding of hydraulic oils, fluid properties and filters.
CO-2	To understand Hydraulic pumps, motors and actuators,
CO-3	Describe working of hydraulic valves and hydraulic system.
CO-4	Design and analysis of different hydraulic and pneumatic circuits.
CO-5	To understand working, construction principal and operation of pneumatic power system.

CO	**Co –PO Mapping**											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO-11**	**PO- 12**
CO-1	-	-	-	-	-	-	High	Medium	Medium	High	-	-
CO-2	-	-	-	-	-	-	Medium	High	High	High	-	-
CO-3	-	-	-	-	-	-	High	High	Medium	Medium	-	-
CO-4	-	-	-	-	-	-	Medium	Medium	High	Medium	-	-
CO-5	-	-	-	-	-	-	High	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	5
Course title:	Digital Image Processing	**Course code**	**24170501**
Course type:	Engineering Science	**Course Credit**	3

CO 1	Review the fundamental concepts of a digital image processing system.
CO 2	Analyze images in the frequency domain using various transforms.
CO 3	Evaluate the techniques for image enhancement and image restoration.
CO 4	Categorize various compression techniques.
CO 5	Interpret Image compression standards.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	-	Medium	-	Medium	-	Medium	Low
CO- 2	Medium	Medium	Low	-	High	Low	Medium	Low	Medium	Low	Medium	-
CO- 3	High	-	Medium	Medium	Medium	-	High	-	High	-	High	Low
CO- 4	High	Medium	-	Medium	Low	Low	High	Low	High	Low	High	-
CO- 5	High	Medium	Medium	High	-	-	High	-	High	-	High	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	5
Course title:	Machine Learning	**Course code**	**24170502**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Appreciate the importance of visualization in the data analytics solution
CO 2	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory
CO 3	Apply structured thinking to unstructured problems
CO 4	Understand a very broad collection of machine learning algorithms and problems
CO 5	Develop an appreciation for what is involved in learning from data.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	High	High	Medium	-	High	Low	Low	High	-	High
CO- 2	-	Low	Low	-	High	Low	Low	Low	Low	Medium	-	Medium
CO- 3	Low	-	Medium	Medium	-	-	Medium	-	-	Low	Low	Medium
CO- 4	High	Low	High	Medium	Low	-	Low	-	Low	Medium	-	Medium
CO- 5	High	Medium	Medium	-	High	Low	High	-	-	High	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	5
Course title:	NoSQL Databases	**Course code**	24170508
Course type:	Engineering Science	**Course Credit**	3

CO 1	Review of the Relational Model
CO 2	ACID Properties
CO 3	Distributed Databases: Sharding and Replication
CO 4	Consistency
CO 5	The CAP Theorem

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	High	Medium	Medium	-	High	-	High	High	-
CO- 2	High	-	Low	-	High	Medium	-	Low	-	Low	-	-
CO- 3	-	-	High	Medium	Medium	-	-	High	-	High	High	-
CO- 4	High	Medium	-	-	Low	-	Medium	Medium	-	-	Medium	-
CO- 5	High	Medium	Medium	High	High	-	Medium	Medium	-	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	5
Course title:	Fuzzy Logic and Applications	**Course code**	24170505
Course type:	Engineering Science	**Course Credit**	3

CO 1	Understand basic knowledge of the fuzzy sets, operations and their properties.
CO 2	Understand the fundamental concepts of Fuzzy functions and Fuzzy logic
CO 3	Apply the concepts of Fuzzy sets in image processing, pattern reorganization and decision making
CO 4	Identify the applications of fuzzy sets.
CO 5	Apply the concepts of Fuzzy logic in image processing.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	Medium	High	-	-	High	-	High
CO- 2	High	Medium	Low	Medium	High	-	Low	Medium	-	Low	-	Low
CO- 3	Medium	Medium	High	Medium	Medium	Medium	High	Medium	Medium	High	-	High
CO- 4	High	Medium	Medium	Medium	Low	-	Medium	-	Medium	Medium	-	Medium
CO- 5	High	Medium	Medium	High	High	-	Medium	-	-	Medium	-	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	5
Course title:	Sensor Technology	**Course code**	24170503
Course type:	Engineering Science	**Course Credit**	3

CO 1	Use concepts in common methods for converting a physical parameter into an electrical
CO 2	Select the right sensor for a given application.
CO 3	Design basic circuit building blocks.
CO 4	Simulate, synthesize, and layout a complete sensor or sensor system
CO 5	Design MEMS device or microsystem ready for fabrication tools.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	High	High	Medium	-	High	-	-	Medium	-	Medium
CO- 2	Medium	Medium	Medium	Medium	High	-	Medium	High	High	Medium	High	Medium
CO- 3	Medium	High	Medium	Medium	Medium	Medium	Medium	-	-	Medium	-	Medium
CO- 4	High	Medium	Medium	Medium	Low	-	Medium	High	-	High	High	High
CO- 5	High	High	Medium	High	High	-	High	-	High	High	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Semester 6

Program:	Bachelor of Engineering	**Branch:**	**CE AI**
Year:	3 Year	**Semester:**	**6**
Course title:	Deep Learning	**Course code**	**24170601**
Course type:	Engineering Science	**Course Credit**	**3**

CO 1	Able to understand the mathematics behind functioning of artificial neural networks
CO 2	Able to analyze the given dataset for designing a neural network based solution
CO 3	Able to carry out design and implementation of deep learning models for signal/image processing applications
CO 4	Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems
CO 5	To enable design and deployment of deep learning models for machine learning problems

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	-	High	High	Medium	-	High	Low	High	High	Low	High
CO- 2	-	Medium	Low	-	High	Low	Low	-	-	Low	-	Low
CO- 3	Medium	-	Medium	Medium	-	-	Medium	-	Low	Medium	Low	Medium
CO- 4	High	Medium	Medium	Medium	Low	-	Medium	Low	-	Medium	-	Medium
CO- 5	High	Medium	Medium	High	High	High	Medium	-	-	Medium	High	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	6
Course title:	Advanced Machine Learning	**Course code**	**24170602**
Course type:	Engineering Science	**Course Credit**	3

CO 1	Learn the basics of learning problems with hypothesis and version spaces
CO 2	Understand the features of machine learning to apply on real world problems
CO 3	Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and
CO 4	Analyze the various algorithms of supervised and unsupervised learning
CO 5	Analyze the concept of neural networks for learning linear and non-linear activation functions

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	-	High	Low	High	-	High	-
CO- 2	High	Medium	Low	-	High	High	High	High	High	High	High	High
CO- 3	Medium	Low	-	Medium	Medium	-	Medium	High	Medium	-	Medium	-
CO- 4	-	Medium	Low	Medium	Low	-	Medium	-	Medium	-	Medium	Low
CO- 5	High	-	Medium	High	High	High	High	High	High	Low	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	6
Course title:	Natural Language Processing	**Course code**	24170603
Course type:	Engineering Science	**Course Credit**	3

CO 1	Use the Python programming language to solve general problems.
CO 2	Process text by using NLP techniques such as lemmatization, POS tagging etc.
CO 3	Extract meaningful information from a piece of text.
CO 4	Engage various NLP techniques to solve a particular NLP problem.
CO 5	Learn various techniques under Natural Language Processing (NLP) to solve language processing problems.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	Medium	Medium	Medium	-	-	Medium	High
CO- 2	High	Medium	Low	Medium	High	-	High	High	Medium	High	High	-
CO- 3	Medium	Medium	Medium	High	Medium	High	Medium	Medium	-	Medium	Medium	-
CO- 4	High	Medium	Medium	Medium	Low	-	High	High	High	High	High	High
CO- 5	High	Medium	Medium	High	High	-	High	High	-	-	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	6
Course title:	Computer Vision	**Course code**	24170605
Course type:	Engineering Science	**Course Credit**	3

CO 1	Be familiar with mathematical foundations of Computer Vision tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	Computer Vision discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	Computer Vision, classification and clustering.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	-	Medium	High	-	High	-	High	Low	High
CO- 2	Medium	-	Low	Medium	High	Medium	Low	-	-	Medium	-	-
CO- 3	High	Medium	-	High	Medium	High	-	High	Low	High	-	High
CO- 4	Medium	Medium	Medium	-	Low	Medium	-	Medium	-	-	Low	Medium
CO- 5	High	-	Medium	High	High	High	-	High	-	High	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	3 Year	**Semester:**	6
Course title:	Blockchain Fundamentals	**Course code**	24170608
Course type:	Engineering Science	**Course Credit**	3

CO 1	Able to solve real world problems using Blockchain Fundamentals
CO 2	Able to understand the use of Blockchain Fundamentals
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop Blockchain Fundamentals applications with synchronization.
CO 5	Able to develop Blockchain Fundamentals for web applications.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	-	High	High	Medium	Low	Medium	High	-	High	High	Medium
CO- 2	-	Medium	Low	Medium	High	-	High	-	High	High	-	High
CO- 3	Medium	-	Medium	High	Medium	High	Medium	-	-	Medium	High	Medium
CO- 4	High	Medium	-	Medium	Low	-	Low	High	Low	Low	-	Low
CO- 5	High	-	-	High	High	-	High	-	-	High	Low	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO-1	Medium	Medium	Low	Medium	High	-	-	-	Medium	Low	Medium	High
CO-2	-	Low	-	Medium	High	Medium	Medium	Medium	-	Low	-	High
CO-3	Medium	Medium	Medium	Medium	Medium	-	-	-	Medium	-	Medium	-
CO-4	-	-	Medium	Medium	Low	Medium	Medium	High	Medium	Medium	-	Low
CO-5	Medium	Medium	-	Medium	High	Medium	Medium	Medium	-	Low	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Design and Analysis of Algorithms	**Course code**	**24130502**
Course type:	Engineering Science	**Course credit:**	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using Algorithms
CO 3	Apply basic Algorithms structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	-	Medium	Low	Medium	High	Low	Low
CO- 2	Medium	High	Low	Medium	High	Medium	-	Low	-	High	Low	Low
CO- 3	Medium	Medium	Medium	High	Medium	-	Medium	-	Medium	-	High	High
CO- 4	High	High	Medium	Medium	Low	High	Medium	Medium	-	Low	Medium	High
CO- 5	Medium	Medium	Low	High	High	Medium	-	Low	Medium	High	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3Year	**Semester:**	5
Course title:	Ethical Hacking	**Course code**	**24130503**
Course type:	Engineering Science	**Course credit:**	3

CO 1	Apply fundamental principles of problem solving in Ethical Hacking
CO 2	Apply basic programming principles using Ethical Hacking
CO 3	Apply basic Ethical Hacking structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanITd studies and research in computer scienIT and related engineering and scientific disciplines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO-1	Medium	Medium	Low	Medium	High	-	-	Medium	Low	Medium	High	-
CO-2	Medium	Medium	Low	Medium	High	-	Medium	-	Low	-	High	-
CO-3	Medium	Medium	Medium	Medium	Medium	-	-	Medium	-	Medium	-	-
CO-4	High	Medium	Medium	Medium	Low	-	High	Medium	Medium	-	Low	-
CO-5	Medium	Medium	Low	Medium	High	-	Medium	-	Low	Medium	High	-

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3VYear	**Semester:**	5
Course title:	Introduction to Cryptocurrency and Bitcoin	**Course code**	24130505
Course type:	Engineering Science	**Course credit:**	3

CO 1	Describe the basic concepts and technology used for blockchain.
CO 2	Describe the primitives of the distributed computing and cryptography related to blockchain.
CO 3	Illustrate the concepts of Bitcoin and their usage.
CO 4	Implement Ethereum block chain contract.
CO 5	Apply security features in blockchain technologies.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	-	Low	-	-	-	Medium	Medium
CO- 2	Medium	Medium	-	Medium	High	-	Low	-	Low	Medium	Medium	Medium
CO- 3	-	-	Medium	Medium	Medium	Medium	-	-	Low	Medium	-	-
CO- 4	Medium	-	-	Medium	Low	Low	-	Medium	-	-	-	Low
CO- 5	Medium	-	Low	Medium	High	-	-	Low	-	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3Year	**Semester:**	5
Course title:	Principles of Virtualization	**Course code**	24130506
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understanding Virtual machines and Implementation of virtual machines
CO 2	Understanding virtualization and various ways of using virtualization
CO 3	Implementation of private cloud platform using virtualization
CO 4	Use virtual machines of public cloud platform
CO 5	Virtual machines and Implementation of virtual machines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	-	Medium	Low	Medium	High	-	High	-	Low	-	Medium	-
CO- 2	Medium	-	Low	-	High	-	Medium	-	-	-	Low	Medium
CO- 3	-	Medium	-	Medium	-	-	-	Low	-	Medium	Medium	Medium
CO- 4	High	Medium	Medium	-	Low	Low	Medium	-	-	Medium	-	-
CO- 5	Medium	-	Low	Medium	High	-	-	Low	Medium	-	Low	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3Year	**Semester:**	5
Course title:	Network Security	**Course code**	24130508
Course type:	Engineering Science	**Course credit:**	3

CO 1	Provide security of the data over the network.
CO 2	Do research in the emerging areas of cryptography and network security.
CO 3	Implement various networking protocols.
CO 4	Protect any network from the threats in the world.
CO 5	Give security of the data over the network.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	-	-	Medium	High	Low	-	-	-	Low	-	-
CO- 2	Medium	Medium	-	Medium	High	High	-	-	-	High	Medium	-
CO- 3	Medium	Medium	Medium	Medium	Medium	-	-	Medium	-	-	Medium	-
CO- 4	-	Medium	-	Medium	Low	Low	-	Medium	Low	-	Medium	-
CO- 5	-	Medium	Low	Medium	High	High	-	Medium	High	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Personality Development Lab	**Course code**	**24130601**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	High	-	-	Low	Medium	High	-
CO- 2	High	Medium	Low	Medium	High	-	High	-	Low	Medium	High	High
CO- 3	Medium	High	Medium	High	Medium	-	High	-	Medium	High	Medium	High
CO- 4	High	Medium	High	Medium	Low	-	-	-	High	Medium	Low	-
CO- 5	Medium	Medium	Low	Medium	High	Low	Medium	-	Low	Medium	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Cloud web services	**Course code**	**24130602**
Course type:	Engineering Science	**Course credit:**	4

CO 1	Students learn the concepts working with number Cloud.
CO 2	Students realize the problems and solve them which web
CO 3	Student gain knowledge in the concept of services
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	High	High	Medium	High	Low	-	-
CO- 2	Medium	Medium	-	-	High	High	High	Medium	High	Low	Medium	Low
CO- 3	-	-	Medium	Medium	Medium	High	High	Medium	Medium	-	-	-
CO- 4	High	Medium	Medium	Medium	Low	Low	Low	Medium	Low	Low	Medium	-
CO- 5	Medium	Medium	-	-	High	Low	Low	Medium	High	Low	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Digital Forensic Investigation	**Course code**	**24130603**
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of cybercrimes
CO 2	Apply a number of different computer forensic tools to a given scenario
CO 3	Understand the basics of computer forensics
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	Low	Medium	High	Medium	-	Medium	High	-	Low	Medium
CO- 2	Medium	-	-	Medium	High	Medium	-	Medium	High	Medium	Low	Medium
CO- 3	Medium	Medium	-	Medium	Medium	-	-	-	-	Medium	Medium	Medium
CO- 4	High	Medium	-	Medium	Low	-	Medium	Medium	Low	-	Medium	Medium
CO- 5	Medium	Medium	Low	Medium	High	-	Medium	Medium	Low	-	Low	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	6
Course title:	Linux Security and Forensics	**Course code**	24130607
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of Linux Security and Forensics
CO 2	Apply a number of different computer forensic tools to a given scenario
CO 3	Understand the basics of Linux Security and Forensics
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	Medium	High	-	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	High	-	High	High	Medium	-	Medium	High
CO- 3	Medium	-	Medium	Medium	Medium	-	Medium	-	High	-	Medium	Medium
CO- 4	-	Medium	Medium	Medium	Low	High	High	-	-	High	Medium	Low
CO- 5	Medium	Medium	-	Medium	High	-	-	-	High	-	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	6
Course title:	Storage and Data Centre	**Course code**	24130608
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of Storage and Data Centre
CO 2	Apply a number of different computer Storage and Data Centre
CO 3	Understand the basics of Storage and Data Centre
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	-	Medium	Medium	Medium	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	Medium	Medium	High	High	Medium	-	Medium	High
CO- 3	Medium	High	Medium	Medium	-	-	Medium	-	High	-	Medium	Medium
CO- 4	-	-	Medium	Medium	Medium	Medium	High	-	-	High	Medium	Low
CO- 5	Medium	High	-	Medium	Medium	Medium	-	-	High	-	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	-	High	High	High	Medium	High	Low	-	-
CO- 2	Medium	-	Low	Medium	High	-	-	Medium	High	Low	Medium	Low
CO- 3	-	Medium	Medium	-	-	High	High	-	Medium	-	-	-
CO- 4	High	Medium	-	Medium	Low	-	Low	-	Low	Low	Medium	-
CO- 5	Medium	Medium	Low	-	High	Low	-	Medium	High	Low	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	Medium	Medium	Medium	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	Medium	Medium	High	High	Medium	-	Medium	High
CO- 3	Medium	High	Medium	Medium	-	-	Medium	-	High	-	High	Medium
CO- 4	-	-	Medium	Medium	High	Medium	High	Medium	High	High	Medium	Low
CO- 5	Medium	High	-	Medium	Medium	High	-	-	High	-	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO-1	Medium	Medium	Low	Medium	High	-	-	-	Medium	Low	Medium	High
CO-2	-	Low	-	Medium	High	Medium	Medium	Medium	-	Low	-	High
CO-3	Medium	Medium	Medium	Medium	Medium	-	-	-	Medium	-	Medium	-
CO-4	-	-	Medium	Medium	Low	Medium	Medium	High	Medium	Medium	-	Low
CO-5	Medium	Medium	-	Medium	High	Medium	Medium	Medium	-	Low	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	5
Course title:	Design and Analysis of Algorithms	**Course code**	**24130502**
Course type:	Engineering Science	**Course credit:**	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using Algorithms
CO 3	Apply basic Algorithms structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	-	Medium	Low	Medium	High	Low	Low
CO- 2	Medium	High	Low	Medium	High	Medium	-	Low	-	High	Low	Low
CO- 3	Medium	Medium	Medium	High	Medium	-	Medium	-	Medium	-	High	High
CO- 4	High	High	Medium	Medium	Low	High	Medium	Medium	-	Low	Medium	High
CO- 5	Medium	Medium	Low	High	High	Medium	-	Low	Medium	High	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3Year	**Semester:**	5
Course title:	Ethical Hacking	**Course code**	**24130503**
Course type:	Engineering Science	**Course credit:**	3

CO 1	Apply fundamental principles of problem solving in Ethical Hacking
CO 2	Apply basic programming principles using Ethical Hacking
CO 3	Apply basic Ethical Hacking structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanITd studies and research in computer scienIT and related engineering and scientific disciplines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO-1	Medium	Medium	Low	Medium	High	-	-	Medium	Low	Medium	High	-
CO-2	Medium	Medium	Low	Medium	High	-	Medium	-	Low	-	High	-
CO-3	Medium	Medium	Medium	Medium	Medium	-	-	Medium	-	Medium	-	-
CO-4	High	Medium	Medium	Medium	Low	-	High	Medium	Medium	-	Low	-
CO-5	Medium	Medium	Low	Medium	High	-	Medium	-	Low	Medium	High	-

Program:	Bachelor of Engineering	**Branch:**	CE CTIS/cs
Year:	3VYear	**Semester:**	5
Course title:	Introduction to Cryptocurrency and Bitcoin	**Course code**	24130505
Course type:	Engineering Science	**Course credit:**	3

CO 1	Describe the basic concepts and technology used for blockchain.
CO 2	Describe the primitives of the distributed computing and cryptography related to blockchain.
CO 3	Illustrate the concepts of Bitcoin and their usage.
CO 4	Implement Ethereum block chain contract.
CO 5	Apply security features in blockchain technologies.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	-	Low	-	-	-	Medium	Medium
CO- 2	Medium	Medium	-	Medium	High	-	Low	-	Low	Medium	Medium	Medium
CO- 3	-	-	Medium	Medium	Medium	Medium	-	-	Low	Medium	-	-
CO- 4	Medium	-	-	Medium	Low	Low	-	Medium	-	-	-	Low
CO- 5	Medium	-	Low	Medium	High	-	-	Low	-	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3Year	**Semester:**	5
Course title:	Principles of Virtualization	**Course code**	24130506
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understanding Virtual machines and Implementation of virtual machines
CO 2	Understanding virtualization and various ways of using virtualization
CO 3	Implementation of private cloud platform using virtualization
CO 4	Use virtual machines of public cloud platform
CO 5	Virtual machines and Implementation of virtual machines

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	-	Medium	Low	Medium	High	-	High	-	Low	-	Medium	-
CO- 2	Medium	-	Low	-	High	-	Medium	-	-	-	Low	Medium
CO- 3	-	Medium	-	Medium	-	-	-	Low	-	Medium	Medium	Medium
CO- 4	High	Medium	Medium	-	Low	Low	Medium	-	-	Medium	-	-
CO- 5	Medium	-	Low	Medium	High	-	-	Low	Medium	-	Low	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3Year	**Semester:**	5
Course title:	Network Security	**Course code**	24130508
Course type:	Engineering Science	**Course credit:**	3

CO 1	Provide security of the data over the network.
CO 2	Do research in the emerging areas of cryptography and network security.
CO 3	Implement various networking protocols.
CO 4	Protect any network from the threats in the world.
CO 5	Give security of the data over the network.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	-	-	Medium	High	Low	-	-	-	Low	-	-
CO- 2	Medium	Medium	-	Medium	High	High	-	-	-	High	Medium	-
CO- 3	Medium	Medium	Medium	Medium	Medium	-	-	Medium	-	-	Medium	-
CO- 4	-	Medium	-	Medium	Low	Low	-	Medium	Low	-	Medium	-
CO- 5	-	Medium	Low	Medium	High	High	-	Medium	High	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	5
Course title:	Personality Development Lab	**Course code**	**24130601**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	High	-	-	Low	Medium	High	-
CO- 2	High	Medium	Low	Medium	High	-	High	-	Low	Medium	High	High
CO- 3	Medium	High	Medium	High	Medium	-	High	-	Medium	High	Medium	High
CO- 4	High	Medium	High	Medium	Low	-	-	-	High	Medium	Low	-
CO- 5	Medium	Medium	Low	Medium	High	Low	Medium	-	Low	Medium	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	5
Course title:	Cloud web services	**Course code**	**24130602**
Course type:	Engineering Science	**Course credit:**	4

CO 1	Students learn the concepts working with number Cloud.
CO 2	Students realize the problems and solve them which web
CO 3	Student gain knowledge in the concept of services
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	High	High	Medium	High	Low	-	-
CO- 2	Medium	Medium	-	-	High	High	High	Medium	High	Low	Medium	Low
CO- 3	-	-	Medium	Medium	Medium	High	High	Medium	Medium	-	-	-
CO- 4	High	Medium	Medium	Medium	Low	Low	Low	Medium	Low	Low	Medium	-
CO- 5	Medium	Medium	-	-	High	Low	Low	Medium	High	Low	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS/cs
Year:	3 Year	**Semester:**	5
Course title:	Digital Forensic Investigation	**Course code**	**24130603**
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of cybercrimes
CO 2	Apply a number of different computer forensic tools to a given scenario
CO 3	Understand the basics of computer forensics
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	Low	Medium	High	Medium	-	Medium	High	-	Low	Medium
CO- 2	Medium	-	-	Medium	High	Medium	-	Medium	High	Medium	Low	Medium
CO- 3	Medium	Medium	-	Medium	Medium	-	-	-	-	Medium	Medium	Medium
CO- 4	High	Medium	-	Medium	Low	-	Medium	Medium	Low	-	Medium	Medium
CO- 5	Medium	Medium	Low	Medium	High	-	Medium	Medium	Low	-	Low	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	6
Course title:	Linux Security and Forensics	**Course code**	24130607
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of Linux Security and Forensics
CO 2	Apply a number of different computer forensic tools to a given scenario
CO 3	Understand the basics of Linux Security and Forensics
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	-	Medium	High	-	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	High	-	High	High	Medium	-	Medium	High
CO- 3	Medium	-	Medium	Medium	Medium	-	Medium	-	High	-	Medium	Medium
CO- 4	-	Medium	Medium	Medium	Low	High	High	-	-	High	Medium	Low
CO- 5	Medium	Medium	-	Medium	High	-	-	-	High	-	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	6
Course title:	Storage and Data Centre	**Course code**	24130608
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the basic terminology of Storage and Data Centre
CO 2	Apply a number of different computer Storage and Data Centre
CO 3	Understand the basics of Storage and Data Centre
CO 4	Analyze and validate digital evidence data
CO 5	Analyze acquisition methods for digital evidence related to system security

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	-	Medium	Medium	Medium	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	Medium	Medium	High	High	Medium	-	Medium	High
CO- 3	Medium	High	Medium	Medium	-	-	Medium	-	High	-	Medium	Medium
CO- 4	-	-	Medium	Medium	Medium	Medium	High	-	-	High	Medium	Low
CO- 5	Medium	High	-	Medium	Medium	Medium	-	-	High	-	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS /cs
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	-	High	High	High	Medium	High	Low	-	-
CO- 2	Medium	-	Low	Medium	High	-	-	Medium	High	Low	Medium	Low
CO- 3	-	Medium	Medium	-	-	High	High	-	Medium	-	-	-
CO- 4	High	Medium	-	Medium	Low	-	Low	-	Low	Low	Medium	-
CO- 5	Medium	Medium	Low	-	High	Low	-	Medium	High	Low	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CTIS/cs
Year:	3 Year	**Semester:**	5
Course title:	Soft skills and Aptitude-II	**Course code**	**24130501**
Course type:	Engineering Science	**Course credit:**	1

CO 1	Students learn the concepts working with number series and LCM, HCF and ratios.
CO 2	Students realize the problems and solve them which includes Area and volumes, Averages, ages
CO 3	Student gain knowledge in the concept of Time and work
CO 4	Students understand profit and loss concept and also learn the problems related to probability.
CO 5	Students recognize the data from graphs and charts

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	Medium	Medium	Medium	-	-	High	-	Medium	High
CO- 2	Medium	Medium	Low	Medium	Medium	Medium	High	High	Medium	-	Medium	High
CO- 3	Medium	High	Medium	Medium	-	-	Medium	-	High	-	High	Medium
CO- 4	-	-	Medium	Medium	High	Medium	High	Medium	High	High	Medium	Low
CO- 5	Medium	High	-	Medium	Medium	High	-	-	High	-	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	4 Year	**Semester:**	7
Course title:	Artificial Intelligence	**Course code**	**23040701**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	-	-	High	Medium	-	Medium	-
CO- 2	High	-	Low	Medium	High	-	High	-	-	Medium	High	-
CO- 3	-	Medium	-	Medium	Medium	-	Medium	Medium	-	High	-	-
CO- 4	High	-	-	Medium	Low	-	-	-	-	High	-	Medium
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	4 Year	**Semester:**	7
Course title:	Python Programming	**Course code**	**23040702**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs concepts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Low	Medium	High	High	Medium	-	-	High	Medium	-	Medium	-
CO- 2	-	-	Low	Medium	High	-	High	-	-	Medium	High	-
CO- 3	-	Medium	-	-	Medium	Medium	Medium	Medium	-	High	-	-
CO- 4	High	-	-	-	Low	High	-	-	Medium	High	-	Medium
CO- 5	High	Medium	Medium	High	High	-	-	-	Medium	-	-	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	4 Year	**Semester:**	8
Course title:	Programming with XML & JSON	**Course code**	23040802
Course type:	Engineering Science	**Course Credit**	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	Medium	-	High	Medium	-	Medium	-
CO- 2	-	-	Low	Medium	High	Medium	High	-	-	Medium	High	-
CO- 3	-	Medium	-	Medium	Medium	High	Medium	Medium	-	High	Medium	-
CO- 4	High	-	-	Medium	Low	-	-	-	-	High	High	Medium
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	Switchgear & Protection	**Course code**	**23050702**
Course type:	Professional core	**Course credit:**	5

Course Outcome: -

CO STATEMENTS

CO 1	Explain the purposes of protection, in relation to major types of apparatus, protection principle, dangers and criteria.
CO 2	Choose and justify a suitable protection system for a specified application.
CO 3	Analyze and compare specified protection systems
CO 4	Compare merits of various principles, relay hardware and interrupting devices.
CO 5	Compare the different type of circuit breakers performance based on which selection of circuit breaker can be made for a given application

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	Interconnected Power System	**Course code**	23050701
Course type:	Professional core	**Course credit:**	5

Course Outcome: -

CO STATEMENTS

CO 1	Model modern power system network.
CO 2	Solve the problem of power flow through any power system network
CO 3	Find economical generation of power and rescheduling of power Solve swing equation
CO 4	Find the stability of a power system
CO 5	Find the variation in the frequency because of change in generation

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	Design of AC Machines	**Course code**	23050703
Course type:	Professional core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Design the Induction machines of given specifications.
CO 2	Prepare the detailed sketches of the designed machine.
CO 3	Use computer for electrical machine design.
CO 4	Design the synchronous machines of given specifications.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	Advanced Power Electronics	**Course code**	23050704
Course type:	Department Elective -II	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Evaluate different dc-dc voltage regulators.
CO 2	Simulate and analyze resonant converters.
CO 3	Select appropriate phase shifting converter for a multi-pulse converter.
CO 4	Evaluate various multi-level inverter configurations.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	Industrial Instrumentation	**Course code**	23050705
Course type:	Department Elective -II	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Select a transducer based on its operating characteristics for the required application.
CO 2	Check various available techniques available and select appropriate to obtain satisfactory task for the parameter to be measured.
CO 3	Know advantages and limitations of selected techniques.
CO 4	Interpret the measurement results and cause of any possible error.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	23000023	**Course code**	Project - I
Course type:	PROJECT	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

After successful completion of course students will be able to:

CO 1	Identify technical problems related to societal need, industry, research, etc.
CO 2	Understand various tools and techniques.
CO 3	Apply various tools and techniques for problem solution.
CO 4	Analyse the system and select parameters to be improved.
CO5	Achieve precision in uses of components, tools and techniques related to their experiments/fabrication.
CO6	Effective project report writing skills with modern IT tools

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Medium	High	Medium	High	Low	Low	Low	High	Low	High
CO- 2	High	High	Medium	High	Medium	High	Low	Low	Low	High	Low	High
CO- 3	High	Medium	High	Medium	Medium	High	High	Low	Medium	Low	Low	High
CO- 4	High	Medium	High	Medium	Medium	High	High	Low	Medium	Low	Low	High
CO- 5	High	Medium	High	High	High	High	Medium	Low	Medium	Low	Low	High
CO- 6	High	High	Medium	Medium	High	Medium	Medium	Medium	High	High	Low	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	8
Course title:	Power System Planning & Design	**Course code**	23050801
Course type:	Professional core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Design transmission line (electrical and mechanical aspects)
CO 2	Design primary and secondary distribution.
CO 3	Selection of sizes and location of generating stations, substations.
CO 4	Explain the basic concepts of power system earthing and measurement of earthing resistance.
CO 5	Explain the basic concepts of insulation co-ordination.
CO 6	Explain the basic concepts of generation planning, transmission planning and distribution planning.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low
CO- 6	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	8
Course title:	Power System Operation & Control	**Course code**	23050803
Course type:	Engineering Science	**Course credit:**	3

Course Outcome: -

CO STATEMENTS

CO 1	Understand the techniques to control power flows, frequency andvoltage.
CO 2	Explore the significance of power systemrestructuring.
CO 3	Perform system state estimation and explore itsimportance.
CO 4	Learn the power system security and its application as a systemoperator.
CO 5	Carry out load forecasting using availablemethods.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	8
Course title:	Energy Consservation & Audit	**Course code**	23050804
Course type:	Department Elective - III	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Identify and assess the energy conservation/saving opportunities in different electric system
CO 2	Identify and assess energy conservation opportunities in thermal system
CO 3	Demonstrate skills required for energy audit and management.
CO 4	Prepare energy flow diagrams and energy audit report
CO 5	Suggest cost-effective measures towards improving energy efficient and energy conservation

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium
CO- 5	Medium	High	Low	Low	Medium	Medium	High	Low	Medium	Low	Low	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	8
Course title:	Testing & Commissioning of Electrical Equipments	**Course code**	23050802
Course type:	Professional Core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Preparation of maintenance schedule of different equipment and machines.
CO 2	Trouble shooting chart for various electrical equipment, machines and domestic appliances.
CO 3	Procedure of different types of earthing for different types of electrical installations.
CO 4	Familiar about electrical safety regulations and rules during maintenance.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	8
Course title:	Power Quality Management	**Course code**	23050805
Course type:	Department Elective - III	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand the major power quality problems.
CO 2	Use equipment that are required to measure the quality of power
CO 3	Apply and analyze/compare techniques available to mitigate power quality problems.
CO 4	To observe & Analyze Total Harmonic distortion using FFT Analysis.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Low	Medium	Medium	High	Low	High	High	High
CO- 2	High	High	Low	Medium	High	High	High	Medium	High	Low	Low	Low
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	Medium	Medium	Medium	Medium
CO- 4	High	Medium	Medium	Medium	Low	High	Medium	Medium	Low	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Electrical Engineering
Year:	4th Year	**Semester:**	7
Course title:	23000023	**Course code**	Project - II
Course type:	PROJECT	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

After successful completion of course students will be able to:

CO 1	Demonstrate a sound technical knowledge of their selected project topic.
CO 2	Undertake problem identification, formulation and solution.
CO 3	Design engineering solutions to complex problems utilising a systems approach and team work.
CO 4	Communicate with engineers and the community at large in written and oral forms.
CO5	Demonstrate the knowledge and understanding of engineering and management principle and apply it to assigned project

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Medium	High	Medium	High	Low	Low	Low	High	Low	High
CO- 2	High	High	Medium	High	Medium	High	Low	Low	Low	High	Low	High
CO- 3	High	Medium	High	Medium	Medium	High	High	Low	Medium	Low	Low	High
CO- 4	High	Medium	High	Medium	Medium	High	High	Low	Medium	Low	Low	High
CO- 5	High	Medium	High	High	High	High	Medium	Low	Medium	Low	Low	High

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030701
Course title:	Design of Steel Structure	**Course credit:**	5

CO 1	Prepare structural layout of Industrial steel structures, plate girder, foot-over bridge.
CO 2	Determine the loads acting on it and identify the typical failure modes.
CO 3	Apply the principles, procedures and current Indian codal provisions to the analysis and design of Industrial structures, plate girder & foot-over bridges.
CO 4	Apply the principles of plastic design in steel beams & portal frames.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Low	Low	Medium	High	High	Low	High	Medium	High	Medium
CO- 2	High	High	Medium	Medium	High	Medium	Medium	Low	Medium	High	Medium	Medium
CO- 3	Medium	High	Low	High	Low	Low	High	High	Low	Low	High	High
CO- 4	High	Medium	High	Medium	Low	Medium	Medium	High	High	Low	High	Low

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Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030702
Course title:	Irrigation Engineering	**Course credit:**	4

CO 1	Calculate the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory
CO 2	Concepts of irrigation and different hydraulic structures.
CO 3	How to estimate the quantity of water required by crops.
CO 4	Be able to plan and design irrigation projects.
CO 5	Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects.

CO	CO – PO Mapping											
	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12
CO- 1	Medium	High	Medium	Medium	Low	High	Medium	Medium	Medium	High	Medium	Low
CO- 2	High	High	Low	Medium	Medium	High	Medium	Low	Medium	High	High	Low
CO- 3	Medium	Low	Medium	Low	High	Medium	High	Medium	Low	Medium	High	High
CO- 4	High	High	Medium	Medium	Low	High	Medium	High	Medium	Low	Medium	Low
CO- 5	Medium	High	Low	High	Medium	Medium	High	Low	Low	Medium	High	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030703
Course title:	Urban Transportation Engineering	**Course credit:**	4

CO 1	Know about the transportation system planning in new or existing town or city.
CO 2	Analyze the issues related to congestion and inconvenience due to Urban transportation.
CO 3	To understand and evaluate current scenarios of traffic management and improve it.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Medium	High	Low	High	High	Medium	Medium	High	Medium	High
CO- 2	Low	High	High	Low	Medium	Medium	High	Low	High	Medium	High	Medium
CO- 3	Low	High	Low	High	Medium	Low	High	Low	High	Low	Low	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030704
Course title:	Ground Improvement Techniques	**Course credit:**	4

CO 1	To know various index (preliminary) and engineering properties of soil, its determination through various methodology and application for design of shallow and deep foundation systems for various civil engineering structures.
CO 2	Give Knowledge of various topics like compaction, shear strength, consolidation, earth pressure, stress distribution which gives insight to students to analyses soil parameters based on application and need of project site.
CO 3	The course will also develop understanding about soil testing procedures, experimentation techniques and related issues. Simulation of mechanics on soil as a material to understand its behavior before failure and estimating its permissible values.
CO 4	The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	High	Low	Medium	Medium	High	Medium	Low	High	High	Medium
CO- 2	Medium	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium	Low	Medium	High
CO- 3	Medium	High	Medium	High	Medium	Medium	High	Medium	High	Medium	High	Medium
CO- 4	Low	Medium	Medium	High	High	Low	Medium	Medium	High	Low	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030705
Course title:	Remote Sensing and GIS	**Course credit:**	4

CO 1	Ability to develop Orthographic and Contour maps using aerial photographs and Remote sensing Images
CO 2	Ability to develop maps using Total Station, GIS, GPS and Scanners
CO 3	Ability to create GIS application referencing Spatial features with Attribute data

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Medium	Low	Medium	Medium	High	High	Low	Medium	Medium	High
CO- 2	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	High	Low
CO- 3	High	Medium	Low	Medium	High	High	Low	High	Low	Medium	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	7
Year:	4th Year	**Course code**	23030706
Course title:	Earthquake Engineering	**Course credit:**	4

CO 1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake. Determine the loads acting on it and identify the typical failure
CO 2	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.
CO 3	Determine the lateral forces generated in the structure due to earthquake.
CO 4	Apply the concept of ductile detailing in RC structures.

CO	**CO – PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	High	Low	Medium	Medium	High	Medium	Low	Medium	High	High	Low
CO- 2	Medium	Low	Medium	Low	High	Medium	High	Medium	Low	Medium	High	High
CO- 3	High	High	Medium	Medium	Low	High	Medium	High	Medium	Low	Medium	Low
CO- 4	Medium	High	Low	High	Medium	Medium	High	Low	Low	Medium	High	Medium

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DEPARTMENT OF CIVIL ENGINEERING

Program:	Bachelor of Engineering	**Semester:**	8
Year:	4th Year	**Course code**	23030801
Course title:	Construction Project Management	**Course credit:**	4

CO 1	Execute all type of managerial tasks in construction projects.
CO 2	Use software for construction projects management.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	High	Medium	High	Medium	High	Medium	High	Low	Low	High	High
CO- 2	High	Medium	Medium	High	High	Medium	High	Medium	Low	Medium	High	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Semester:**	8
Year:	4th Year	**Course code**	23030802
Course title:	Prestressed Concrete	**Course credit:**	5

CO 1	Apply concepts & methods for pre stressing systems for different materials.
CO 2	compute stresses in beams due to transverse loads & prestressing.
CO 3	Determine the losses in beams due to prestress, short- and long-term deflection, flexural and shear strength of beam.
CO 4	Analyze and design substructure, foundation and adjoining elements.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Low	Medium	Low	High	High	High	High	Low	High	Low	High
CO- 2	High	High	Low	Medium	Low	High	High	Medium	Low	Medium	Medium	Low
CO- 3	High	High	High	Low	Medium	Medium	High	Low	Medium	Medium	High	Medium
CO- 4	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Low	Medium	Medium

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Program:	Bachelor of Engineering	**Semester:**	8
Year:	4th Year	**Course code**	23030803
Course title:	Foundation Engineering	**Course credit:**	4

CO 1	On choosing suitable foundation system (shallow/Deep) for different structures, that satisfy the allowable bearing capacity and settlement requirements based on soil properties
CO 2	Design deep foundation satisfying bearing capacity and settlement requirements.
CO 3	Design and analysis of retaining walls and sheet piles under static loads.
CO 4	Students will have the ability to select type of foundation required for the soil at a place and able to design shallow, foundation, deep foundation and retaining structures.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Medium	Medium	Low	Low	High	High	Medium	Low	Medium	Medium	High
CO- 2	Low	High	Low	Medium	High	High	Medium	Low	Medium	High	High	Low
CO- 3	Medium	Low	Medium	Low	High	High	High	High	Low	High	Low	Low
CO- 4	Low	Medium	Low	Medium	Low	High	Low	Medium	Low	Low	Medium	Low

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Program:	Bachelor of Engineering	**Semester:**	8
Year:	4th Year	**Course code**	23030804
Course title:	Air Pollution and Control	**Course credit:**	4

CO 1	Select the most appropriate technology to purify and/or control emission of particulate emission.
CO 2	Suggest the applicable technology to prevent, control or scrub the oxide of sulfur from the gas and design the control equipment.
CO 3	Apply the best technologies for control of NOx.
CO 4	Propose the measures to control the emission from mobile sources.
CO 5	Devise the techniques to control gases and vapors from industries using concepts of absorption, adsorption and condensation.

	CO – PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	High	Low	High	Medium	High	Medium	Medium	High	Low	High	Medium	Medium
CO- 2	High	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	Low	Medium	Low
CO- 3	High	Medium	High	Low	Medium	Medium	Low	Medium	High	High	Low	Low
CO- 4	Low	Medium	High	High	Low	Low	High	Medium	High	Low	Medium	Medium
CO- 5	Low	Medium	High	High	Low	Low	High	Medium	High	Low	Medium	Medium

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Program:	Bachelor of Engineering	**Semester:**	8
Year:	4th Year	**Course code**	23030805
Course title:	Dock Harbour and Airport Engineering	**Course credit:**	4

CO 1	To understand the various elements of Harbour and Airport.
CO 2	To understand the fundamentals of planning and design of various marine structures.
CO 3	To make the students aware about the operations in Harbour.
CO 4	To give knowledge of maintenance techniques at Harbour.
CO 5	To understand the fundamentals of planning and design of Airport structures.
CO 6	To make students aware of design of runway and taxiways at Airport.
CO 7	To make students aware of the operations at Airport.

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CO	CO – PO Mapping											
	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12
CO- 1	Medium	High	High	High	Medium	Medium	High	Low	Low	Medium	Medium	Medium
CO- 2	Medium	High	Low	Medium	High	High	Medium	Low	Medium	Low	High	Low
CO- 3	Medium	Low	Medium	Low	High	Medium	High	Medium	Low	Medium	High	High
CO- 4	High	Medium	High	Medium	Low	High	Medium	High	Medium	Low	Medium	Low
CO- 5	Medium	High	Low	High	Medium	High	High	Low	Low	Medium	Medium	Medium
CO- 6	Medium	High	High	Medium	Low	High	High	Low	Medium	Low	Medium	Low
CO- 7	Medium	High	Low	High	Medium	Low	High	Low	Medium	Medium	High	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	Branch:	Auto
Year:	4th Year	Semester:	7
Course title:	Vehicle testing & Homologation	Course code	23010701
Course type:	Core	Course credit:	5

CO 1	Need of vehicle testing and homologation
CO 2	To describe the noise and Vibration Harshness Testing
CO 3	To Study about the vehicle performance and Energy consuption of the vehicle
CO 4	Testing the Road and track and PDI of the engine and Inspetion
CO 5	Understanding of some AIS Standards:
CO 6	Testing the active and passive safety of the vehicle

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	low	-	Medium	High	-	-
CO-2	Medium	Medium	low	low	low	low	-	Medium	-	-	-	-
CO-3	Medium	low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	low	low	-	-	-	-	-
CO-5	Medium	Medium	low	low	low	Medium	-	High	High	Medium	-	-
Co-6	High	Medium	Medium	low	low	low	-	Medium	Medium	Medium	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Gunjan

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	7
Course title:	Vehicle Dynamics	**Course code**	23090708
Course type:	Core	**Course credit:**	4

CO 1	To study about the Performance Characteristics of Vehicle
CO 2	Design the aerodynamics air and air distribution of the vehicle
CO 3	Terminology and Axis System of the vehicle
CO 4	Calculation of effective spring rate of the suspesion system
CO 5	Resistance forces acting on motorcycle

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Medium	Low	Medium	Low	Low	Low	Medium	Medium	Low	-	-	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	7
Course title:	Automobile Component Design	**Course code**	23010703
Course type:	Core	**Course credit:**	5

CO 1	Design of standardization in automobile system
CO 2	Consideration of the Welding and Casting of the metal
CO 3	Selection of bearings from manufacturers catalogue.
CO 4	Details Bearing types and their constructional details
CO 5	Design of I.C. Engine Components

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	Low	Medium	Low	Low	Low	Medium	Low	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	7
Course title:	Two and Three Wheelers	**Course code**	23010704
Course type:	Engineering Science	**Course credit:**	4

CO 1	Vehicle body classification and specification
CO 2	Analysis Static load, Load due to Acceleration and Braking, Moments and Torque due to driving conditions
CO 3	Introduction to electric vehicles & hybrid vehicles.
CO 4	Fundamentals of engine electricals, Lighting and Indicators
CO 5	To study about the steering system and suspension system and braking system

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	Low	-	Low	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Low	Medium	Low	Medium	Low	Medium	Low	Medium	High	Medium	

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	2
Course title:	Project - I	**Course code**	23000023
Course type:	Core	**Course credit:**	2

CO 1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO 2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO 3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO 4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO 5	Prepare a professional report as per recommended format and defend the work.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	Low	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	Medium	High	Medium	High	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	Medium	Low	Medium	Low	-
CO-5	Low	Medium	Low	Low	Low	Low	Low	Medium	Low	Medium	Low	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	7

Course title:	Noise, Vibration & Harshness and Safety	**Course code**	23010712
Course type:	Core	**Course credit:**	3

CO-1	The basic terminologies of Noise, Vibration & Harshness – NVH, which is a major focus for high end luxury vehicles manufacturers, in the current times
CO-2	basic terminologies of Noise, Vibration & Harshness – NVH, which is a major focus for high end luxury vehicles manufacturers, in the current times
CO-3	Understand Application of engineering techniques, tools, for measurement methods in order to learn to control and solve complex Vehicle vibrations behavior /as well as performance problems.
CO-4	Application of systematic engineering synthesis and design processes for eliminating or reducing the Vibration, Noise to reduce irritation to occupants and achieve improvement in perception of ride comfort

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	Medium	High	Medium	Medium	-	-	Low	-	Medium	Low	-	-
CO-2	High	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	Medium	-	-	-	Low	Medium	High		Medium
CO-4	Medium	Medium	High	Medium	Low	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	High	Medium	Medium	Low	Medium	High	Medium	Low

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	8

Course title:	Project - II	**Course code**	23000025
Course type:	Core	**Course credit:**	8

CO-1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO-2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO-3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO-4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO-5	Prepare a professional report as per recommended format and defend the work.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	Low	Medium	Low	High	Medium	High	Low	-
CO-2	Medium	Medium	-	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	-	High	High	Medium	Low	-	-	Medium	High	Medium	Medium
CO-4	-	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	Low	Medium	Low	Medium	Low	High	Medium	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	8

Course title:	Automobile System Design	**Course code**	23010801
Course type:	Core	**Course credit:**	5

CO-1	Design of various clutch system components of the master cylinder
CO-2	Design the propeller shaft and universal joint, slip joint
CO-3	To study about the Axle of the steering system and Turing radius
CO-4	Design the Braking system and Disc brake of the vehicle
CO-5	Describe the fully floating and Half floating of the vehicle

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO - 1	Medium	Low	Medium	Medium	-	-	Low	-	Medium	High	-	-
CO - 2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO - 3	High	Low	Medium	High	Low	Low	Low	Medium	Medium	High	Medium	Medium
CO - 4	Medium	Medium	High	Medium	Low	Low	Low	Medium	-	-	-	-
CO - 5	Low	Medium	Medium	Low	Medium	Medium	Medium	High	Medium	Medium	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	Auto
Year:	4th Year	**Semester:**	8

Course title:	Vehicle Body Engineering	**Course code**	23010802
Course type:	Core	**Course credit:**	4

CO-1	Design of the car body and construction of the car
CO-2	Objective the vehicle aerodynamics
CO-3	Construction of the mini bus and articulated layout
CO-4	Method of the body trim and mechanism

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	Low	Medium	Low	Medium	Medium	High	Low	-
CO-2	Medium	Medium	Low	-	-	Low	-	Medium	-	Low	-	-
CO-3	-	-	-	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	-	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Low	Low	Low	-	-	-	-	-	-	-	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	4 Year	**Semester:**	7
Course title:	Artificial Intelligence	**Course code**	**23040701**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical conITpts used in computer scienIT discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO - 10**	**PO - 11**	**PO - 12**
CO- 1	Medium	Medium	High	High	Medium	-	-	-	High	-	High	
CO- 2	-	Medium	Low	Medium	High	-	Medium	-	Medium	-	Medium	
CO- 3	-	-	Medium	Medium	Medium	-	High	-	-	-		
CO- 4	High	-	High	Medium	Low	-	-	-	-	-		High
CO- 5	High	Medium	Medium	High	High	-	-	-	-	-		Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	4 Year	**Semester:**	7
Course title:	Python Programming	**Course code**	**23040702**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs conITpts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO - 10**	**PO - 11**	**PO - 12**
CO- 1	Medium	-	High	High	Medium	Medium	-	-	-	-	-	
CO- 2	High	-	Low	Medium	High	High	-	Medium	-	-	-	Medium
CO- 3	Medium	High	-	-	-	-	-	Medium	-	-	-	Medium
CO- 4	-	High	-	-	-	-	-	-	-	Medium	High	-
CO- 5	-	Medium	Medium	High	High	-	-	-	-	Low	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	IT
Year:	4 Year	**Semester:**	8
Course title:	Programming with XML & JSON	**Course code**	23040802
Course type:	Engineering Science	**Course Credit**	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO - 10**	**PO - 11**	**PO - 12**
CO- 1	Medium	Medium	High	High	Medium	-	-	-	Medium	-	-	-
CO- 2	High	-	Low	Medium	High	High	-	Medium	Low	-	Medium	-
CO- 3	Medium	-	Medium	-	Medium	High	-	High	High	Medium	Medium	-
CO- 4	-	-	-	-	Low	-	-	High	-	Low		High
CO- 5	-	Medium	-	-	High	-	Medium	-	-	High		Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Process Equipment Design-I	**Course code**	24020701
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Define** mass transfer, heat transfer and unit operation subjects which are learned in the previous semester
CO2	Create **understanding** of equipment design with mechanical concept.
CO3	**Build** a bridge between theoretical and practical concepts used for designing the equipment in any process industry.
CO4	Analyze the various physical properties, design parameters and solutions for designing of equipments
CO5	Review the **importance** of design concepts in process industry.
CO6	Design process equipment and **modify** the design of existing equipment to new process conditions or new required capacity

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	Low	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Chemical Reaction Engineering-II	**Course code**	24020702
Course type:	Engineering Science	**Course credit:**	4

Learning Outcome

No.	Outcome
CO1	**Relate** to the basics of non ideality and characteristics of residence time distributions
CO2	**Interpret** the RTD profiles and experimental data to model the non ideal reactors
CO3	**Select** proper reaction mechanism and design the catalytic reactor by rate data analysis
CO4	**Compare** the reactor performance with or w/o internal of external mass transfer limitations
CO5	**Appraise** the performance of different reactors in multi phase systems
CO6	**Design, Develop and/or Modify** reactor systems for specific purpose of real life problems

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Low	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Energy Technology (Elective-I)	**Course code**	24020706
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**List** the available renewable and non-renewable energy resources and relate to fulfill global energy demand.
CO2	**Summarize** the various characterization techniques used in solid and liquid fuels
CO3	Execute the effective **utilization** of potential conventional energy source by advanced conversion technologies
CO4	**Analyze** the potential utilization of biomass and bio-fuels as a substitute for the fossil fuel applications
CO5	**Assess** the available non-conventional (renewable) energy resources and techniques to utilize them effectively.
CO6	Facilitate the **design** and applications of related devices using renewable energy sources.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	Medium	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	Low	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	-	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Computer Aided Process Synthesis	**Course code**	24020703
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Choose** and apply blocks and streams from a simulators library to make a process flow sheet
CO2	Understand, create, **select**, and describe computer tools for chemical process simulation
CO3	**Apply** stream and block parameters to a chemical unit operation for computer simulation
CO4	**Analyze** process intensification and construct Heat exchanger networks and develop the pinch design approach to develop a network
CO5	**Determine** flow sheeting solution by using design specification and sensitivity analysis approach
CO6	**Solve** process design and simulation calculations of various unit operations using Aspen software

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Plant Design and Project Engineering	**Course code**	24020704
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Choose** appropriate process for a project and to learn basic economic concept, to understand and apply this concepts in the project works undertaken and to chemical engineering situation by solving problem
CO2	**Understand** piping and instrumentation diagram.
CO3	**Organize** the primary techno-economic feasibility of project.
CO4	**Categorize** the equipment and able to prepare specification sheet.
CO5	**Evaluate** the project cost including capital investment, product cost, breakeven point, depreciation cost for equipment and the total project cost.
CO6	**Plan** the control and schedule of the project using CPME/PERT technique, calculations, problem on profitability and replacement analysis.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Solid Fluid Operation	**Course code**	24020806
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Define** solid fluid operations in chemical industries.
CO2	To **understand** the principles behind different solid - fluid operations.
CO3	**Apply** knowledge to make students understand the global scenario and requirement of solid fluid operations and advancement in the same field.
CO4	To **analyze** the variety of application of solid fluid operations in chemical industries.
CO5	To make student realize the **importance** of design related problems in solid-fluid operations in chemical industries
CO6	**Modify** the design or can suggest the changes required for better operation in terms of economy and efficiency

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	–	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Fertilizer Technology	**Course code**	24020805
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Choose** reactions and unit operations steps in manufacturing of various fertilizers
CO2	**Classify** fertilizers on the basis of different properties
CO3	**Identify** engineering problems in fertilizer manufacturing.
CO4	**Categorize** the equipment used for storage and handling of fertilizers
CO5	**Explain** the need and importance of fertilizer
CO6	**Discuss** the initiatives and schemes of Central/State Governments towards fertilizers

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	–	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Chemical System Modeling	**Course code**	24020801
Course type:	Engineering Science	**Course credit:**	2

Learning Outcome

No.	Outcome
CO1	**Choose** process models based on conservation principles and process data.
CO2	**Explain** the chemical processes, different parts of the processes and unit operations.
CO3	Have an understanding of computational techniques to **solve** the process models.
CO4	Use economics to derive an objective function and **analyze** principles of engineering to develop equality and inequality constraints.
CO5	**Choose** various optimization techniques as a tool in process design and operation for optimizing important industrial processes
CO6	Get familiar with the preferred software packages and optimization techniques ASPEN PLUS, GAMS, HYSIS, CHEMCAD and MATLAB to **solve** linear programming and nonlinear programming problems which will make them ready for industry..

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Low	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Petroleum Refining & Petrochemicals	**Course code**	24020802
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Choose** purification and fractionation process of crude oil
CO2	**Outline** the crude composition, properties and characterization methods of different petroleum fractions.
CO3	**Identify** the process technology of product upgradation units and Hydrogen processes.
CO4	**Compare** the different conversion processes of the heavier fractions by cracking and coking technology
CO5	**Interpret** the treatment processes for preparing finished products using chemical or physical separation
CO6	**Design** the process technology of various important petrochemicals products.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Medium	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Process Simulation & Optimization	**Course code**	24020803
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Relate** the important physical phenomena from the problem statement, various types of models such as empirical models, hybrid models etc.
CO2	**Translate** chemical process systems into mass balance, energy balance and momentum balance formulations
CO3	**Develop** model equations for the given system, demonstrate the model solving ability for various processes/unit operations, develop various models for various systems such as reactor, distillation column, heat exchangers and analyze their behavior.
CO4	Be able to theoretically **examine** different types of optimization problems.
CO5	**Assess** the utilization of different optimization techniques.
CO6	Ability to **solve** various multivariable optimization problems.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

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Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	8
Course title:	Project-II	**Course code**	23000025
Course type:	Engineering Science	**Course credit:**	8

Learning Outcome

No.	Outcome
CO1	**Define** the research methodology and design experiments for primary data generation
CO2	**Demonstrate** the capable of working as individual and team player for designing the research project
CO3	Acquire research skills to **identify** the research problem and knowledge gap
CO4	**Adapt** with the modern research analysis tools, software and instruments.
CO5	**Appraise** the capability to generate relevant information from literature survey
CO6	**Develop** communication skills, both written and oral.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Medium	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Medium	–	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	CHEMICAL ENGINEERING
Year:	4th Year	**Semester:**	7
Course title:	Nano-Technology (Elective-I)	**Course code**	24020707
Course type:	Engineering Science	**Course credit:**	3

Learning Outcome

No.	Outcome
CO1	**Define** the nano-materials
CO2	**Classify** the appropriate nano-materials
CO3	**Choose** various synthesis and processing methods for nano-materials
CO4	**Analyze** and Identify nano-materials for engineering applications
CO5	**Explain** the role of nanotechnology in various engineering disciples
CO6	**Develop** new techniques for the synthesis of nanomaterials

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes														
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-	High
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Low	Low	-	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	Low	-	-	-	-	Low	-	-	-	-	-	Medium	--	-	-
CO-6	Low	-	-	-	Medium	-	-	-	-	-	-	-	-	-	-

B. Tech CO mapping from academic year 2022-2023

Environmental engineering

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VII
Course title:	Resource and energy Recovery from waste	**Course code**	24100704
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** the fundamental principle of existing and emerging technologies for the treatment of waste to recover of materials and generated of energy from waste.
CO2	**Understand** the process of generation of energy from waste through biochemical conversion.
CO3	**Understand** the process of thermo-chemical conversion of waste to energy.
CO4	**Analysis** and describe the potential of solid waste as a secondary raw material and the associated problem and possibilities in sustainable society.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low		Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VII
Course title:	Advanced wastewater treatment technology	**Course code**	24100701
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Compare** the most appropriates types of membrane processes for advanced treatment of wastewater.
CO2	**Discuss** method of advanced treatment technologies for pollutant removal particularly nitrogen & phosphorous from wastewater.
CO3	**Recommend** advanced oxidation process and electrochemical processes to treat concentrated wastewater.
CO4	**Explain** the concept of advance treatment processes like adsorption, ion exchange for removal of pollutants.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VII
Course title:	Design of Air Pollution Control Equipment	**Course code**	24100702
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learnt** about Major sources of air pollution in India.
CO2	**Describe** in detail the tools and principles for enhancing indoor air quality.
CO3	Give a detailed explanation of the air pollution control systems' impact on human health and the environment.
CO4	**Classification** and characteristics of air pollutants.
CO5	**Design** and operation of particulate control devices (cyclones, electrostatic precipitators, baghouses).

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VII
Course title:	Environmental Risk Assessment and Management	**Course code**	24100703
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learn** about strategies for engaging stakeholders and communicating risks effectively.
CO2	The importance of environmental risk assessment and management in environmental engineering is **explained** in detail.
CO3	**Evaluate** community resilience and vulnerabilities in the Indian context.
CO4	**Evaluated**Role of EIA in assessing and managing environmental risks.
CO5	**Analysis** the Public awareness and participation in risk management in India.
CO6	**Explain** EIA processes and practices in India.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-
CO-6	-	-	-	Low	Medium	-	-	-	-	-	-	Low	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VII

Course title:	Cleaner Production and Waste Utilization	**Course code**	24100705
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learn** about the different types and sources of waste produced by different processes and industries.
CO2	**Explain** the procedures for characterizing and measuring waste.
CO3	**Describe** the fundamentals of resource efficiency and cleaner production.
CO4	**Identifying** opportunities for waste reduction and improved efficiency.
CO5	**Describe** the concepts of life cycle assessment and how they contribute to cleaner production.
CO6	**Explain** the Conducting LCA and interpreting results for decision-making in India.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO 9	PO 10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-
CO-6	-	-	-	Low	Medium	-	-	-	-	-	-	Low	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VIII
Course title:	Environmental Impact Assessment	**Course code**	24100801
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** the different steps within environmental impact assessment.
CO2	**Explain** the effects of the current institutional and jurisdictional setups on environmental impact assessments.
CO3	**Understand** how to liaise with and the importance of stakeholders in the EIA process.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VIII
Course title:	Anaerobic Biological Treatment Technologies	**Course code**	24100802
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** Historical development and key challenges in India.
CO2	Give a thorough **explanation** of microbial ecology in anaerobic processes..
CO3	**Recognizing** anaerobic systems (such as anaerobic lagoons, CSTR, and UASB).
CO4	Biogas utilization for energy generation and its **applications** in India.
CO5	**Understanding** Anaerobic treatment in various industrial sectors (e.g., agro-processing, food, and beverage).
CO6	**Evaluation** of the viability and economics of anaerobic digestion initiatives in India.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-
CO-6	-	-	-	Low	Medium	-	-	-	-	-	-	Low	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VIII
Course title:	Industrial Wastewater Pollution and Control	**Course code**	24100803
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** Significance of industrial wastewater pollution control in environmental engineering.
CO2	**Remembering** Types and characteristics of industrial wastewater.
CO3	**Choosing** treatment methods according to the properties of wastewater.
CO4	**Understand** the regulatory requirements in India for the pre-treatment of industrial wastewater.
CO5	**Identify** Wastewater pollution and control practices in various industrial sectors (e.g., chemical, textile, food and beverage).
CO6	An **outline** of the standards and laws pertaining to the management of industrial wastewater.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-
CO-6	-	-	-	Low	Medium	-	-	-	-	-	-	Low	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VIII
Course title:	Preventive Environmental Management	**Course code**	24100804
Course type:	Engineering Science	**Course credit:**	5

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Recognizing** India's historical development and major issues.
CO2	**Identify** the Environmental risk assessment methodologies and tools.
CO3	**Applying** the EIA's role in evaluating and controlling possible environmental effects.
CO4	An **outline** of the standards and laws pertaining to the prevention of environmental degradation.
CO5	**Illustrate** to EMS and ISO 14001 standards.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Environmental Engineering
Year:	4th Year	**Semester:**	VIII
Course title:	Environmental legislation and audit	**Course code**	24100805
Course type:	Engineering Science	**Course credit:**	4

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	Show that you **understand** the environmental protection provisions of the constitution.
CO2	**Identify** the Assistance the industries receive in order to comply with environmental regulations and laws.
CO3	**Discuss** the industries in obtaining the clearance for starting new project.
CO4	**Apply** the knowledge of ISO 14000 for obtaining certificating.
CO5	**Discuss** the environmental audit of the industries as per the requirement of current environmental laws.

CO-PO Mapping

Course Outcomes	Expected Mapping with Programme Outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	Low	Low	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	-	-	-	Low	-	-	-	-	-	-	-	-	-
CO-3	Low	Medium	Medium	Medium	-	-	-	-	-	-	Medium	Low	-	-
CO-4	-	-	Medium	-	-	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	Low	Medium	-	-	-	-	-	-	-	-	-

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Computer Aided Design & Manufacturing	**Course code**	23090701
Course type:	Core	**Course credit:**	4

CO-1	To analize 1-D concept, Trusses and beams.
CO-2	To visualize the role of computer in manufacturing, types of manufacturing and CIM.
CO-3	To understand different types of NC/CNC machine tools.
CO-4	To understand concept of Group Technology and CAPP
CO-5	To describe component of FMS and need of FMS.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	-	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Medium	Medium	Low	Low	Low	Medium	-	High	High	Medium	-	-

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Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Power Plant Engineering	**Course code**	23090702
Course type:	Core	**Course credit:**	4

CO-1	Discuss the load duration curves, site selection and economics of power plants.
CO-2	Describe the effect of various components and steam conditions on the performance of steam power plant.
CO-3	Analyze the performance of Steam turbine power plant under various operating and geographical conditions.
CO-4	To describe working of different types of nozzles, turbines, condensors and cooling towers.
CO-5	To study about nuclear power plant and gas turbine power plant.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Medium	Low	Medium	Low	Low	Low	Medium	Medium	Low	-	-	Low

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Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Operation Research	**Course code**	23090703
Course type:	Core	**Course credit:**	6

CO-1	To understand requirement of Linear programming, assumptions in LP.
CO-2	To solve problems related to Game theory and transportation problems.
CO-3	To solve problems related to replacement theory and Queing theory.
CO-4	To implement CPM and PERT in industry.
CO-5	To solve problems based on Decision theory.

CO	Co –PO Mapping											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	Low	Medium	Low	Low	Low	Medium	Low	Medium

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Machine Design	**Course code**	23090704
Course type:	Core	**Course credit:**	5

CO-1	Identify the factors for engineering components design and analyze various members subjected to direct stress.
CO-2	Design various members such as beams, levers, laminated springs for bending and stiffness.
CO-3	Design various machine components under torsion such as shafts, shaft couplings, and keys.
CO-4	Design various threaded fasteners and power screw components.
CO-5	Design curved machine components.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	Low	-	Low	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Low	Medium	Low	Medium	Low	Medium	Low	Medium	High	Medium	

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Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Project 1	**Course code**	23000023
Course type:	Core	**Course credit:**	2

CO-1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO-2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO-3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO-4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO-5	Prepare a professional report as per recommended format and defend the work.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	High	Low	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	Medium	High	Medium	High	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	-	Low	Low	Medium	Low	Medium	Low	-
CO-5	Low	Medium	Low	Low	Low	Low	Low	Medium	Low	Medium	Low	Medium

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Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	7

Course title:	Metal Forming Analysis	**Course code**	23090712
Course type:	Core	**Course credit:**	3

CO-1	Explain and interpret the basics of various forming processes.
CO-2	Explain and apply the yield criteria and governing equations of plasticity.
CO-3	Apply the slab method of metal forming process analysis.
CO-4	Apply the Slip-line field theory of metal forming process analysis.
CO-5	Apply the upper and lower bound techniques of metal forming process analysis.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	-	-	Low	-	Medium	Low	-	-
CO-2	Medium	Medium	Low	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	Low	High	High	-	-	-	-	Medium	High	Medium	Medium
CO-4	Medium	Medium	High	Medium	Low	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	High	Medium	Medium	Low	Medium	High	Medium	

Program:	Bachelor of Engineering	**Branch:**	Mechanical
Year:	4th Year	**Semester:**	8

Course title:	Project 2	**Course code**	23000025
Course type:	Core	**Course credit:**	8

CO-1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO-2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO-3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO-4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO-5	Prepare a professional report as per recommended format and defend the work.

	Co –PO Mapping											
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO-1	High	Medium	High	Medium	Low	Medium	Low	High	Medium	High	Low	-
CO-2	Medium	Medium	-	Low	Low	Low	-	Medium	-	Low	-	-
CO-3	Medium	-	High	High	Medium	Low	-	-	Medium	High	Medium	Medium
CO-4	-	Medium	High	Medium	-	Low	Low	-	-	-	-	-
CO-5	Low	Medium	Low	Medium	Low	Medium	Low	Medium	Low	High	Medium	Low

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Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	4 Year	**Semester:**	7
Course title:	ML using Cloud Service	**Course code**	24170702
Course type:	Engineering Science	**Course Credit**	3

CO 1	Apply basic concepts of machine learning and different types of machine learning algorithms.
CO 2	Differentiate various regression techniques and evaluate their performance.
CO 3	Compare different types of classification models and their relevant application.
CO 4	Illustrate the tree-based and probabilistic machine learning algorithms.
CO 5	Identify different unsupervised learning algorithms for the related real-world problems.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	-	-	High	High	Medium	-	-
CO- 2	High	-	Low	Medium	-	-	-	Low	-	-	-	-
CO- 3	-	-	Medium	-	-	-	-	Medium	-	Medium	-	Medium
CO- 4	-	High	-	Medium	Low	-	-	-	Medium	Low	-	High
CO- 5	High	Medium	-	High	High	-	-	Medium	High	High	-	High

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Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	4 Year	**Semester:**	7
Course title:	Chat-Bot Development	**Course code**	24170703
Course type:	Engineering Science	**Course Credit**	3

CO 1	Understand the tools and landscape of the Bot ecosystem
CO 2	Build a basic FAQ bot for an organisation
CO 3	Deploy the bot into a website or integrate with a bot channel such as Skype, Webchat or Slack
CO 4	Handle technical queries with the capabilities to build a useful and relevant Chatbot system.
CO 5	Use an online and comprehensive Chatbot system to quickly develop and deploy a real conversation style FAQ Chatbot system at minimal costs.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	High	High	Medium	Medium	High	High	Medium	-	High	-
CO- 2	High	-	Low	-	High	-	Low	Medium	-	-	Low	-
CO- 3	-	-	-	High	-	-	Medium	-	-	-	High	-
CO- 4	Low	Low	Medium	Medium	Low	High	-	Medium	Low	-	Medium	-
CO- 5	High	High	Medium	High	High	Medium	-	High	High	-	Medium	-

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Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	4 Year	**Semester:**	7
Course title:	Information Security Fundamentals	**Course code**	24170707
Course type:	Engineering Science	**Course Credit**	3

CO 1	Analyze and evaluate the cyber security needs of an organization.
CO 2	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
CO 3	Design and develop a security architecture for an organization.
CO 4	Measure the performance and troubleshoot cyber security systems.
CO 5	Implement cyber security solutions and use of cyber security, information assurance,

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Low	Medium	High	High	Medium	High	-	High	-	High	High	-
CO- 2	Low	High	Low	Medium	Low	Low	-	Low	-	Medium	Low	-
CO- 3	High	-	High	High	High	High	-	High	-	High	High	-
CO- 4	High	Low	-	Medium	Low	-	-	-	-	Medium	-	-
CO- 5	High	Medium	Medium	High	High	Medium	-	Medium	-	High	Medium	-

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Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	4 Year	**Semester:**	7
Course title:	Infrastructure Containers	**Course code**	24170708
Course type:	Engineering Science	**Course Credit**	3

CO 1	Differentiate the cluster and grid architecture.
CO 2	Illustrate virtualization concepts.
CO 3	Differentiate virtualization and Containerization.
CO 4	Identify the architecture, infrastructure and delivery models of cloud computing.
CO 5	Choose the appropriate cloud provider, Programming Models and approaches.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	-	-	Medium	High	High	Medium	-
CO- 2	Low	-	Low	Medium	High	-	-	-	Low	Medium	-	Low
CO- 3	Low	Medium	High	Medium	-	-	-	-	Medium	-	-	-
CO- 4	High	-	-	Medium	Low	-	-	High	-	Medium	Low	Low
CO- 5	High	Medium	Medium	High	High	-	-	Medium	-	High	High	-

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE AI
Year:	4 Year	**Semester:**	7
Course title:	Environmental Science	**Course code**	**24170710**
Course type:	Engineering Science	**Course Credit**	3

CO 1			Gain in-depth knowledge on natural processes that sustain life, and govern economy.
CO 2			Predict the consequences of human actions on the web of life, global economy and quality of human life.
CO 3			Adopt sustainability as a practice in life, society and industry.
CO 4			Develop critical thinking for shaping strategies (scientific, social, economic and legal)
CO 5			Environmental protection and conservation of biodiversity, social equity and

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	High	High	Medium	Medium	-	High	Medium	Medium	High	Medium
CO- 2	-	-	Low	-	High	High	-	Medium	High	High	Low	High
CO- 3	High	Medium	High	Medium	Medium	Medium	Low	Low	-	Medium	-	Low
CO- 4	High	-	Medium	Medium	Low	Low	-	Medium	Low	-	Medium	Low
CO- 5	High	Medium	Medium	High	High	High	-	High	High	High	High	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CS
Year:	3 Year	**Semester:**	7
Course title:	Machine Learning	**Course code**	24130707
Course type:	Engineering Science	**Course credit:**	3

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	-	High	-	Medium	Medium	-	-	Medium	High
CO- 2	-	-	Low	Medium	High	-	Medium	High	-	-	Medium	High
CO- 3	Medium	Medium	Medium	Medium	Medium	-	-	-	Medium	Medium	Medium	Medium
CO- 4	High	Medium	-	Medium	Low	-	-	Medium	High	-	Medium	Low
CO- 5	Medium	-	Low	-	High	Medium	High	-	-	-	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

COURSE OUTCOME

Program:	Bachelor of Engineering	**Branch:**	CE CS
Year:	3 Year	**Semester:**	7
Course title:	BlockChain	**Course code**	24130706
Course type:	Engineering Science	**Course credit:**	3

CO 1	Understand the various technologies and its business
CO 2	Analyse the block chain applications in a structure manner.
CO 3	Understand the modern currencies and its market usuage
CO 4	Handle the cryptocurrency.
CO 5	Explain the modern concepts of block chain

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO- 12**
CO- 1	Medium	Medium	Low	Medium	High	Medium	High	-	Medium	-	Medium	High
CO- 2	Medium	-	-	Medium	High	-	Medium	High	Medium	High	Medium	High
CO- 3	Medium	-	Medium	Medium	Medium	-	Medium	High	-	-	Medium	Medium
CO- 4	-	Medium	-	Medium	Low	Medium	High	High	-	-	Medium	Low
CO- 5	Medium	Medium	Low	Medium	High	-	-	Medium		High	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

COURSE OUTCOME

Program:	Bachelor of Engineering	**Branch:**	CE CS
Year:	3 Year	**Semester:**	7
Course title:	IT Governance and Risk Management	**Course code**	24130704
Course type:	Engineering Science	**Course credit:**	3

CO 1	Design static web pages using HTML and CSS Using internet technologies
CO 2	Create dynamic web pages using JavaScript using internet technologies and services.
CO 3	Develop JDBC programs and server-side scripts using servlets.
CO 4	Develop server-side scripts using JSP.
CO 5	Apply jQuery methods and events.

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO-11**	**PO-12**
CO- 1	Medium	-	-	Medium	High	-	-	-	-	-	-	-
CO- 2	-	-	Low	Medium	High	Medium	High	Medium	High	-	-	-
CO- 3	Medium	-	-	Medium	-	-	Medium	Medium	Medium	-	-	-
CO- 4	High	Medium	Medium	Medium	Low	-	-	-	-	-	Medium	High
CO- 5	Medium	-	-	Medium	High	-	-	-	-	-	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Bachelor of Engineering	**Branch:**	CE CS
Year:	3 Year	**Semester:**	7
Course title:	Environmental Science	**Course code**	**24130710**
Course type:	Engineering Science	**Course credit:**	2

CO 1	Gain knowledge about environment and ecosystem.
CO 2	Students will learn about natural resource, its importance and environmental impacts of Human activities on natural resource.
CO 3	Gain knowledge about the conservation of biodiversity and its importance
CO 4	Students will learn about increase in population growth and its impact on environment
CO 5	Aware students about problems of environmental pollution, its impact on human

CO	**Co –PO Mapping**											
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO-10**	**PO- 11**	**PO-12**
CO- 1	Medium	Medium	Low	Medium	High	-	Low	-	Low	Medium	-	-
CO- 2	Medium	-	-	-	High	-	Medium	-	-	-	-	-
CO- 3	Medium	Medium		Medium	-	Low	-	-		Medium	-	Low
CO- 4	-	Medium	Medium	Medium	Low	Medium	-	-	Medium	-	Medium	Medium
CO- 5	Medium	Medium	Low	-	High	-	-	-	Medium	-	Medium	-

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080101
Course title:	English for Research Paper Writing (Audit Course)	**Course credit:**	-

CO 1	Prepare structural layout of Industrial steel structures, plate girder, foot-over bridge.
CO 2	Determine the loads acting on it and identify the typical failure modes.
CO 3	Apply the principles, procedures and current Indian codal provisions to the analysis and design of Industrial structures, plate girder & foot-over bridges.
CO 4	Apply the principles of plastic design in steel beams & portal frames.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	High	Low	High	High	High	Medium	High	Medium	Medium
CO- 2	Low	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	High	Medium
CO- 3	Medium	High	Low	High	Low	Low	High	High	Low	Low	High
CO- 4	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium

HWD, Civil
Mami Prajapati

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080102
Course title:	Research Methodology and IPR	**Course credit:**	2

CO 1	Conduct a quality literature review and find the research gap.
CO 2	Identify an original and relevant problem and identify methods to find its solution
CO 3	Validate the model
CO 4	Present and defend the solution obtained in an effective manner in written or spoken form.
CO 5	Follow research ethics
CO 6	Understand IPR protection for further research and better products

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	High	Medium
CO- 2	High	Medium	Low	Medium	Medium	Medium	Medium	Low	Low	High	High
CO- 3	Medium	Low	Medium	Low	High	Low	High	Medium	Low	Medium	Medium
CO- 4	High	High	Low	Medium	Low	High	Medium	High	Medium	High	High
CO- 5	Medium	Medium	High	High	Medium	Medium	High	Low	Medium	Medium	Medium
CO- 6	Low	High	Low	Medium	Medium	Medium	High	Low	Low	Medium	High

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080103
Course title:	Advanced Structural Analysis	**Course credit:**	4

CO 1	Analyze skeleton structures using stiffness method
CO 2	Analyze skeleton structures having secondary effects using stiffness method
CO 3	Derive element properties and analyze structure using finite element method
CO 4	Solve realistic engineering problems through computational simulations using finite element code

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Medium	High	Low	High	High	Medium	Medium	High	Medium
CO- 2	Low	High	High	Low	Medium	Medium	High	Low	High	Medium	High
CO- 3	Low	High	Low	High	Medium	Low	High	Low	High	Low	Medium
CO- 4	High	Medium	Medium	High	Medium	High	High	Medium	High	Low	High

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080104
Course title:	Advanced Concrete Design of Structures	**Course credit:**	4

CO 1	Carry out load calculation, analysis, design and detailing of Slender Column, Corbel, Deep beams, flat slabs, water tanks, bunker and silos, Shear Walls as per relevant IS code of practice.
CO 2	Analysis and design of raft foundation, strip footing and pile caps
CO 3	Ensure serviceability criteria for reinforced concrete structural elements

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	Medium	High	Low	Medium	Medium	High	Medium	Low	High	High
CO- 2	Medium	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium	Low	Medium
CO- 3	Medium	High	Medium	High	Medium	Medium	High	Medium	High	Medium	High

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080106
Course title:	Analytical and Numerical methods for Structural Engg. (Elective 1)	**Course credit:**	4

CO 1	Solve algebraic equations
CO 2	Obtain numerical solution of ordinary and partial differential equations
CO 3	Apply integration method/s for structural analysis
CO 4	Carry out interpolations and curve fitting
CO 5	Obtain solution of Eigen value problems and Fourier series for structural analysis
CO 6	Apply iterative and transformation methods in structural engineering

CO	CO – PO Mapping										
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Medium	Low	Medium	Medium	High	High	Low	Medium	Medium
CO- 2	High	High	Low	High	High	Low	Medium	High	Medium	Low	High
CO- 3	High	Medium	Low	Medium	High	High	Low	High	Low	Medium	Medium
CO- 4	Low	High	Low	Medium	High	High	Medium	High	Low	High	High
CO- 5	Medium	High	Low	High	Low	Low	High	High	Medium	Low	Medium
CO- 6	High	High	Medium	Low	Medium	Medium	High	High	Low	Medium	Low

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080107
Course title:	Theory and applications of Cement Composites (Elective 1)	**Course credit:**	4

CO 1	Formulate constitutive behaviour of composite materials –Ferrocement & FiberReinforced Concrete - by understanding their strain- stress behaviour
CO 2	Classify the materials as per orthotropic and anisotropic behaviour
CO 3	Estimate strain constants using theories applicable to composite materials
CO 4	Analyse and design structural elements made of cement composites

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Low	Medium	Medium	High	Medium	Low	Medium	High	High
CO- 2	Medium	Low	Medium	Low	High	Medium	High	Medium	Low	Medium	Low
CO- 3	High	High	Medium	Medium	Low	High	Medium	High	Medium	Low	Medium
CO- 4	Medium	High	Low	High	Medium	Medium	High	Low	Low	Medium	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080108
Course title:	Theory of structural stability (Elective 1)	**Course credit:**	4

CO 1	Determine stability of columns and frames
CO 2	Determine stability of beams and plates
CO 3	Use stability criteria and concepts for analyzing discrete and continuous systems

CO	CO – PO Mapping										
	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11
CO- 1	Medium	Medium	Medium	Low	High	Medium	Medium	Medium	Low	Medium	Low
CO- 2	Medium	High	Medium	Medium	Medium	High	Medium	Medium	Medium	Low	Medium
CO- 3	Medium	High	Low	Medium	Medium	Medium	High	Low	Low	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080109
Course title:	Theory of Thin plates & shells (Elective 2)	**Course credit:**	4

CO 1	Use analytical methods for the solution of thin plates and shells.
CO 2	Use analytical methods for the solution of shells
CO 3	Apply the numerical techniques and tools for the complex problems in thin plates
CO 4	Apply the numerical techniques and tools for the complex problems in shells.

CO	CO – PO Mapping										
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	Medium	High	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	Medium	High	High	Low	Medium	High	High	Medium	Medium	Low	Low
CO- 3	High	High	Low	Low	High	Medium	High	Low	Low	High	Low
CO- 4	Medium	High	Medium	Low	High	Medium	High	Medium	Low	High	Low

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080110
Course title:	Advanced Solid Mechanics (Elective 2)	**Course credit:**	4

CO 1	Understanding the basic concepts and solve simple problems of elasticity and plasticity
CO 2	Solve the advanced practical problems related to the theory of elasticity, concepts of stress and strain, strain energy, and failure criteria
CO 3	Propose materials and structural elements to the analysis of complex structures
CO 4	Apply numerical methods to solve continuum problems.

CO	CO – PO Mapping										
	PO- 1	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	High	Low	High	Medium	High	Medium	Low	Medium	Low
CO- 2	High	High	High	Medium	Medium	High	High	Medium	Medium	Medium	Low
CO- 3	High	High	Medium	Low	Medium	Medium	High	Low	Low	High	Low
CO- 4	Medium	High	Medium	Medium	High	Medium	High	Medium	Medium	Medium	Low

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Program:	Masters of Technology	**Semester:**	1
Year:	1st Year	**Course code**	26080111
Course title:	Structural Optimization (Elective 2)	**Course credit:**	4

CO 1	Understand optimization techniques,
CO 2	Classify the optimization problems
CO 3	Derive response quantities corresponding to design variable
CO 4	Apply optimization techniques to trusses, beams and frames

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Low	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	Medium	High	Medium	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium
CO- 3	High	Medium	Medium	Low	Medium	Medium	High	Low	Medium	High	Medium
CO- 4	Medium	Medium	Medium	Medium	High	Medium	High	Medium	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080105
Course title:	Disaster Management (Audit Course)	**Course credit:**	-

CO 1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO 2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO 3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO 4	Critically understand the strengths and weaknesses of disaster management approaches, planning, and programming in different countries, particularly their home country or the countries they work in.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Low	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	High	High	High	Medium	High	High	Medium	High	Medium	High	High
CO- 3	High	High	Medium	Low	High	Medium	High	Low	High	High	Medium
CO- 4	Medium	Medium	Medium	High	High	Medium	High	Medium	High	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080201
Course title:	Advanced Steel Design	**Course credit:**	4

CO 1	Design steel structures/ components by different design processes.
CO 2	Analyze and design beams and columns for stability and strength, and drift.
CO 3	Design welded and bolted connections.
CO 4	Apply unified code philosophy to steel building design
CO 5	Apply plastic method for design of beams and frames
CO 6	Design & detail Industrial building, steel stacks & composite structures as per the IS code

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Medium	Medium	Medium	Medium	Medium	High	Low	Medium	Low
CO- 2	High	High	Low	High	High	Medium	Medium	Medium	Medium	Low	High
CO- 3	High	Medium	Low	Medium	High	Low	Low	High	Low	Medium	Medium
CO- 4	Low	Low	Low	Medium	High	Medium	Medium	Medium	Low	High	High
CO- 5	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	Medium
CO- 6	High	Low	Medium	Low	Medium	Medium	High	Medium	Low	Medium	Low

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080202
Course title:	Structural Dynamics	**Course credit:**	4

CO 1	Analyze and Interpret dynamics response of single degree freedom system using fundamental theory and experiments
CO 2	Analyze and Interpret dynamics response of Multi degree freedom system using fundamental theory and experiments
CO 3	Differentiate the effects of various types of dynamic loads
CO 4	Use structural engineering software for dynamic analysis
CO 5	Perform & interpret the results of various experiments on models to understand structural behavior of symmetrical & un-symmetrical structures in plan & elevation

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
CO- 2	Medium	High	Medium	High	High	Medium	Medium	Medium	Medium	Low	Medium
CO- 3	High	Medium	Low	Medium	Medium	Low	Medium	High	Low	Medium	Medium
CO- 4	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium	Low	High	High
CO- 5	Medium	Medium	Low	High	Low	Medium	Medium	High	Medium	Medium	Medium

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Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080203
Course title:	Structural Design Project	**Course credit:**	2

CO 1	Use computational tool for modeling, analyzing & designing structures using relevant codes.
CO 2	Prepare site visit reports
CO 3	Prepare detailed design report
CO 4	Prepare structural drawings which may be Good for construction.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Low	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	Medium	High	Medium	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium
CO- 3	High	Medium	Medium	Low	Medium	Medium	High	Low	Medium	High	Medium
CO- 4	Medium	Medium	Medium	Medium	High	Medium	High	Medium	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080204
Course title:	Design of Formwork	**Course credit:**	4

CO 1	Use computational tool for modeling, analyzing & designing structures using relevant codes.
CO 2	Prepare site visit reports
CO 3	Prepare detailed design report
CO 4	Prepare structural drawings which may be Good for construction.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	Medium	Low	Medium	High	Low	Low	High	Low	Medium	Medium
CO- 2	Low	Low	Low	Medium	High	Medium	Medium	Medium	Low	High	High
CO- 3	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	Medium
CO- 4	High	Low	Medium	Low	Medium	Medium	High	Medium	Low	Medium	Low

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Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080205
Course title:	Design of High rise Structures	**Course credit:**	4

CO 1	Analyze, design and detail tall structures under different loading conditions by static and dynamic method of analysis
CO 2	Use of computational software for analysis and design of high-rise structures
CO 3	Apply codal provisions for tall structures.
CO 4	Choose & apply appropriate structural systems for different size & height of structure
CO 5	Develop design basis report

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Medium	Medium	Medium	Medium	Medium	High	Low	Medium	Low
CO- 2	High	High	Low	High	High	Medium	Medium	Medium	Medium	Low	High
CO- 3	High	Medium	Low	Medium	High	Low	Low	High	Low	Medium	Medium
CO- 4	Low	Low	Low	Medium	High	Medium	Medium	Medium	Low	High	High
CO- 5	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	Medium

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Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080206
Course title:	Design of Masonry Structures	**Course credit:**	4

CO 1	Distinguish from a wide range of materials for their suitability to arrive at feasible and optimal solutions for masonry constructions
CO 2	Apply knowledge of structural masonry for advanced research and construction procedures
CO 3	Justify the design of masonry buildings for sustainable development
CO 4	Check the stability of walls

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Low	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	High	High	High	Medium	High	High	Medium	High	Medium	High	High
CO- 3	High	High	Medium	Low	High	Medium	High	Low	High	High	Medium
CO- 4	Medium	Medium	Medium	High	High	Medium	High	Medium	High	Medium	High

SWARNIM INSTITUTE OF TECHNOLOGY

Swarrnim Institute of Technology
Swarrnim Startup & Innovation University
University Campus, Bhoyan Rathod, Near ONGC WSS, Opp. IFCCO, Adalaj Kalol Highway,
Gandhinagar,Gujarat, INDIA 382420 Phone: 095123 43333

Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080207
Course title:	Structural Health Monitoring & Retroffiting of Structures	**Course credit:**	4

CO 1	Diagnose the distress and the cause of distress in the structure.
CO 2	Detect the changes in the characteristics of the structure
CO 3	Assess the remaining performance capacity
CO 4	Choose & apply the appropriate repair and retrofitting techniques for damaged structures.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	High	Low	High	High	High	Medium	High	Medium	Medium
CO- 2	Low	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	High	Medium
CO- 3	Medium	High	Low	High	Low	Low	High	High	Low	Low	High
CO- 4	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium

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Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080208
Course title:	Design of Bridge Structures	**Course credit:**	4

CO 1	Analyze and design small to medium span of reinforced concrete slab culverts, T beam bridges as per IRC specifications
CO 2	Apply design principles of pre-stressed concrete T beam bridges, box girder bridges, balanced cantilever bridges
CO 3	Use of computational software for analysis & design of bridges
CO 4	Choose & apply appropriate structural form for different span of bridges
CO 5	Develop design basis report

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Low	High	High	Medium	Medium	Medium	Medium	Low	High
CO- 2	High	Medium	Low	Medium	High	Low	Low	High	Low	Medium	Medium
CO- 3	Low	Low	Low	Medium	High	Medium	Medium	Medium	Low	High	High
CO- 4	Medium	High	Low	High	Low	Low	Medium	High	Medium	Low	Medium
CO- 5	High	Low	Medium	Low	Medium	Medium	High	Medium	Low	Medium	Low

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Program:	Masters of Technology	**Semester:**	2
Year:	1st Year	**Course code**	26080209
Course title:	Soil Structure Interaction	**Course credit:**	4

CO 1	Apply various theories applicable to SSI and will have capacity to idealize soil response in order to analyze and design rigid and flexible foundation elements subjected to different loadings
CO 2	Calculate Contact pressure and settlement under shallow foundations, mat foundation, pile-raft foundation, settlement computation from constitutive laws.
CO 3	Analyise retaining structures through various analytical and graphical approaches, and design supporting structures for excavations
CO 4	Analyse sub-structural and super-structural element using various SSI tools based on hybrid models, discrete models and FEM approach and elastic theory approach
CO 5	Analyise vertical piles, laterally loaded piles and pile-raft system and foundations subjected to dynamic forces/seismic forces

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
CO- 2	Medium	High	Medium	High	High	Medium	Medium	Medium	Medium	Low	Medium
CO- 3	High	Medium	Low	Medium	Medium	Low	Medium	High	Low	Medium	Medium
CO- 4	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium	Low	High	High
CO- 5	Medium	Medium	Low	High	Low	Medium	Medium	High	Medium	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080301
Course title:	Industrial Safety	**Course credit:**	3

CO 1	Understand Importance of Safety and Important related Acts.
CO 2	Apply Maintenance techniques as per requirements and able to compare for with different technique for better performance
CO 3	Understand wear and corrosion, its causes and remedial actions for preventions
CO 4	Demonstrate fault tracing, its methods and application

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Low	Low	High	Low	High	Medium	Low	Medium	Low
CO- 2	High	High	High	Medium	High	High	Medium	High	Medium	High	High
CO- 3	High	High	Medium	Low	High	Medium	High	Low	High	High	Medium
CO- 4	Medium	Medium	Medium	High	High	Medium	High	Medium	High	Medium	High

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Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080302
Course title:	Operation Research	**Course credit:**	3

CO 1	Students should able to apply the Liner programming techniques to solve problems of real-life applications and carry out post optimality analysis.
CO 2	Students should able to apply the concepts of non-linear programming and apply them for real life problems
CO 3	Students should able to obtain quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.
CO 4	Students should able to implement various scientific tools and models that are available in the subject to take decisions in a complex environment.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Medium	Medium	Medium	Medium	Medium	High	Low	Medium	Low
CO- 2	High	High	Low	High	High	Medium	Medium	Medium	Medium	Low	High
CO- 3	High	Medium	Low	Medium	High	Low	Low	High	Low	Medium	Medium
CO- 4	Low	Low	Low	Medium	High	Medium	Medium	Medium	Low	High	High

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Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080303
Course title:	Composite Materials	**Course credit:**	3

CO 1	Understanding the Composite Material
CO 2	Apply Different materials as per requirements and able to compare for with different technique for better performance
CO 3	Analyze different search techniques in Casting
CO 4	Develop material basis report

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	Low	Medium	High	Low	High	Medium	Low	Medium	Low
CO- 2	High	High	High	Medium	High	High	Medium	Medium	Medium	High	High
CO- 3	Medium	High	Medium	Low	Medium	Medium	High	Low	High	Medium	Medium
CO- 4	Medium	Medium	Medium	Medium	High	Medium	High	Medium	High	Medium	High

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Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080304
Course title:	Design of Prestressed Concrete Structures (Program Elective-V) _	**Course credit:**	3

CO 1	Apply principle of prestressing, determination of losses, deflections and cable profile
CO 2	Analyze and design pre-tensioned and post-tensioned prestressed concrete beam with limit state design method
CO 3	Apply principles of prestressing to slab, column, beam-column, pipes & cylindrical water tank
CO 4	Apply prestressing techniques to composite structures like Prestressed concrete beam over cast-in-situ slab.
CO 5	Apply design principles of partial prestressing, prestressing of few special structures like folded plates, cylindrical shell and poles.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
CO- 2	Medium	High	Medium	High	High	Medium	Medium	Medium	Medium	Low	Medium
CO- 3	High	Medium	Low	Medium	Medium	Low	Medium	High	Low	Medium	Medium
CO- 4	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium	Low	High	High
CO- 5	Medium	Medium	Low	High	Low	Medium	Medium	High	Medium	Medium	Medium

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Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080305
Course title:	Earthquake Resistant Design of Structures (Program Elective-V)	**Course credit:**	3

CO 1	Apply the concept of Earthquake Resistant Design & appraise the effect of structural & architectural irregularities of buildings
CO 2	Determine the lateral loads on SDOF & MDOF structural system subjected to earthquake
CO 3	Analyze RCC framed structures through Equivalent static force method - Response spectrum method for determining the lateral forces generated due to earthquake. Design & detailing of Multi-storey RC building using the available software
CO 4	Appraise the concepts of ductile detailing for various structural elements in RC structures
CO 5	Classify & describe various control systems & apply to framed structures

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	Medium	High	High	Low	High	High	High	Medium	High	Medium	Medium
CO- 2	Low	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	High	Medium
CO- 3	Medium	High	Low	High	Low	Low	High	High	Low	Low	High
CO- 4	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium
CO- 5	Medium	High	High	Low	High	High	High	Medium	High	Medium	Medium

SWARNIM INSTITUTE OF TECHNOLOGY

Program:	Masters of Technology	**Semester:**	3
Year:	2nd Year	**Course code**	26080306
Course title:	Advanced Design of foundations Systems (Program Elective-V)	**Course credit:**	3

CO 1	Apply various design approaches, selection of proper foundation system as per sub-soil conditions based on codal provisions and theoretical practice followed
CO 2	Analyze and design rigid and flexible foundation systems using elastic theories based on numerical and analytical approaches through software including soil structure interaction effect
CO 3	Design temporary and permanent soil retaining structures, excavation supports, foundations in water bodies and high embankments
CO 4	Apply conceptual knowledge of special foundations such as batter piles, shell foundations and sheet pile walls for various applications such as resisting high lateral loads.

	CO – PO Mapping										
CO	**PO- 1**	**PO- 2**	**PO- 3**	**PO- 4**	**PO- 5**	**PO- 6**	**PO- 7**	**PO- 8**	**PO- 9**	**PO- 10**	**PO- 11**
CO- 1	High	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	High	Medium
CO- 2	Medium	Medium	Low	High	High	Low	Medium	High	Low	Medium	High
CO- 3	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium
CO- 4	Medium	Medium	High	Medium	High	High	High	Medium	High	Medium	Medium

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