



# TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108



## Bachelor of Technology SoE and Syllabus 2025-26 (NEW NEP-2020 Scheme) (Department of Civil Engineering)

### **Vision of Institute**

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

### **Mission of Institute**

M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

M2- To provide facilities and services to meet the challenges of Industry and Society.

M3- To facilitate socially responsive research, innovation and Entrepreneurship.

M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108  
Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra  
(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Department of Basic Sciences and Humanities

### Scheme of Instruction for First Year of B. Tech. (UG) Programme Group-B Semester – I (AE/CE/ME)

SN	Sem	Type	BoS/ Dept	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage				ESE Duration Hours
							L	P	SL	Hrs		CT/A	CA	ESE	TOTAL	
<b>FIRST SEMESTER (GROUP-B)</b>																
1	1	BSC	S&H	BSH41101	Linear Algebra and Calculus	T	4	0	2	6	4	30	10	60	100	3
2	1	BSC	S&H	BSH41106	Chemical Process in Engineering	T	3	0	2	5	3	30	10	60	100	3
3	1	BSC	S&H	BSH41107	Chemical Process in Engineering-Lab	P	0	2	-	2	1	25	-	25	50	-
4	1	ESC	CE	BCE41101	Engineering Mechanics	T	3	0	2	5	3	30	10	60	100	3
5	1	IKS	S&H	BSH41204	Indian Ancient Technology	T	2	0	2	4	2	15	5	30	50	1
6	1	ESC	ME	BME41101	IDEA-Lab & Engineering Workshop	P	0	4	-	4	2	50	-	-	50	-
7	1	ESC	CE	BCE41102	Environment Sustainability -Lab	P	0	2	-	2	1	25	-	25	50	-
8	1	VSEC	CSE	BCS41104	Fundamentals of Computer-Lab	P	0	2	-	2	1	25	-	25	50	-
9	1	VSEC	S&H	BSH41205	Social Internship	P	0	2	-	2	1	25	-	-	25	-
10	1	PCC	AE/ ME/ CE	BAE41101/ BME41102 BCE41103	Basics of Aircraft Design-Lab / CNC Machine and Programing-Lab / Building Maintenance -Lab	P	0	4	-	4	2	25	-	25	50	-
11	1	CC	S&H	BSH41X01	Liberal Learning Module-I	P	0	4	-	4	2	50	-	-	50	-
<b>TOTAL FIRST SEM</b>							<b>12</b>	<b>20</b>	<b>08</b>	<b>40</b>	<b>22</b>	<b>330</b>	<b>35</b>	<b>310</b>	<b>675</b>	<b>10</b>

<b>SECOND SEMESTER (GROUP-B)</b>																
1	2	BSC	S&H	BSH41201	Differential Equation and Statistics	T	4	0	2	6	4	30	10	60	100	3
2	2	BSC	S&H	BSH41206	Solid State Physics & Optics	T	3	0	2	5	3	30	10	60	100	3
3	2	BSC	S&H	BSH41210	Solid State Physics & Optics-Lab	P	0	2	-	2	1	25	-	25	50	-
4	2	ESC	EE	BEE41201	Principle of Electrical Engineering	T	3	0	2	5	3	30	10	60	100	3
5	2	ESC	EE	BEE41202	Principle of Electrical Engineering -Lab	P	0	2	-	2	1	25	-	25	50	-
6	2	ESC	ME	BME41202	Engineering & Computer Graphics	T	2	0	2	4	2	15	5	30	*50	1
7	2	ESC	IT	BIT41205	C Language -Lab	P	0	2	2	4	1	25	-	25	50	-
8	2	VSEC	CE	BCE41201	Computer Aided Drawing-Lab	P	0	2	-	2	1	25	-	25	50	-
9	2	VSEC	S&H	BSH41105	Professional Etiquette	P	0	2	-	2	1	25	-	-	25	-
10	2	AEC	S&H	BSH41104	Digital Wellness & Basic Communication Lab	P	0	4	-	4	2	50	-	-	50	-
11	2	CC	S&H	BSH41Y01	Liberal Learning Module-II	P	0	4	-	4	2	50	-	-	50	-
<b>TOTAL SECOND SEM</b>							<b>12</b>	<b>18</b>	<b>10</b>	<b>40</b>	<b>21</b>	<b>330</b>	<b>35</b>	<b>310</b>	<b>675</b>	<b>10</b>

Course Category	BSC/ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	Multidisciplinary courses	VSEC (Skill Course)	Social Science & Management		Experiential Learning Courses	CC (Co- Curricular Courses)
					AEC (Ability Enhancement Course)	IKS (Indian Knowledge System)		
Credits SEM-I	08 / 06	-	-	02	02	-	-	02
Credits SEM-II	08 / 07	02	-	02	-	02	-	02
Cumulative Sum	16 / 13	02	-	04	02	02	-	04

PROGRESSIVE TOTAL CREDITS: 22+21=43

				July, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	

# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

## SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Second Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)

Semester – III

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	III	PCC	CE	BCE42301	Mechanics of Solids	T	3	0	3	3	30	10	60	3 Hrs.	100
2	III	PCC	CE	BCE42302	Fluid Mechanics	T	3	0	3	3	30	10	60	3 Hrs.	100
3	III	MDM	CE	BCE42306	Idea lab – Digital Construction (3DS Max) & Additive Prototyping	P	0	4	4	2	-	50	50	-	100
4	III	HSSM	SH	BSH42302	Numerical Methods for Engineers	T	2	0	2	2	14	06	30	2 Hrs.	50
5	III	VEC	CE	BCE42308	Sustainable Development Goals	T	2	0	2	2	14	06	30	2 Hrs.	50
6	III	OEC		B\$\$423XX	Open Elective-I	T	4	0	4	4	30	10	60	3 Hrs.	100
7	III	PCC	CE	BCE42303	Mechanics of Solids - Lab	P	0	2	2	1	-	25	25	-	50
8	III	PCC	CE	BCE42304	Fluid Mechanics - Lab	P	0	2	2	1	-	25	25	-	50
9	III	AEC	CE	BCE42307	Liberal Learning Module-3	P	0	2	2	1	-	50	-	-	50
10	III	CEP	CE	BCE42305	Field Project	P	0	4	4	2	-	50	-	-	50
							<b>14</b>	<b>14</b>	<b>28</b>	<b>21</b>	<b>118</b>	<b>242</b>	<b>340</b>	<b>13 Hrs.</b>	<b>700</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (3 <sup>rd</sup> sem)	--	08	--	06	--	05	02	--
Cumulative Sum	16 / 13	10	--	06	04	09	02	04

**PROGRESSIVE TOTAL CREDITS: 43+21=64**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

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## SCHEME OF INSTRUCTION & SYLLABI

**Programme: Civil Engineering**

**Scheme of Instructions: Second Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)**

**Semester – IV**

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	IV	PCC	CE	BCE42401	Structural Analysis	T	3	0	3	3	30	10	60	3 Hrs.	100
2	IV	PCC	CE	BCE42402	Surveying	T	3	0	3	3	30	10	60	3 Hrs.	100
3	IV	PCC	CE	BCE42403	Concrete Technology	T	3	0	3	3	30	10	60	3 Hrs.	100
4	IV	MDM	ECE	BEC42406	Instrumentation & Sensor Technologies for Engineering Applications	T	2	0	2	2	14	06	30	2 Hrs.	50
5	IV	OEC		B\$\$424XX	Open Elective-II	T	2	0	2	2	14	06	30	2 Hrs.	50
6	IV	HSSM	CE	BCE42404	Project Management	T	2	0	2	2	14	06	30	2 Hrs.	50
7	IV	PCC	CE	BCE42405	Surveying - Lab	P	0	2	2	1	-	25	25	-	50
8	IV	VSEC	CE	BCE42406	Structural Software Training	P	0	4	4	2	-	50	50	-	100
9	IV	AEC	CE	BCE42407	Liberal Learning Module-4	P	0	2	2	1	-	50	-	-	50
10	IV	VEC	CE	BCE42408	Introduction to Earth Sciences	P	0	4	4	2	-	50	50	-	100
							<b>15</b>	<b>12</b>	<b>27</b>	<b>21</b>	<b>132</b>	<b>223</b>	<b>395</b>	<b>15 Hrs.</b>	<b>750</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (4 <sup>th</sup> sem)	--	10	--	04	02	05	--	--
Cumulative Sum	16 / 13	20	--	10	06	14	02	04

**PROGRESSIVE TOTAL CREDITS: 64+21=85**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
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## SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Third Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)

Semester – V

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	V	PCC	CE	BCE43501	Design of Steel Structures	T	3	0	3	3	30	10	60	3 Hrs.	100
2	V	PCC	CE	BCE43502	Environmental Engineering	T	3	0	3	3	30	10	60	3 Hrs.	100
3	V	PCC	CE	BCE43503	Geotechnical Engineering	T	3	0	3	3	30	10	60	3 Hrs.	100
4	V	PEC	CE	BCE43506-09	Program Elective – I	T	3	0	3	3	30	10	60	3 Hrs.	100
5	V	MDM	IT	BIT43516	Cyber Security & Laws	T	4	0	4	4	30	10	60	3 Hrs.	100
6	V	OEC		B\$\$435XX	Open Elective-III	T	2	0	2	2	14	06	30	2 Hrs.	50
7	V	PCC	CE	BCE43504	Environmental Engineering - Lab	P	0	2	2	1	-	25	25	-	50
8	V	PCC	CE	BCE43505	Geotechnical Engineering - Lab	P	0	2	2	1	-	25	25	-	50
							<b>18</b>	<b>4</b>	<b>22</b>	<b>20</b>	<b>164</b>	<b>106</b>	<b>380</b>	<b>17 Hrs.</b>	<b>650</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (5 <sup>th</sup> sem)	--	11	03	06	--	--	--	--
Cumulative Sum	16 / 13	31	03	16	06	14	02	04

**PROGRESSIVE TOTAL CREDITS: 85+20=105**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
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## SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Third Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)

Semester – VI

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	VI	PCC	CE	BCE43601	Reinforced Cement Concrete Structures	T	3	0	3	3	30	10	60	3 Hrs.	100
2	VI	PCC	CE	BCE43602	Transportation Engineering	T	3	0	3	3	30	10	60	3 Hrs.	100
3	VI	PCC	CE	BCE43603	Irrigation Engineering	T	2	0	2	2	14	06	30	2 Hrs.	50
4	VI	PEC	CE	BCE43606-09	Program Elective – II	T	3	0	3	3	30	10	60	3 Hrs.	100
5	VI	PEC	EE	BCE43610-13	Program Elective – III	T	3	0	3	3	30	10	60	3 Hrs.	100
6	VI	MDM	CE	BEE43613	Green Energy Technology	T	2	0	2	2	14	06	30	2 Hrs.	50
7	VI	PCC	CE	BCE43604	Transportation Engineering - Lab	P	0	2	2	1	-	25	25	-	50
8	VI	PCC	CE	BCE43605	Concrete Testing Lab	P	0	2	2	1	-	25	25	-	50
9	VI	PCC	CE	BCE43614	Geomatics Lab	P	0	2	2	1	-	25	25	-	50
10	VI	VSEC	CE	BCE43615	Building Information Modelling and Management	P	0	2	2	1	-	25	25	-	50
11	VI	PROJ	CE	BCE43616	Mini Project	P	0	2	2	1	-	25	25	-	50
							<b>16</b>	<b>10</b>	<b>26</b>	<b>21</b>	<b>148</b>	<b>177</b>	<b>425</b>	<b>16 Hrs.</b>	<b>750</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (6 <sup>th</sup> sem)	--	11	06	02	01	--	01	--
Cumulative Sum	16 / 13	42	09	18	07	14	03	04

**PROGRESSIVE TOTAL CREDITS: 105+21=126**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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## SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering


Scheme of Instructions: Fourth Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)

Semester – VII

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	VII	PCC	CE	BCE44701	Estimating & Costing	T	4	0	4	4	30	10	60	3 Hrs.	100
2	VII	PEC	CE	BCE44702-05	Program Elective – IV	T	4	0	4	4	30	10	60	3 Hrs.	100
3	VII	PEC	CE	BCE44706-09	Program Elective – V	T	3	0	3	3	30	10	60	3 Hrs.	100
4	VII	MDM	BA	BBA44701	Professional Practices, Laws & Ethics	T	4	0	4	4	30	10	60	3 Hrs.	100
5	VII	PCC	CE	BCE44711	Foundation Engineering	T	3	0	3	3	30	10	60	3 Hrs.	100
6	VII	PCC	CE	BCE44712	Construction Management	T	3	0	3	3	30	10	60	3 Hrs.	100
7	VII	PROJ	CE	BCE44710	Project	P	0	6	6	3	-	50	50	-	100
							<b>21</b>	<b>6</b>	<b>27</b>	<b>24</b>	<b>180</b>	<b>110</b>	<b>410</b>	<b>18 Hrs.</b>	<b>700</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (7 <sup>th</sup> sem)	--	10	07	04	--	--	03	--
Cumulative Sum	16 / 13	52	16	22	07	14	06	04

**PROGRESSIVE TOTAL CREDITS: 126+24=150**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

## Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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### SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Fourth Year B.Tech. in Civil Engineering (As Per NEW NEP-2020 Scheme)

Semester – VIII

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	VIII	RM	ME	BME34802	Research Methodology	T	4	0	4	4	30	10	60	3 Hrs.	100
2	VIII	OJT	CE	BCE34803	Internship / On Job Training	P	0	24	24	12	-	50	50	-	100
							<b>4</b>	<b>24</b>	<b>28</b>	<b>16</b>	<b>30</b>	<b>60</b>	<b>110</b>	<b>3 Hrs,</b>	<b>200</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (8 <sup>th</sup> sem)	--	--	--	--	--	--	16	--
Cumulative Sum	16 / 13	52	16	22	07	14	22	04

PROGRESSIVE TOTAL CREDITS: 150+16=166

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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## Program: Civil Engineering

### List of Program Electives offered By Civil Engineering Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	Semester VII
BCE43506-Water Resources Engineering	BCE43606-Rural Water Supply and Sanitation	BCE43610- Building Construction Practice	BCE44702-Pavement Design	BCE44706-High Rise Structures
BCE43507-Water Quality Engineering	BCE43607-Environmental Laws and Policy	BCE43611- Advanced Building Construction Methods	BCE44703-Urban Transportation Planning	BCE44707-Industrial Structures
BCE43508-Surface Hydrology	BCE43608-Solid and Hazardous Waste Management	BCE43612- Structural Audit & Retrofitting of Structures	BCE44704-Airport Planning and Design	BCE44708-Prestressed Concrete
BCE43509-Flood Control & Drainage Engineering	BCE43609-Air and Noise Pollution Control	BCE43613- Cement Manufacturing Technology & Equipment	BCE44705-High Speed Rail Engineering	BCE44709-Earthquake Engineering

### List of Open Electives offered By Civil Engineering Department

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BCE42306: Green Structures and Smart Cities	BCE42406: Plastic Waste Management	BCE43510: Railways & Airport Engineering

### List of Multidisciplinary Minor Courses offered By Civil Engineering Department

SN	Sem	Type	BoS/ Dept	Sub. Code	Subject
1.	III	MDM-I	S&H	BSH42302	Numerical Methods for Engineers
2.	IV	MDM-II	ECE	BEC42406	Instrumentation & Sensor Technologies for Civil Engineering Applications
3.	V	MDM-III	IT	BIT43516	Cyber Security & Laws
4.	VI	MDM-IV	EE	BEE43613	Green Energy Technology
5.	VIII	MDM-V	BA	BBA44801	Professional Practices, Laws & Ethics

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Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

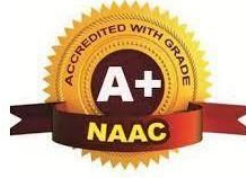
**Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur**  
(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

**Program: Civil Engineering**

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Program Core courses)	PEC (Program Elective courses)	Multidisciplinary courses	VSEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)	Semester Wise Credits
<b>Semester -I</b>	08	06	--	--	--	02	02	--	02	<b>20</b>
<b>Semester -II</b>	08	07	02	--	--	02	02	--	02	<b>23</b>
<b>Semester -III</b>	--	--	08	--	06	--	05	02	--	<b>21</b>
<b>Semester -IV</b>	--	--	10	--	04	02	05	--	--	<b>21</b>
<b>Semester -V</b>	--	--	11	03	06	--	--	--	--	<b>20</b>
<b>Semester -VI</b>	--	--	11	06	02	01	--	01	--	<b>21</b>
<b>Semester -VII</b>	--	--	10	07	04	--	--	03	--	<b>24</b>
<b>Semester -VIII</b>	--	--	--	--	--	--	--	16	--	<b>16</b>
<b>Cumulative Sum</b>	<b>16</b>	<b>13</b>	<b>52</b>	<b>16</b>	<b>22</b>	<b>07</b>	<b>14</b>	<b>22</b>	<b>04</b>	<b>166</b>

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*Department of Civil Engineering*

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**DEPARTMENT OF CIVIL ENGINEERING**

**B.Tech. Civil Engineering**

**III Semester**

**Teaching Scheme & Syllabus**

Considering

**National Education Policy (NEW NEP) – 2020**

From

**Academic Year 2025-26**

## **Vision of Institute**

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

## **Mission of Institute**

- **M1:** To strive for rearing standard and stature of the students by practicing high standards of Professional ethics, transparency and accountability
- **M2:** To provide facilities and services to meet the challenges of Industry and Society
- **M3:** To facilitate socially responsive research, innovation and entrepreneurship
- **M4:** To ascertain holistic development of student and staff members by inculcating knowledge and profession as work practices.

## **Vision of the Department**

To forge learning Center of Excellence in the field of Civil Engineering

## **Mission of the Department**

- **M1:** To promote academic and ethical development while upholding high standards.
- **M2:** To provide advance facilities with the skills needed to face Industry and societal challenges.
- **M3:** To promote socially responsible research, innovation, and entrepreneurship in the field of Civil Engineering.
- **M4:** To foster the holistic development of both students and faculty members by inculcating a blend of knowledge and professional work methods for overall progress.

## **Program Educational Objectives (PEO)**

- **PEO 1:** Analyze and design civil engineering structures while keeping social awareness and ethical responsibilities in mind.
- **PEO 2:** Demonstrate leadership abilities in supporting sustainable practices in Civil Engineering
- **PEO 3:** Exhibit a commitment to lifelong learning, staying updated on developing technologies and industry trends, and adjusting to the evolving world of Civil Engineering.
- **PEO 4:** Execute proficiency in creative problem-solving and innovation, demonstrating an entrepreneurial attitude within the context of Civil Engineering.

## **Program Outcomes (PO)**

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 8. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**9. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**10. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**11. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSO)**

- **PSO1:** Competency to manage large infrastructure projects while providing safe and cost-effective project execution, along with expertise of rapid construction and project management.
- **PSO2:** Plan, execute, manage, maintain and rehabilitate civil engineering systems and processes.
- **PSO3:** Apply innovative construction and management techniques to compete with modern structural design and construction within the budget and time frame.



# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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## SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech Civil Engineering

Scheme of Instructions: Second Year B. Tech. in Civil Engineering (As Per NEP 2020)

Semester – III



SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	III	PCC	CE	BCE42301	Mechanics of Solids	T	3	0	3	3	30	10	60	3 Hrs.	100
2	III	PCC	CE	BCE42302	Fluid Mechanics	T	3	0	3	3	30	10	60	3 Hrs.	100
3	III	MDM	CE	BCE42306	Idea lab – Digital Construction (3DS Max) & Additive Prototyping	P	0	4	4	2	-	50	50	-	100
4	III	HSSM	SH	BSH42302	Numerical Methods for Engineers	T	2	0	2	2	14	06	30	2 Hrs.	50
5	III	VEC	CE	BCE42308	Sustainable Development Goals	T	2	0	2	2	14	06	30	2 Hrs.	50
6	III	OEC		B\$\$423XX	Open Elective-I	T	4	0	4	4	30	10	60	3 Hrs.	100
7	III	PCC	CE	BCE42303	Mechanics of Solids - Lab	P	0	2	2	1	-	25	25	-	50
8	III	PCC	CE	BCE42304	Fluid Mechanics - Lab	P	0	2	2	1	-	25	25	-	50
9	III	AEC	CE	BCE42307	Liberal Learning Module-3	P	0	2	2	1	-	50	-	-	50
10	III	CEP	CE	BCE42305	Field Project	P	0	4	4	2	-	50	-	-	50
<b>Total</b>							<b>14</b>	<b>14</b>	<b>28</b>	<b>21</b>	<b>118</b>	<b>242</b>	<b>340</b>	<b>13 Hrs.</b>	<b>700</b>

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits (3 <sup>rd</sup> Sem)	--	08	--	06	--	05	02	--
Cumulative Sum	16 / 13	10	--	06	04	09	02	04

**PROGRESSIVE TOTAL CREDITS: 43+21=64**

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

## Program: Civil Engineering

List of **Program Electives** offered By Civil Engineering Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
<b>Semester V</b>	<b>Semester VI</b>	<b>Semester VI</b>	<b>Semester VIII</b>	<b>Semester VIII</b>
BCE43506-Water Resources Engineering	BCE43606-Rural Water Supply and Sanitation	BCE43610- Building Construction Practice	BCE44702-Pavement Design	BCE44706-High Rise Structures
BCE43507-Water Quality Engineering	BCE43607-Environmental Laws and Policy	BCE43611- Advanced Building Construction Methods	BCE44703-Urban Transportation Planning	BCE44707-Industrial Structures
BCE43508-Surface Hydrology	BCE43608-Solid and Hazardous Waste Management	BCE43612- Structural Audit & Retrofitting of Structures	BCE44704-Airport Planning and Design	BCE44708-Prestressed Concrete
BCE43509-Flood Control & Drainage Engineering	BCE43609-Air and Noise Pollution Control	BCE43613- Cement Manufacturing Technology & Equipment	BCE44705-High Speed Rail Engineering	BCE44709-Earthquake Engineering

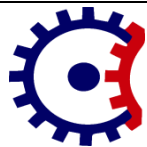
## Program: Civil Engineering

List of **Open Electives** offered By Civil Engineering Department

Open Elective-I	Open Elective-II	Open Elective-III
<b>Semester-III</b>	<b>Semester-IV</b>	<b>Semester-V</b>
BCE42306: Green Structures and Smart Cities	BCE42406: Plastic Waste Management	BCE43510: Railways & Airport Engineering

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	VSEC (Skill Course)	Humanities SocialScience & Management	Experiential Learning Courses	CC (Liberal Learning Courses)	Semester Wise Credits
<b>Semester -I</b>	08	06	--	--	--	02	02	--	02	<b>20</b>
<b>Semester -II</b>	08	07	02	--	--	02	02	--	02	<b>23</b>
<b>Semester -III</b>	--	--	08	--	06	--	05	02	--	<b>21</b>
<b>Semester -IV</b>	--	--	10	--	04	02	05	--	--	<b>21</b>
<b>Semester -V</b>	--	--	11	03	06	--	--	--	--	<b>20</b>
<b>Semester -VI</b>	--	--	11	06	02	01	--	01	--	<b>21</b>
<b>Semester -VII</b>	--	--	10	07	04	--	--	03	--	<b>24</b>
<b>Semester -VIII</b>	--	--	--	--	--	--	--	16	--	<b>16</b>
<b>Cumulative Sum</b>	<b>16</b>	<b>13</b>	<b>52</b>	<b>16</b>	<b>22</b>	<b>07</b>	<b>14</b>	<b>22</b>	<b>04</b>	<b>166</b>

				June, 2025	4.00	Applicable for AY 2025-26 Onwards
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**B.Tech. Civil Engineering - Second year (Semester-III)**

**BCE42301: Mechanics of Solids**

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs./week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
		<b>Total Marks</b>	<b>100 Marks</b>

**Course Objectives:**

1.	To make students determine and apply basic principles and concepts of equilibrium, Bending Moment, shear force in frames and frames, shear stress, bending stress, torsional stress and stress-strain laws to different materials for different conditions of loading
2.	To make students learn and understand the theory and concept of deflection of Frames, Beam, trusses and also apply the deflections in beams by given methods which is an important criteria in design.
3.	To determine the state of stress in three dimensions and various theories of failure in designing the structural members.
4.	To classify the failure pattern of metal under different action and provide knowledge about the torsional shaft for various section.
5.	To understand the nature of stresses developed in simple geometries such as cantilevers, bars, cylinder, shaft and spheres for various types of simple loads.

**Course Contents**

<b>Unit I</b>	Mechanical properties and uniaxial problems: Types of force distribution, concept of stress, strain and their relationship, stress strain behavior of ductile and brittle material in uniaxial state of stress, elastic constants, relation between elastic constants Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading. Stress due to variation of temperature., Thin wall pressure vessels cylindrical and spherical subjected to internal pressure.
<b>Unit II</b>	Axial force, shear force and bending moment diagram Concepts of free body diagrams, types of loads, Determination of axial forces, shear forces and bending moment at a section, axial force, shear force and bending moment in beams and simple frames, Differential relations between shear force and bending moment, Relation between load and shear force.
<b>Unit III</b>	Stress in beams Bending stresses in simple beams, Assumptions and derivation of simple bending theory relation between bending moment, bending stress and curvature of homogeneous and composite beams, Shear stresses in simple beams, Shear flow and shear stress distribution, shear stress in composite beams, combined effect of bending moment and axial force, State of stress in two dimensions, principal stresses, maximum shear stresses.
<b>Unit IV</b>	Torsion of Shaft: Torsion of circular sections, assumptions and derivation of relation between torsional moment, shear stress and angle of twist. Torsional stress in solid and hollow circular sections. Introduction to Torsion in rectangular section, Torsion in thin walled hollow section

<b>Unit V</b>	Deflection of Beams: Derivation of differential equation of elastic curve, Differential Equation relating deflection moment, shear and load, Introduction to Deflection of linearly varying beams by integration Deflection of simple beams by double integration method. Compound stresses, combined effect of Bending and Shear, Moment area method, Conjugate Beam Method
<b>Text Books</b>	
T.1	Bhavikatti S. S., Strength of Materials, 3rd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
T.2	“Strength Of Materials” author by Bedi,D.S 5 <sup>th</sup> Edition REVISE Khanna Book Publishing Co.Pvt.Ltd.
T.3	“Strength Of Materials” author by Ramamrutham,S.; Narayanan,R. 17 <sup>th</sup> Edition REPRIND Thanpatrai Publications (P) Ltd.
T.4	“Strength Of Materials” author by Subramanian 2 <sup>nd</sup> edition REPRINT Oxford University Press.
<b>Reference Books</b>	
R.1	“Foundation Vibration Analysis: a Strength-of-Materials Approach” author by Wolf John. P;Deek S ,Andrew. J Reprint Elsevier Publication
R.2	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition),2010
R.3	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition),2010. 3.
R.4	Shah Y.L., Ogale R.A., Strength of Materials and Machine Element, 2nd edition, Jain book agency, New Delhi
<b>Useful Links</b>	
1	<a href="https://nptel.ac.in/courses/105/105/105105108/">https://nptel.ac.in/courses/105/105/105105108/</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42301.1</b>	<b>Classify</b> the behavior of materials under different stress and strain conditions.	2
<b>BCE42301.2</b>	<b>Determine</b> the bending moment and shear force diagram and discuss the concept of shear force and bending moment	3
<b>BCE42301.3</b>	<b>Evaluate</b> the bending stress and shear stress distribution for beams under the different conditions of loading.	5
<b>BCE42301.4</b>	<b>Calculate</b> the torsional effect on circular and hollow circular section of shaft at different speed, angle of twist, power and torque.	3
<b>BCE42301.5</b>	<b>Analyze</b> slope and deflection of beam under the different support condition and different loading condition.	4

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## B.Tech. Civil Engineering - Second year (Semester-III)

### BCE42302: Fluid Mechanics

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs./week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
		<b>Total Marks</b>	<b>100 Marks</b>

#### Course Objectives:

1.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.
2.	Understand the concept of Bernoulli's equation, Euler's equation and momentum equation. Apply the concept of Flow measuring devices and various hydraulic coefficients.
3.	Calculate the discharge and velocity through using various devices, introduced to motion of fluid with and without reference of force.
4.	Find the behavior of flow using Reynolds Apparatus which is used in every problem of fluid Mechanics.
5.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.

#### Course Contents

<b>Unit I</b>	<b>Fluids and Their Properties:</b> Definition of fluid, Differences between solids, liquids and gases, fluid properties, Newton's equation, Rheological Diagram, Ideal and real fluids. Compressibility and bulk modulus, Surface tension, capillarity, pressure inside a bubble and cylindrical jet, vapor pressure and cavitations Effect of pressure and Temperature on fluid properties.
<b>Unit II</b>	<b>Fluids Pressure and its Measurement:</b> Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure and vacuum. Gauge and absolute pressures Pressure measurement by manometers.
<b>Unit III</b>	<b>Hydrostatics:</b> Total pressure & center of pressure, Forces on a Horizontal, Vertical, Inclined, Curved, submerged surfaces, Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium. <b>Kinematics of Flow-I:</b> Lagrangian and Eulerian approaches in fluid flow description. Steady, unsteady, uniform, Non-uniform flow. One, two and three dimensional flow, Rotational & Irrotational flow. Streamline, path line, streak line.
<b>Unit IV</b>	<b>Kinetics of Flow:</b> Forces influencing motion, Euler's equations of motion for one dimensional flow, Bernoulli's equation for ideal fluids, Assumptions, derivation, limitation and application, Kinetic energy correction factor. Momentum equation, forces on pipe bent Impact of jet on different types of plate. Determination of Reynolds no using Reynolds apparatus.

<b>Unit V</b>	<b>Flow through Orifices and mouthpieces:</b> Definition, types, hydraulic coefficients, and factors affecting them and their experimental determination, time for emptying tank by orifices. Discharge through large and submerged orifices, external and internal mouth pieces, running free and running full, pressure at vena contracta, Discharge Through a convergent-divergent mouthpiece. Notches and weirs: Definition and type, flow over rectangular notch, triangular notch end contraction, coefficient of discharge and its determination. Error in measurement of head. Velocity of approach and its effects, Cippoletti, Broad crested and submerged weirs. Types non-conventional weirs.
<b>Text Books</b>	
T.1	“Advanced Engineering Fluid Mechanics” authored by Muralidhar K. Biswas G., Narosa Publishing House, 1996.
T.2	“Engineering Fluid Mechanics”, authored by Kumar K. L., Gupta S.K, S chand Publications, 2008.
T.3	“Hydraulics and Fluid Mechanics Including Hydraulics Machines authored by “Modi P.N., Seth S.M, 14 <sup>th</sup> edition, Standard Book House Publishers, New Delhi, 2009
T.4	“Fluid Mechanics” authored by R. K Bansal and R K Rajput, Laxmi Publication, LTD, 1989
<b>Reference Books</b>	
R.1	“Engineering Fluid Mechanics” authored by Graebel, W.P, 1th Edition, Taylor And Francis , 2001.
R.2	“Fundamental Mechanics Of Fluids ”, authored by Currie, I.G ,4th edition, Taylor And Francis, 1974
R.3	“Engineering Fluid Mechanics” authored by R.J Garde, A.J Mirajgaonkar, SCITECH Publication, 2010
R.4	“Fluid Mechanics, Hydraulics And Hydraulic Machines” authored by Arora K.R., NT Standard Publishers Distributorsl, 2005.
<b>Useful Links</b>	
1	<a href="https://nptel.ac.in/courses/105/103/105103192/">https://nptel.ac.in/courses/105/103/105103192/</a>
2	<a href="https://nptel.ac.in/courses/105/103/105103095/">https://nptel.ac.in/courses/105/103/105103095/</a>
3	<a href="http://nptel.ac.in/courses/117103064">http://nptel.ac.in/courses/117103064</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42302.1</b>	<b>Recognize</b> the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	1
<b>BCE42302.2</b>	<b>Determine</b> fluid pressure using fluid measurement devices.	3
<b>BCE42302.3</b>	<b>Apply</b> basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3
<b>BCE42302.4</b>	<b>Evaluate</b> the fluid problem by using Bernoulli’s equation.	5
<b>BCE42302.5</b>	<b>Use</b> the concept of fluid measurement and its control through discharge.	3

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**Program: B. Tech Second Year (CE)**

<b>Semester-III</b>		<b>BSH42302: Numerical Methods for Engineers</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme (Th)</b>		<b>Examination Scheme(P)</b>	
<b>Theory (Th)</b>	2 Hrs/week	<b>CT-I</b>	7 Marks	-	-
<b>Practical (P)</b>		<b>CT-II</b>	7 Marks	-	-
<b>Total Credits</b>	<b>2</b>	<b>CA</b>	6 Marks	-	-
<b>Duration of ESE: 2Hrs</b>		<b>ESE</b>	30 Marks	-	-
		<b>Total Marks</b>	<b>50 Marks</b>	-	-

**Course Outcome:**

- Analyze** numerical techniques to find the roots of equations different types of equations
- Apply** the knowledge of Numerical techniques to solve ordinary differential equations in engineering problems.
- Formulate** simple optimization problem and learn to solve it by Graphical method and Simplex method.

**Course Contents**

<b>Unit I</b>	<b>Numerical Method I</b> Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordan method. Gauss Seidel method, Crout's method,
<b>Unit II</b>	<b>Numerical Method II</b> Numerical Methods (Differential Equations) Numerical solution of ordinary differential equation by Taylor series method, Runge- Kutta method of 4th order, Euler modified method, Milne's Predictor corrector method. Runge- Kutta method to solve simultaneous first order Differential Equation.
<b>Unit III</b>	<b>INTRODUCTION TO OPTIMIZATION TECHNIQUES:</b> Linear programming problem: Formulation, Graphical method, Simplex method, Transportation Problems.

**Text Books**

T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville
T.4	Introduction to Operation Research by Dr. Gupta, Prem kumar, Dr. Hira D.S., S. Chand & Co.

**Reference Books**

R.1	A Text Book of applied Mathematics, Volume I & II, by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
R.3	Mathematics for Engineers by Chandrika Prasad
R.4	A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

*(Signature)*

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## B.Tech. Civil Engineering - Second year (Semester-III)

### BCE42306: Idea Lab - Digital Construction (3DS Max) & Additive Prototyping

Teaching Scheme		Examination Scheme	
Practical	4 Hrs./week	CA	50 Marks
Tutorial	-		
Total Credits	2	ESE	50 Marks
Duration of ESE:			
		Total Marks	100 Marks

#### Course Objectives:

1.	Understand & explore the interface, tools, and commands of AutoCAD for 2D drafting and building plans.
2.	Develop skills in creating 2D drawings, sectional views, and elevations of residential, educational, and hospital buildings using AutoCAD.
3.	Study 3D modeling concepts, standard primitives, transformations, and scene creation using 3ds Max.
4.	Apply materials, lighting, cameras, and rendering techniques for realistic 3D visualization.
5.	Design and fabricate physical prototypes of building models using 3D printing technology.

#### Course Contents

1	Study AutoCAD interface, coordinate system, and basic setup for drafting.	CO 1
2	Apply basic commands to construct a 2D drawing.	CO 1
3	Study 3DS Max interface and workspace by navigating basic tools.	CO 1
4	Create a 2D double-line drawing of a 1BHK Residential Building plan.	CO 2
5	Apply AutoCAD commands to create a 2D double-line drawing of a School Building plan.	CO 2
6	Apply AutoCAD commands to create a 2D double-line drawing of a Hospital Building plan.	CO 2
7	Apply AutoCAD tools to generate elevation drawings of a 1BHK Residential Building plan.	CO 3
8	Create section drawings of a 1BHK Residential Building plan using proper projection and drafting standards.	CO 3
9	Understand the creation of standard primitives and object properties.	CO 3
10	Apply transformation tools on 3D models.	CO 4
11	Create a simple interior/exterior 3D model.	CO 4
12	Create a complete 3D scene with texturing, lighting, and rendering.	CO 4

13	Create a prototype of a 1BHK Residential Building using a 3D printer.	CO 5
14	Create a prototype of a small bridge/ truss structure using a 3D printer.	CO 5
15	Create a prototype of a building column/ footing/ beam using a 3D printer.	CO 5
<b>Text Books</b>		
T.1	“Ibrahim Zeid, Mastering AutoCAD 2024 and AutoCAD LT 2024	
T.2	“Autodesk 3ds Max 2020: A Detailed Guide to Modeling, Texturing, Lighting, and Rendering, 2nd Edition by Pradeep Mangain	
<b>Reference Books</b>		
R.1	“AutoCAD 2023 for Engineers and Designers — 3D & Advanced” author by Prof. Sham Tickoo, 2023	
R.2	“George Omura, Mastering AutoCAD 2021 and AutoCAD LT 2021” by Brian C. Benton, George Omura, 2021	
R.3	“Autodesk 3ds Max Complete Reference Guide”, SDC Publications, by Kelly L. Murdock 2020	
R.4	“Autodesk 3ds Max 2025: Fundamentals (Mixed Units)”, by ASCENT - Center for Technical Knowledge, 2025	
<b>Useful Links</b>		
1		

	Course Outcomes	CL
<b>BCE42306.1</b>	<b>Demonstrate</b> proficiency in AutoCAD and 3ds Max interfaces, navigation, and basic modeling/drafting tools.	2
<b>BCE42306.2</b>	<b>Create</b> accurate 2D building plans, sections, and elevation drawings for residential, school, and hospital buildings using AutoCAD.	5
<b>BCE42306.3</b>	<b>Create</b> 3D objects and develop simple interior and exterior 3D scenes in 3DS Max.	4
<b>BCE42306.4</b>	<b>Analyze</b> texturing, lighting, and rendering techniques to generate photorealistic 3D visualizations of building models.	4
<b>BCE42306.5</b>	<b>Create</b> 3D prototypes of residential, school, and hospital building models using a 3D printer.	5

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**B.Tech. Civil Engineering - Second year (Semester-III)**

**BCE42308 : Sustainable Development Goals**

Teaching Scheme		Examination Scheme	
Lectures	2 Hrs./week	CIE	20 Marks
Tutorial	-		
Total Credits	2	ESE	30 Marks
Duration of ESE: 1Hrs			
		<b>Total Marks</b>	<b>50 Marks</b>

**Course Objectives:**

1.	To develop a comprehensive understanding of the UN Sustainable Development Goals (SDGs) and their interconnections.
2.	To analyze the global challenges addressed by the SDGs and their impact on various sectors.
3.	To explore innovative solutions and best practices for implementing the SDGs.
4.	To evaluate the progress made towards achieving the SDGs at national and international levels.
5.	To foster a sense of global citizenship and social responsibility among students.


**Course Contents**

<b>Unit I</b>	<b><u>Introduction to Sustainable Development Goals (SDGs):</u></b> Definition of Sustainability, Aspects of sustainability, historical perspective of sustainable development, Climate Change Conferences and Summits, the Brundtland Commission Report, transition from Millennium Development Goals (MDGs) to SDGs, the role of UN and the need for SDGs and Adoption by the World, scope and inclusion of the 2030 Agenda for Sustainable Development.	(7)
<b>Unit II</b>	<b><u>Framework &amp; Structuring of the 17 SDGs:</u></b> SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-being, SDG 4: Quality Education, SDG 5: Gender Equality, SDG 6: Clean Water and Sanitation, SDG 7: Affordable and Clean Energy, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 10: Reduced Inequalities, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life below Water, SDG 15: Life on Land, SDG 16: Peace, Justice and Strong Institutions, SDG 17: Partnerships for the Goal	(7)
<b>Unit III</b>	<b><u>SDGs Implementation and Future Perspectives:</u></b> Interconnections between the SDGs, the role of technology and innovation in SDG implementation, financing the SDGs, measuring SDG progress, future challenges and opportunities, Climate change and its impact on sustainable development, Case studies of successful SDG implementation – India, World	(7)

**Text Books**

T.1	Hazra, Somnath., Bhukta, Anindya (2020) Sustainable Development Goals An Indian Perspective, Springer International Publishing, Switzerland
T.2	Ziai, Aram (2016) Development Discourse and Global History from colonialism to the sustainable development goals. Routledge, London & New York
<b>Reference Books</b>	
R.1	TEXTBOOKS FOR SUSTAINABLE DEVELOPMENT A GUIDE TO EMBEDDING, by the Mahatma Gandhi Institute of Education for Peace and Sustainable Development, 35 Ferozshah Road, New Delhi 110001, India (2017) 1 <sup>st</sup> edition <a href="https://d1c337161ud3pr.cloudfront.net/files%2F6d6a3320-cea1-487b-910d-1eb62f5f86ad_Embedding%20Guidebook.pdf">https://d1c337161ud3pr.cloudfront.net/files%2F6d6a3320-cea1-487b-910d-1eb62f5f86ad_Embedding%20Guidebook.pdf</a>
R.2	Introduction to the Sustainable Development Goals (SDGs) by Jocelyn Baker <a href="https://ecampusontario.pressbooks.pub/sdgintr/">https://ecampusontario.pressbooks.pub/sdgintr/</a>
R.3	Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2020. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.
R.4	OECD (2019), Sustainable Results in Development: Using the SDGs for Shared Results and Impact, OECD Publishing, Paris, <a href="https://doi.org/10.1787/368cf8b4-en">https://doi.org/10.1787/368cf8b4-en</a> .
<b>Useful Links</b>	
1.	<a href="https://nptel.ac.in/courses/109106200">https://nptel.ac.in/courses/109106200</a>
2.	<a href="https://www.un.org/sustainabledevelopment/">https://www.un.org/sustainabledevelopment/</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42308.1</b>	<b>Explore</b> the historical origins and evolution of the UN-SDGs.	2
<b>BCE42308.2</b>	<b>Apply</b> the framework of the 17 SDGs and their interlinkages to solve practical problems within diverse global scenarios.	3
<b>BCE42308.3</b>	<b>Analyze</b> the role of technology and innovation in achieving the SDGs along with future challenges and opportunities.	4

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## B.Tech. Civil Engineering - Second year (Semester-III)

### BCE42303: Mechanics of Solids Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs./week	CA	25 Marks
Tutorial	-		
Total Credits	1	ESE	25 Marks
Duration of ESE:		Total Marks	50 Marks

#### Course Objectives:

1.	To study suitability of various materials for civil engineering construction
2.	To study the resistance offered by various materials against the external forces on the structures.
3.	Students will be able to understand the importance and the concept of elastic properties of different metals.
4.	Students will be able to know the behavior of different metals under structural loading conditions such as tension, bending, torsion, shear etc and observe the failure pattern
5.	Students will be able to know the concept of different properties of brick and their applications.

#### Course Contents

1	To study various types of Strain Gauge apparatus.	CO 1
2	To determine the Tensile Strength of Steel specimen.	CO 1
3	To perform Hardness test on various metals. (Brinell's hardness test & Rockwell Hardness test).	CO 2
4	To perform standard Torsion test on metals.	CO 3
5	To perform the Impact test on metal (Izod/ Charpy).	CO3
6	Compression test on Bricks and Stones.	CO 4
7	To determine the spring constant of Closely Coiled Spring.	CO 4
8	To perform shear test on different metals.	CO4
9	To determine water absorption of roofing tiles, flooring tiles and bricks and determine its flexural Rigidity	CO 4
10	To study fatigue test on mild steel bar.	CO 5
11	To perform the bending test on wooden beam and find its Flexural Rigidity	CO5
12	To determine the compressive strength of timber/bricks.	CO5

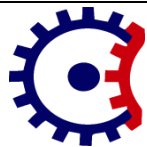
#### Text Books

T.1	Bhavikatti S. S., Strength of Materials, 3rd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
T.2	"Strength Of Materials" author by Bedi, D.S 5 <sup>th</sup> Edition REVISE Khanna Book Publishing Co.Pvt.Ltd.
T.3	"Strength Of Materials" author by Ramamrutham, S.; Narayanan, R. 17 <sup>th</sup> Edition REPRIND Thanpatrai Publications (P) Ltd.

T.4	“Strength Of Materials” author by Subramanian 2 <sup>nd</sup> edition REPRINT Oxford University Press.
<b>Reference Books</b>	
R.1	“Foundation Vibration Analysis: A Strength-Of-Materials Approach” author by Wolf, John. P; Deek s, Andrew. J REPRINT Elsevier publication
R.2	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition), 2010
R.3	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition),2010. 3.
R.4	Shah V.L., Ogale R.A., Strength of Materials and Machine Element, 2nd Edition, Jain Book Agency, New Delhi
<b>IS Codes</b>	
1	Relevant IS Codes: IS 1608-2005, IS 5816-1999, IS 1500-2005, IS 1598-1977, IS 3495 (Part 1 to 4) 1992, IS 7906-5 (2004), IS 5242-1979, IS 1608-2005, IS 2408-1963
<b>Useful Links</b>	
1	<a href="https://nptel.ac.in/courses/105/105/105105108/">https://nptel.ac.in/courses/105/105/105105108/</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42303.1</b>	<b>Classify</b> the behavior of materials under different stress and strain conditions.	2
<b>BCE42303.2</b>	<b>Determine</b> the bending moment and shear force diagram and discuss the concept of shear force and bending moment	3
<b>BCE42303.3</b>	<b>Evaluate</b> the bending stress and shear stress distribution for beams under the different conditions of loading.	5
<b>BCE42303.4</b>	<b>Design</b> the torsional effect on circular and hollow circular section of shaft at different speed, angle of twist, power and torque.	6
<b>BCE42303.5</b>	<b>Analyze</b> slope and deflection of beam under the different support condition and different loading condition.	4

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**B.Tech. Civil Engineering - Second year (Semester-III)**

**BCE42304: Fluid Mechanics Lab**

Teaching Scheme		Examination Scheme	
Practical	2 Hrs./week	CA	25 Marks
Tutorial	-		
Total Credits	1	ESE	25 Marks
Duration of ESE:		Total Marks	50 Marks

**Course Objectives:**

1.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.
2.	Understand the concept of Bernoulli's equation, Euler's equation and momentum equation. Apply the concept of Flow measuring devices and various hydraulic coefficients.
3.	Calculate the discharge and velocity through using various devices, introduced to Motion of fluid with and without reference of force.
4.	Find the behavior of flow using Reynolds Apparatus which is used in every problem of fluid Mechanics.

**Course Contents**

1	To verify Bernoulli's theorem	CO4
2	To determine the coefficient of discharge of Venturimeter	CO5
3	To determine the coefficient of discharge of Orifice meter	CO5
4	To determine the coefficient of discharge of Rectangular Notch	CO5
5	To determine the coefficient of discharge of Triangular Notch	CO5
6	To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.	CO5
7	To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.	CO2
8	To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.	CO3
9	To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number	CO3
10	Determination of Metacentric height of a given ship model.	CO1
11	To determine force exerted by jet on flat surface.	CO2
12	To determine velocity distribution profile using Pitot Tube.	CO5

**Text Books**

T.1	"Advanced Engineering Fluid Mechanics" authored by Muralidhar K. Biswas G. Narosa Publishing House, 1996.
T.2	"Engineering Fluid Mechanics ", authored by Kumar K. L., Gupta S.K, S chand Publications,2008.

T.3	“Hydraulics and Fluid Mechanics Including Hydraulics Machines authored by “Modi P.N., Seth S.M,14 <sup>th</sup> edition,Standard Book House Publishers, New Delhi, 2009
T.4	“Fluid Mechanics” authored by R. K Bansal and R K Rajput,Laxmi Publication, LTD,1989
<b>Reference Books</b>	
R.1	“Engineering Fluid Mechanics” authored by Graebel,W.P, 1th Edition, Taylor And Francis , 2001.
R.2	“Fundamental Mechanics Of Fluids”, authored by Currie,I.G ,4th edition, Taylor And Francis, 1974
R.3	“Engineering Fluid Mechanics” authored by R.J Garde, A.J Mirajgaonkar, SCITECH Publication, 2010
R.4	“Fluid Mechanics, Hydraulics and Hydraulic Machines” authored by Arora K.R., NT Standard Publishers Distributors, 2005.
<b>Useful Links</b>	
1	<a href="https://nptel.ac.in/courses/105/103/105103192/">https://nptel.ac.in/courses/105/103/105103192/</a>
2	<a href="https://nptel.ac.in/courses/105/103/105103095/">https://nptel.ac.in/courses/105/103/105103095/</a>
3	<a href="http://nptel.ac.in/courses/117103064">http://nptel.ac.in/courses/117103064</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42304.1</b>	<b>Recognize</b> the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	1
<b>BCE42304.2</b>	<b>Determine</b> fluid pressure using fluid measurement devices.	3
<b>BCE42304.3</b>	<b>Apply</b> basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3
<b>BCE42304.4</b>	<b>Evaluate</b> the fluid problem by using Bernoulli’s equation.	5
<b>BCE42304.5</b>	<b>Use</b> the concept of fluid measurement and its control through discharge.	3

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**B.Tech. Civil Engineering - Second year (Semester-III)**

**BCE42306: Green Structures & Smart Cities (Open Elective-I)**

Teaching Scheme		Examination Scheme	
Lectures	4 Hrs./week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	4	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
		Total Marks	100 Marks

**Course Objectives:**

1.	Demonstrate a solid understanding of the core concepts related to embodied energy in buildings.
2.	Discuss the aspects of green construction and their contribution to building sustainability.
3.	Explain the development process and challenges associated with smart city projects.
4.	Discuss the strengths and weaknesses of singular and hybrid smart city models
5.	Explain the importance of sustainable practices within smart city development.

**Course Contents**

<b>Unit I</b>	<b>Introduction to Embodied Energy</b> Introduction to embodied energy, operational energy in building and life cycle energy, ecological foot print, bio-capacity and calculation of planet equivalent, introduction to civil engineering materials with embodied energy minimization concept and utilization.
<b>Unit II</b>	<b>Green Construction Practices</b> Introduction to green construction practices, operational energy reduction and net zero building, introduction to optimization for design of building for energy efficiency, examples of optimization, introduction to radiation budget, surface water balance, effects of trees and microclimatic modification through greening, importance of rating and rating systems.
<b>Unit III</b>	<b>Introduction to Smart Cities</b> Introduction to smart cities, introduction to city planning, dimensions of smart cities, phases, stages of project & their approval status, conventional Vs. smart city components, energy demand, green approaches to meet energy demand, index of Indian cities towards smartness, introduction to statistical analysis
<b>Unit IV</b>	<b>Singular-Hybrid Smart Cities</b> Conventional cities, consequences, alternative resources, reliability on predictability scale, solar options, PV and thermal; singular or hybrid, global experience of smart cities, smart cities, global standards and performance benchmarks, practice codes, India “100 smart cities” policy and mission, smart city planning and development.
<b>Unit V</b>	<b>Sustainable Smart City</b> Swachh Bharat mission and smart cities program, financing smart cities development, smart city case studies, governance of smart cities, introduction to artificial intelligence (AI) in smart cities, introduction to (sustainable development goal) SDG, the importance of SDG 11.

<b>Text Books</b>	
T.1	Green Building Materials: A Guide to Product Selection and Specification, 3rd Edition, Ross Spiegel, Dru Meadows
T.2	Smart Cities: Foundations, Principles, and Applications, Houbing Song, Ravi Srinivasan, Tamim Sookoor, Wiley
T.3	Beyond Smart Cities: How Cities Network, Learn and Innovate, Tim Campbell, Routledge
T.4	Mindful Smart Cities: Rethinking Smart Cities with Mindfulness Engineering, Shima Beigi PhD, VUB PRESS
<b>Reference Books</b>	
R.1	Energy and the Environment, J M Fowler, McGraw Hill, New York, 2nd Edition
R.2	Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay, McGraw hill Education, Seventh reprint
R.3	Time-Saver Standards For Building Types, Joseph De Chiara, Michael J. Crosbie, McGraw-Hill
<b>IS Codes</b>	
IS.1	Handbook on functional requirements of buildings (SP41), Bureau of Indian Standards, New Delhi, New Delhi, 1987
IS.2	Energy Conservation Building Code (ECBC), Bureau of energy efficiency, 2017
IS.3	Sustainable Building Design Manual- Volume I & II, TERI, 2009
IS.4	Green Rating for Integrated Habitat Assessment (GRIHA) guidelines
<b>Useful Links</b>	
1	<a href="https://archive.nptel.ac.in/courses/105/102/105102195/">https://archive.nptel.ac.in/courses/105/102/105102195/</a>
2	<a href="https://onlinecourses.nptel.ac.in/noc19_ce40/preview">https://onlinecourses.nptel.ac.in/noc19_ce40/preview</a>
3	<a href="http://ndl.iitkgp.ac.in/he_document/nptel/IN_N_1_C_E_6797_N_S_M_a_G_B_7313_7314">http://ndl.iitkgp.ac.in/he_document/nptel/IN_N_1_C_E_6797_N_S_M_a_G_B_7313_7314</a>

	<b>Course Outcomes</b>	<b>CL</b>
<b>BCE42306.1</b>	<b>Analyze</b> the relationship between embodied energy and building materials.	4
<b>BCE42306.2</b>	<b>Compare</b> the trade-offs between the green construction practices	4
<b>BCE42306.3</b>	<b>Examine</b> the potential benefits and challenges associated with smart city initiatives	4
<b>BCE42306.4</b>	<b>Outline</b> the suitability of singular vs. hybrid approaches for urban contexts.	4
<b>BCE42306.5</b>	<b>Interpret</b> the importance of sustainable practices within smart city development.	3



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