COURSE AND EXAMINATION SCHEME
OF
NEP 2020 CURRICULUM

BACHELOR OF TECHNOLOGY (B.TECH.)
IN
MECHANICAL ENGINEERING (ME)

GONDWANA UNIVERSITY,
GADCHIROLI
(AY 2024-25)

Board of Studies in Mechanical Engineering

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

PROGRAM OUTCOMES (POs)

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

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.

12. **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.

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UG Program Structure of

B. Tech. (Mechanical Engineering)

List of Abbreviations:

Abbreviation	Title	No of courses	Credits	% of Total Credits
BSC	Basic Science Course	6	17	9.77
ESC	Engineering Science Course	6	13	7.47
PCC	Program Core Course	22	54	31.03
PEC	Program Elective Course	9	20	11.49
MDM	Multidisciplinary Minor	7	14	8.05
OE/SE	Open/School Elective (other than particular program)	3	8	4.60
VSEC	Vocational and Skill Enhancement Course	4	8	4.60
AEC-01	Ability Enhancement Course	1	2	1.15
AEC-02	Indian Language	1	2	1.15
HSSM	Entrepreneurship/Economics/ Management Courses	2	4	2.30
IKS	Indian Knowledge System	1	2	1.15
VEC	Value Education Course	2	4	2.30
RM	Research Methodology	1	4	2.30
CEA	Community Engagement Activity /Field Project	1	2	1.15
ELC	Internship/ OJT	1	12	6.90
ELC	Project	1	4	2.30
CC	Co-curricular Courses	2	4	2.30
Total		**70**	**174**	**100 %**

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – I

Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme									Credit
								Theory Marks					Practical Marks				
				L	T	P	Total	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (UA+CA)	CA	UA	Total	Min (UA+CA)	
BSC	Science and Humanities	STBSC101	Engineering Mathematics I	3	1	–	4	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC102	Engineering Chemistry	3	–	–	3	10	10	80	100	40	–	–	–	–	3
ESC	Civil Engineering	STESC103	Engineering Mechanics	3	–	–	3	10	10	80	100	40	–	–	–	–	3
PCC	Mechanical Engineering	STPCCMEC 104	Basics of Mechanical Engineering	2	–	–	2	5	5	40	50	20	–	–	–	–	2
ESC	Computer Science and Engineering	STESC105	Programming for Problem Solving	2	–	–	2	5	5	40	50	20	–	–	–	–	2
AEC	Science and Humanities	STAEC106	Business Communication Skill	1	–	2	3	5	5	40	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC107	Engineering Chemistry Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
ESC	Civil Engineering	STESC108	Engineering Mechanics Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSEC109	Workshop – I	–	–	4	4	–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC110	Liberal Learning Course (Yoga and Meditation)	–	–	4	4	–	–	–	–	–	50	–	50	25	2
			Total	**14**	**1**	**14**	**29**				**450**				250		**22**
			Total Marks	**700**													

Head of Department
Mechanical Engg. Dept

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – II

Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme									Credit
								Theory Marks					Practical Marks				
				L	T	P	Total	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (UA+CA)	CA	UA	Total	Min (UA+CA)	
BSC	Science and Humanities	STBSC201	Engineering Mathematics II	3	1	–	4	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC202	Engineering Physics	3	1	–	4	10	10	80	100	40	–	–	–	–	4
ESC	Electrical Engineering	STESC203	Basics of Electrical and Electronics Engineering	3	–	–	3	10	10	80	100	40	–	–	–	–	3
ESC	Mechanical Engineering	STESC204	Engineering Graphics and Design	3	–	–	3	10	10	80	100	40	–	–	–	–	3
IKS	Science and Humanities	STIKS205	Indian Knowledge System	2	–	–	2	40	10	–	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC206	Engineering Physics Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
ESC	Mechanical Engineering	STESC207	Engineering Graphics and Design Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSECMEC 208	Workshop - II (Mechanical)	–	–	4	4	–	–	–	–	–	50	50	100	50	2
CC	Mechanical Engineering	STCCMEC209	Club Activities (Self learning course)	–	–	–	–	–	–	–	–	–	50	–	50	25	2
			Total	**14**	**2**	**8**	**24**				**450**				250		**22**
			Total Marks	**700**													

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Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Programme in Mechanical Engineering (ME) (Full Time)

Scheme of Instructions: UG Certificate Level

(Exit Course after First Year of Engineering)

Course Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional	Total Marks	Min. passing marks	Max. Marks	Max. Marks	Total Marks	Min. passing marks
									ESE	MSE			TW	PEE		
PCC	Mechanical Engineering	STEXMEC210	Basics of 3D printing	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC211	Computer Aided Geometric Modeling	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	**100**	--	**100**	**50**
			Total	**8**			**4**	**100**								

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2025-2026 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – III

Course Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
										ESE	MSE	IE				TW	PEE		
PCC	Mechanical Engineering	STPCCMEC301	Material Engineering	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC302	Fluid Mechanics and Machines	3	---	---	3	3	80	10	10	100	40	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC303	Multi-disciplinary Minor - I	2	---	---	2	2	40	5	5	50	20	---	---	---	---
OE	Mechanical Engineering	STOEMEC304	Open Elective - I	3	1	---	4	3	80	10	10	100	40				
HSSM (VEC)	Science and Humanities	STHSSMVEC305	Introduction to Constitution of India	2	---	---	2	---	40	5	5	50	20	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC306	Material Engineering Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PCC	Mechanical Engineering	STPCCMEC307	Fluid Mechanics and Machines Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PCC	Mechanical Engineering	STPCCMEC308	Machine Drawing and Computer Aided Drafting Lab.	---	1	2	2	---	---	---	---	---	---	25	25	50	25
HSSM (EMC)	Mechanical Engineering	STHSSMMEC309	Engineering Economics	2	---	---	2	---	---	---	---	---	---	50	---	50	25
ELC	Mechanical Engineering	STELCMEC310	Mini Project / Field Project	---	---	2	2	---	---	---	---	---	---	50	---	50	25
			Total	15	2	8	22	---	---	---	---	400	---	---	---	250	---
			Total	25			22	650									

Multi-disciplinary Minor – I (STMDMMEC303)
A. Mathematical methods in Engineering and Science
B. Introduction to Non destructive test.
C. Processing of non metals.

Open Elective Course – I (STOEMEC304)
A. Industrial Instrumentation
B. Introduction to IT Tools

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2025-2026 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) **(Full Time)**
Semester – IV

Course Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
									ESE	MSE	IE			TW	PEE		
PCC	Mechanical Engineering	STPCCMEC401	Engineering Thermodynamics	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC402	Strength of Material	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC403	Manufacturing Processes	3	---	---	3	3	80	10	10	100	40	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC404	Multi-disciplinary Minor - II	2	---		2	2	40	5	5	50	20	---	---	---	---
OE	Mechanical Engineering	STOEMEC405	Open Elective - II	2	---	---	2	2	40	5	5	50	20	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC406	Strength of Material Lab	---	---	2	1	---	---	---	---	---	---	25	25	50	25
VSEC	Mechanical Engineering	STVSECMEC407	Workshop Practice - III	---	1	2	2	---	---	---	---	---	---	25	25	50	25
HSSM (AEC-2)	Mechanical Engineering	STHSSMMEC408	Modern Indian / Foreign language	---	---	4	2	---	---	---	---	---	---	50	---	50	25
HSSM (EMC)	Mechanical Engineering	STHSSMMEC409	Human Resource Management	---	---	4	2	---	---	---	---	---	---	50	---	50	25
HSSM (VEC)	Mechanical Engineering	STHSSMMEC410	Lifestyle for Holistic Health	---	---	4	2	---	---	---	---	---	---	50	---	50	25
			Total	**13**	**1**	**16**	**22**	---	---	---	---	**400**	---	---	---	**250**	---
			Total	**30**			**22**	**650**									

Multi-disciplinary Minor – II (STMDMMEC404)
A. Unconventional Machining Processes
B. Solar Energy Technology
C. Statistical Quality Control

Open Elective Course – II (STOEMEC405)
A. Basic Computer Programming
B. Total Quality Management
C. Welding Technology

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY

Teaching and Evaluation Scheme from Academic Year 2025-2026 as per NEP - 2020

Programme Mechanical Engineering (ME) (Full Time)

Scheme of Instructions: UG Diploma Level

(Exit Course after Second Year of Engineering)

Course Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Total Marks	Min. passing marks	Max. Marks TW	Max. Marks PEE	Total Marks	Min. passing marks
PCC	Mechanical Engineering	STEXMEC411	Mechatronics and Internet of Things	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC412	Advanced Manufacturing Engineering	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC413	Industrial Robotics	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	**100**	--	**100**	**50**
			Total	**8**			**4**	**100**								

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2026-2027 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – V

Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
									ESE	MSE	IE			TW	PEE		
PCC	Mechanical Engineering	STPCCMEC501	Heat Transfer	3	1	---	4	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC502	Kinematics of Machines	3	1	---	4	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC503	Design of Machine Elements	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PEC	Mechanical Engineering	STPECMEC504	Program Elective - I	3	---	---	3	3	80	10	10	100	40	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC505	Multi-disciplinary Minor - III	3	---	---	3	3	80	10	10	100	40	---	---	---	---
OE	Mechanical Engineering	STOEMEC506	Open Elective - III	2	---	---	2	2	40	5	5	50	20	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC507	Mechanical Engineering Lab. - I	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PEC	Mechanical Engineering	STPECMEC508	Program Elective – I Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
MDM	Mechanical Engineering	STMDMMEC509	Multi-disciplinary Minor – III Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
			Total	**17**	**2**	**6**	**22**	---	---	---	---	**550**	---	---	---	**150**	---
			Total	**25**			**22**	**700**									

Program Elective Course – I (STPECMEC504)
A. Internal Combustion Engines and Gas Turbines
B. Production Technology

Multi-disciplinary Minor – III (STMDMMEC505)
A. Computer Aided Design
B. Industrial Robotics
C. Electrical Vehicles

Open Elective – III (STOEMEC506)
A. Operation Research Techniques
B. Entrepreneurship Development
C. Introduction to MATLAB

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2026-2027 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – VI

Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
								Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
				L	T	P			ESE	MSE	IE			TW	PEE		
PCC	Mechanical Engineering	STPCCMEC601	Thermal Engineering	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC602	Mechanical Measurement	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC603	Dynamics of Machine	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PEC	Mechanical Engineering	STPECMEC604	Program Elective - II	3	---	---	3	3	80	10	10	100	40	---	---	---	---
PEC	Mechanical Engineering	STPECMEC605	Program Elective – III	3	---	---	3	3	80	10	10	100	40	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC606	Multi-disciplinary Minor - IV	2	---	---	2	2	40	5	5	50	20	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC607	Mechanical Engineering Lab. - II	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PEC	Mechanical Engineering	STPECMEC608	Program Elective – II Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PEC	Mechanical Engineering	STPECMEC609	Program Elective – III Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
VSEC	Mechanical Engineering	STVSECMEC610	Soft Skills	---	1	2	2	---	---	---	---	---	---	25	25	50	25
			Total	**17**	**1**	**8**	**22**	---	---	---	---	**550**	---	---	---	**200**	---
			Total	**26**			**22**	**750**									

Program Elective Course – II (STPECMEC604)
A. Automation in Manufacturing
B. Metrology and Quality Control

Program Elective Course – III (STPECMEC605)
A. Automobile Engineering
B. Product Life Cycle Management

Multi-disciplinary Minor – IV(STMDMMEC606)
A. Industrial Engineering
B. Operational Management.
C. Introduction to composite materials.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme from Academic Year 2025-2026 as per NEP - 2020
Programme Mechanical Engineering (ME) (Full Time)
Scheme of Instructions: B. Voc. Level
(Exit Course after Third Year of Engineering)

Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Total Marks	Min. passing marks	Max. Marks TW	Max. Marks PEE	Total Marks	Min. passing marks
PCC	Mechanical Engineering	STEXMEC611	Design Process Management (PLM)	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC612	Autonomous, Connected, Electric Vehicles (ACE)	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC613	Automotive Systems	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	**100**	--	**100**	**50**
			Total	**8**			**4**	**100**								

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2027-2028 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – VII

Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
									ESE	MSE	IE			TW	PEE		
PEC	Mechanical Engineering	STPECMEC701	MOOC – I	*4	---	---	3	---	---	---	---	100	40	---	---	---	---
PEC	Mechanical Engineering	STPECMEC702	MOOC - II	*4	---	---	3	---	---	---	---	100	40	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC703	Multi-disciplinary Minor - V	*2	---	---	2	---	---	---	---	50	20	---	---	---	---
ELC	Mechanical Engineering	STELCMEC704	Internship / OJT	---	---	24	12	---	---	---	---	---	---	100	200	300	150
			Total	**10**	**---**	**24**	**20**	---	---	---	---	**250**	---	---	---	**300**	---
			Total	**34**			**20**	**550**									

MOOC – I (12 week online certificate courses conducted by NPTEL / SWAYAM / MOOC / OTHERS)

1. Introduction to Mechanical Micro Machining
2. Industrial Hydraulics and Automation
3. Product Design and Manufacturing
4. Computer Integrated Manufacturing
5. Machinery Fault Diagnosis And Signal Processing

***Courses to be mentored and assessed by faculty members**

MOOC – II (12 week online certificate courses conducted by NPTEL / SWAYAM / MOOC / OTHERS)

1. Applied Ergonomics
2. Principles of Industrial Engineering
3. Explosions and Safety
4. Computational Fluid Dynamics For Incompressible Flows
5. Mechanics Of Fiber Reinforced Polymer Composite Structures

***Courses to be mentored and assessed by faculty members**

Multi-disciplinary Minor – V
8 week online certificate courses conducted by NPTEL / SWAYAM / MOOC / OTHERS)

1. Manufacturing Guidelines For Product Design
2. Mechanical Measurement Systems
3. Design Practice
4. Fundamental Of Welding Science And Technology
5. Introduction to Machining and Machining Fluids

***Courses to be mentored and assessed by faculty members**

For **MOOC I, MOOC – II and MDM – V student may opt for the courses other than mentioned above course with the consent of mentors.**

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2027-2028 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – VIII

Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme									
				Hours per week			No. of Credits	Theory						Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total Marks	Min. passing marks	Max. Marks		Total Marks	Min. passing marks
									ESE	MSE	IE			TW	PEE		
PCC	Mechanical Engineering	STPCCMEC801	Refrigeration and Air Conditioning	3	1	---	4	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC802	Design of Mechanical Drives	3	1	---	4	3	80	10	10	100	40	---	---	---	---
PEC	Mechanical Engineering	STPECMEC803	Program Elective - IV	2	---	---	2	2	40	5	5	50	20	---	---	---	---
MDM	Mechanical Engineering	STMDMMEC804	Multi-disciplinary Minor - VI	2	---	---	2	2	40	5	5	50	20	---	---	---	---
ELC	Mechanical Engineering	STELCMEC805	Research Methodology and IPR	3	1	---	4	3	80	10	10	100	40	---	---	---	---
PCC	Mechanical Engineering	STPCCMEC806	Refrigeration and Air Conditioning Lab.	---	---	2	1	---	---	---	---	---	---	25	25	50	25
PCC	Mechanical Engineering	STPCCMEC807	Design of Mechanical Drives Lab	---	---	2	1	---	---	---	---	---	---	25	25	50	25
ELC	Mechanical Engineering	STELCMEC808	Major Project	---	---	8	4	---	---	---	---	---	---	75	75	150	75
			Total	**13**	**03**	**12**	**22**	---	---	---	---	**400**	---	---	---	**250**	---
			Total	**28**			**22**	**650**									

Program Elective Course – IV (STPECMEC803)
A. Stress Analysis
B. Power Plant Engineering

Multi-disciplinary Minor – VI (STMDMMEC804)
A. Finite Element Methods
B. Hydraulics and Pneumatics
C. Industrial Management

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

COURSE AND EXAMINATION SCHEME
OF
NEP 2020 CURRICULUM

BACHELOR OF TECHNOLOGY (B.TECH.)
IN
MECHANICAL ENGINEERING (ME)

GONDWANA UNIVERSITY,
GADCHIROLI
(AY 2024-25)

Board of Studies in Mechanical Engineering

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

PROGRAM OUTCOMES (POs)

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

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.

12. **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.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

UG Program Structure of

B. Tech. (Mechanical Engineering)

List of Abbreviations:

Abbreviation	Title	No of courses	Credits	% of Total Credits
BSC	Basic Science Course	6	17	9.77
ESC	Engineering Science Course	6	13	7.47
PCC	Program Core Course	22	54	31.03
PEC	Program Elective Course	9	20	11.49
MDM	Multidisciplinary Minor	7	14	8.05
OE/SE	Open/School Elective (other than particular program)	3	8	4.60
VSEC	Vocational and Skill Enhancement Course	4	8	4.60
AEC-01	Ability Enhancement Course	1	2	1.15
AEC-02	Indian Language	1	2	1.15
HSSM	Entrepreneurship/Economics/ Management Courses	2	4	2.30
IKS	Indian Knowledge System	1	2	1.15
VEC	Value Education Course	2	4	2.30
RM	Research Methodology	1	4	2.30
CEA	Community Engagement Activity /Field Project	1	2	1.15
ELC	Internship/ OJT	1	12	6.90
ELC	Project	1	4	2.30
CC	Co-curricular Courses	2	4	2.30
Total		**70**	**174**	**100 %**

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – I

Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme									Credit
								Theory Marks					Practical Marks				
				L	T	P	Total	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (UA+CA)	CA	UA	Total	Min (UA+CA)	
BSC	Science and Humanities	STBSC101	Engineering Mathematics I	3	1	–	4	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC102	Engineering Chemistry	3	–	–	3	10	10	80	100	40	–	–	–	–	3
ESC	Civil Engineering	STESC103	Engineering Mechanics	3	–	–	3	10	10	80	100	40	–	–	–	–	3
PCC	Mechanical Engineering	STPCCMEC 104	Basics of Mechanical Engineering	2	–	–	2	5	5	40	50	20	–	–	–	–	2
ESC	Computer Science and Engineering	STESC105	Programming for Problem Solving	2	–	–	2	5	5	40	50	20	–	–	–	–	2
AEC	Science and Humanities	STAEC106	Business Communication Skill	1	–	2	3	5	5	40	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC107	Engineering Chemistry Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
ESC	Civil Engineering	STESC108	Engineering Mechanics Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSEC109	Workshop – I	–	–	4	4	–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC110	Liberal Learning Course (Yoga and Meditation)	–	–	4	4	–	–	–	–	–	50	–	50	25	2
			Total	**14**	**1**	**14**	**29**				**450**				250		**22**
			Total Marks	**700**													

Head of Department
Mechanical Engg. Dept

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Bachelor of Technology in Mechanical Engineering (ME) (Full Time)
Semester – II

Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme									Credit
								Theory Marks					Practical Marks				
				L	T	P	Total	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (UA+CA)	CA	UA	Total	Min (UA+CA)	
BSC	Science and Humanities	STBSC201	Engineering Mathematics II	3	1	–	4	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC202	Engineering Physics	3	1	–	4	10	10	80	100	40	–	–	–	–	4
ESC	Electrical Engineering	STESC203	Basics of Electrical and Electronics Engineering	3	–	–	3	10	10	80	100	40	–	–	–	–	3
ESC	Mechanical Engineering	STESC204	Engineering Graphics and Design	3	–	–	3	10	10	80	100	40	–	–	–	–	3
IKS	Science and Humanities	STIKS205	Indian Knowledge System	2	–	–	2	40	10	–	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC206	Engineering Physics Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
ESC	Mechanical Engineering	STESC207	Engineering Graphics and Design Lab	–	–	2	2	–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSECMEC 208	Workshop - II (Mechanical)	–	–	4	4	–	–	–	–	–	50	50	100	50	2
CC	Mechanical Engineering	STCCMEC209	Club Activities (Self learning course)	–	–	–	–	–	–	–	–	–	50	–	50	25	2
			Total	**14**	**2**	**8**	**24**				**450**				250		**22**
			Total Marks	**700**													

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

GONDWANA UNIVERSITY, GADCHIROLI
FACULTY OF SCIENCE AND TECHNOLOGY
Teaching and Evaluation Scheme w.e.f. Academic Year 2024-2025 as per NEP - 2020
Programme in Mechanical Engineering (ME) (Full Time)
Scheme of Instructions: UG Certificate Level
(Exit Course after First Year of Engineering)

Course Category	Board of Studies	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional	Total Marks	Min. passing marks	Max. Marks	Max. Marks	Total Marks	Min. passing marks
									ESE	MSE			TW	PEE		
PCC	Mechanical Engineering	STEXMEC210	Basics of 3D printing	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
PCC	Mechanical Engineering	STEXMEC211	Computer Aided Geometric Modeling	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	**100**	--	**100**	**50**
			Total	**8**			**4**	**100**								

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STBSC101**

Title of the Course : **Engineering Mathematics-I**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Course Outcome:

After completion of the course, the student will be able to:

1. To apply knowledge of mathematics in formulating and solving problems analytically.
2. To deal with function of several variables that is essential in most branches of Engineering.
3. To use the knowledge of Gamma and Beta function to evaluate some definite integrals arising in various branches of engineering.
4. To use various statistical techniques to applied engineering problem.

Unit	Contents	Hours
1	**Differential Calculus** Successive differentiation, Leibnitz's theorem on the n^{th} derivative of a product, Expansion of a function by using Taylor's and Maclaurian's theorem, Indeterminate forms.	09
2	**Partial Differentiation** Partial Derivatives, Euler's theorem on homogeneous functions, Transformation of independent variables (Chain rule).	09
3	**Application of Partial Differentiation** Jacobians, properties of Jacobians, Taylor's and Maclaurin's series for function of two variable, Maxima and Minima of functions of two variables, Lagrange's method of undermined multipliers.	09
4	**Integral Calculus** Gamma and Beta functions, properties of gamma, beta functions, Differentiations of definite integrals under integral sign, (Leibnitz's Rule), Mean and R.M.S. value.	09
5	**Statistics & Finite Differences** Fitting of straight-line, second-degree parabola & exponential curves, Coefficient of Correlation, Regression lines, Rank coefficient of correlation Finite Differences: Operator E & Delta, Fractional polynomial. Lagrange's, interpolation formula for unequal intervals of arguments.	09
		45

Reference Books:

1. A Text book of Engineering Mathematics, Volume I and II by D. T. Deshmukh.
2. A Text book of Applied Mathematics Volume I and II by J. N. Wartikar and P. N. Wartikar.
3. N. P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi publication, Reprint, 2008.
4. Higher Engineering Mathematics by B. S. Grewal Khanna Publishers.
5. Advanced Engineering Mathematics by H. K. Dass
6. Advanced Engineering Mathematics by Erwins Kreyszig

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STBSC102**

Title of the Course : **Engineering Chemistry**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	3	3	10	10	80	100

Course Outcome:

After completion of the course, the student will be able to:

1. Demonstrate the types of hardness of water and softening methods.
2. Classify the types of corrosion and write the uses of battery.
3. Illustrate the working of IC engine.
4. Explore the Eco-friendly sustainable developments.
5. Prepare the organic polymers, Resins.

Unit	Contents	Hours
1	**Water treatment and Analysis** Definition of hardness of water, Types of hardness and water softening methods like (External treatment methods) 1-Lime-Soda method 2-Zeolite/Permutt method and 3- Ion exchange methods with advantages and limitations. Units of hardness, Numerical problems on Lime-soda and Zeolite process. Boiler troubles: Boiler corrosion, Caustic embrittlement, Priming and Foaming, Scale and Sludge. Internal treatment for Boiler feed water such as Calgon, Colloidal, and Phosphate conditioning. Desalination of Brackish water/Purification of water by Reverse osmosis and Electrodialysis.	9
2	**Corrosion of metals and Battery science** Definition, Cause and Consequences, mechanism of Dry/Direct chemical and Wet/Electrochemical corrosion. Corrosion Prevention methods- Design and Material selection, Anodic & cathodic protection. Types of corrosion- Pitting corrosion, Intergranular corrosion, Stress corrosion and Waterline corrosion Battery science- Primary and Secondary battery, Nickel-Cadmium Battery, Alkaline Fuel cell, Phosphoric acid fuel cell Applications, Advantages and limitations	9
3	**Fuels and Combustion** Classification, Definition of Calorific value, Gross calorific value (HCV) & Net calorific value (NCV) Determination of calorific value by Bomb calorimeter & Boy's calorimeter, Solid Fuel-Proximate & Ultimate Analysis of coal & its significance, Liquid Fuel- Working of IC engine, Knocking, Antiknocking agents, their properties with chemical constitution, Octane number and Cetane number. Gaseous fuel-Composition, Properties and Applications of CNG and LPG, Combustion numerical for Air required	9

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

4	**Green Chemistry** Definition, Goals of Green chemistry, Efficiency parameters a need of green chemistry, Major uses traditional and green pathways of synthesis of Adipic acid, indigo dye, Concept of carbon credits.	9
5	**Synthetic Organic Polymer** Introduction, Functionality of monomer, Polymerization, Free radical mechanism and step growth polymerization concept. Thermoplastic and Thermosetting polymers. Preparation, properties and uses of- Polyethylene (LDPE and HDPE), Resins-Urea formaldehyde, Phenol formaldehyde (Bakelite), Synthetic rubber-(SBR), Styrene butadiene rubber, Polymer composites-Fiber Reinforced plastic (FRP}	9

Text Books:

1. Engineering chemistry, S.S. Dara Chand publication, New Delhi
2. Engineering chemistry Jain and Jain, Dhanpat Rai and sons, New Delhi

Reference Books:

1. Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Sons, New Delhi.
2. Applied Chemistry by N. Krishnamurthy, P.Vallinavagam., K.Jeysubramanian, TMH.
3. Applied Chemistry for Engineers, T. S. Gyngell.
4. Introduction to polymers, by Robert J. Young
5. Chemistry of Advanced Materials:CNR Rao, Rsc Publication.
6. Corrosion Engineering by Mars G. Fontanaand Norbert D. Green McGraw Hill Book Co. Tokyo
7. Fuels and Combustion by Amir Circar, Orient Longmans
8. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering.
9. Water Treatment: F.I. Bilane, Mirpublisher

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STESC103**

Title of the Course : Engineering Mechanics

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	3	3	10	10	80	100

Course Outcomes:

After completion of the course, the student will be able to:

1. Apply the principles of mechanics for solving the structures like trusses, cables and beams.
2. Equipped with problem solving ability for rigid body mechanics.
3. Exhibit various applications of Newtonian Mechanics in their respective engineering discipline.
4. Understand fundamentals before going for higher level courses such as Strength of Materials, Electrical Machines, Engineering Thermodynamics, Structural Analysis, Design of Structures, Machine Designs etc.

Units	Contents	Hours
1	Basic principles of mechanics, Types of force system, Moment of a force about a point and about an axis, Couple, Equivalent force systems: Resultant of a co-planner and spatial force system. Analytical and graphical methods. Equilibrium of co-planner force system. Applications to beams and frames	09
2	Analysis of structures. Theory and Laws of friction and its application like Cone friction wedges, belt friction and band brakes.	09
3	Centroid of composite areas, Moment of inertia and products of inertia of plane areas, Transfer theorems for moment of inertia and Product of inertia. Mhor's circle method.	09
4	Kinematics of Particles: rectilinear motion, Motion curve, Relative motion, Fixed axis rotation. Kinetics of particles: D'Alembert's principle,Principal of Impulse Momentum and their applications to particles. Direct central Impact.	09
5	Vibrations: Equations of motion for single degree-of-freedom systems and rigid body assemblies, free vibration (simple harmonic oscillator), concepts of damping and critical damping, damped free vibration: equations of motion for harmonic excitation.	09
		45

Text Books:

1. Vector Mechanics for Engineers, Vol. 1 – Statics and Vol. 2 – Dynamics, Beer and Johnston, 8th edition, Tata McGraw Hill International Edition, 2010.
2. Engineering Mechanics, Vol. 1 – Statics 4/e, 1998 and Vol. 2 – Dynamics, Merriam, 5/e, Wiley International, 2001.
3. Engineering Mechanics, by Dr. K. L. Kumar, Tata McGraw Hill Publications, 2011

Head of Department
Mechanical Engg. Dept.

References Books:

1. Engineering Mechanics, Irving H. Shames, & Rao, Prentice Hall, New Delhi 2010.
2. Engineering Mechanics, Vol. 1–Statics and Vol. 2–Dynamics, Mokoshi, V.S., Tata MGH Books, 1996.
3. Engineering Mechanics, F.L.Singer, HarperCollins Publishers India, 2001
4. Engineering Mechanics, McLean, 3rd Edition, SCHAUM Series, 1995.
5. Engineering Mechanics, Timoshenko and Young, McGraw Hill Publication.
6. Engineering Mechnaics, R. C. Hibbeler, Pearson Publishers, 2010

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STPCCMEC104**

Title of the Course : **Basics of Mechanical Engineering**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
2	0	0	2	2	2	5	5	40	50

Course Description: After completing this course student will have basic understanding of the thermodynamics, thermal machines, mechanisms, materials, power transmission elements and can identify manufacturing process and design.

Course Outcomes:

After completing the course students will able to:

CO1 Explain basic concepts in Mechanical Engineering

CO2 Describe basic concepts of thermodynamics

CO3 Understand working principles of thermal devices and machines with their application in Mechanical Engineering

CO4 Identify various manufacturing processes and their application.

CO5 Distinguish between different engineering materials and identify stresses in mechanical components.

Detailed Syllabus:

Unit 1	**Fundamentals of Thermodynamics.** (No analytical treatment) Pressure and pressure measurement, temperature, Zeroth law, System and boundary, Forms of energy, work transfer, heat transfer, Laws of thermodynamics, First law for cyclic and non-cyclic process, Air standard cycles, Heat conduction, convection and radiation, Overall heat transfer coefficient, Newton's law of cooling, Stefan Boltzmann's law, Concept of heat exchanger, types of heat exchanger, and concept of effectiveness. Properties of fluids.	**5 Hrs**
Unit 2	**Introduction to Thermal Systems** .(No analytical treatment) Steam generation process, Steam turbine, Principles and working of steam power plant, Condensers. Boiler: Mountings and accessories, working principles of Internal combustion Engine, two stoke and four stroke engines, Concept of Heat Engine, Heat pump, Refrigerator., Refrigeration – Definitions – Refrigerating effect, unit of Refrigeration, COP, Relative COP, Principle and working of vapor compression refrigeration,	**5 Hrs**
Unit 3	**Fundamentals of Machine Elements and Mechanisms.** (No analytical treatment) Working principles of shaft, Axle and Spindles. Friction clutches, Brakes – types of brakes, Couplings-types of couplings, Bearing- types of bearing, Drives- Belt drive: Flat and V belt drive, Open and Cross belt drive, Chain drive, Gears- classification of gears, Simple mechanism: Slider crank mechanism, Pendulum pump, Oscillating cylinder engine, Whitworth quick return mechanism.	**5 Hrs**
Unit 4	**Fundamentals of Manufacturing Processes** (No analytical treatment) Fundamentals of manufacturing process and their applications, Moulding, Pattern making, Casting, forging, Soldering, Brazing and welding. Differences between soldering, brazing and Welding, Description of Electric Arc Welding and Oxy-Acetylene Welding, Adhesives, Resistance welding.	**5 Hrs**

Head of Department

Unit 5	**Materials and Design** (No analytical treatment) Classification of material, Steel and iron, Plain carbon steels, alloy steels, Cast iron, Fe-Fe3C Equilibrium diagrams SSS diagram, Introduction to Heat treatment Processes, Destructive and Non-destructive Testing, Design requirement of machine elements, Design procedure, Standards in design, Indian standards, Modes of failure, Factor of safety, Types of stresses, Theory of failure, fatigue, Creep.	**5 Hrs**

Text Books:-

1. Hajra Choudhary, Bose, "Work Shop Technology (Vol.-I & JI)", 3rd ed. MPP publication, 2018.
2. Khurmi R.S., "Machine Design ",4th Edition. Eurasia Publishing House, 2019.
3. R. S. Khurmi, J. K. Gupta, "A Textbook of Refrigeration and Air Conditioning", S. Chand Publication.

Reference Books:-

1. Nag P.K., "Engineering Thermodynamics", 3rd ed. Tata-McGraw Hill Publications, 2013.
2. Bhandari V.B., "Machine Design ", 3rd ed. Tata-McGraw Hill Publications, 2019.
3. Rao P.N, "Manufacturing Technology Volume J", 3rd ed. Tata-McGraw Hill Publications, 2019
4. S. T. Ambadkar ," An Approach to Engineering Metallurgy" Dennet Publications.
5. R. K. Rajput, "Heat and Mass Transfer", S Chand.
6. R. K. Rajput "Thermal Engineering" Laxmi Publications.
7. Dr. R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraullic Machines" Laxmi Publications.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code: STESC105

Title of the Course: Programming for Problem Solving

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
2	0	0	2	2	2	5	5	40	50

Course Outcome:

After completion of the course, the student will be able to:

1. Write, compile, and execute C programs based on simple constructs like arrays, loops, structures, conditional statements etc.
2. Apply the concepts of arrays and functions to solve problems.
3. Develop simple C program for small applications.

Unit	Contents	Hours
1	**Fundamentals of C** History & Features of C language, structure of C Program, algorithm, flowchart, keywords, data types, constants and variables, operators, precedence and associativity.	8
2	**Control structure in C** Decision making statements: simple if statement, if else statement, if else if ladder, nested if, switch case, Looping statements: while do while, for, break and continue statement.	8
3	**Arrays and Functions** Concepts of array, declaration, and initialization of arrays, one- and two-dimensional arrays, Concepts of user defined functions, definition of function, call by value, call by reference, recursion.	8
		24

Text Books:

1. Programming in ANSI C – Balaguruswami 8th Edition (Mc Graw Hill Publications)
2. C Programming: A Modern Approach - K. N. King.
3. Programming in C - Stephen Kochan.
4. Let us C –Yashwant Kanetkar (BPB Publications)

Reference Books:

1. C: The Complete Reference - by Kernighan Brian W. and Ritchie Dennis
2. Computer Fundamentals and Programming in C - by Reema Thareja

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : STAEC106
Title of the Course : Business Communication Skill

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
1	0	2	3	2	2	5	5	40	50

Course Outcome:

After completion of the course, the student will be able to:

1. Basic proficiency in writingandspeaking English.
2. Essential business communication skills.
3. Presentation and organizing skills.
4. Correspondence skills and etiquettes.
5. Oral communication skills.

Units	Contents	Hours
1	Identifying Common Errors in Writing 1.1 Sentence Structures 1.2 Use of phrases and clauses in sentences 1.3 Subject-verb agreement. 1.4 Noun-pronoun agreement 1.5 Articles 1.6 Prepositions 1.7 Misplaced modifiers 1.8 Importance of proper punctuation	6
2	Introduction to the essentials of Business Communication 2.1 Meaning and types of communication. 2.2 Channels of communication 2.3 Levels of communication 2.4 Direction of communication 2.5 Barriers to communication 2.6 Use of visual aids in communication	6
3	Presentation and Organizing Skills Organizing meetings 3.1 How to call meeting and design the agenda. 3.2 Prepare minutes of the meeting. Presentation skills 3.3 Preparation, audience, and their requirements 3.4 Effective ways to deliver the presentation. 3.5 Multimedia presentation Time Management 3.6 Goal setting 3.7 Importance of time 3.8 Prepare time schedule	6
4	Business and E- Correspondence 4.1 Need and importance of business letters 4.2 Office memorandum, circulars 4.3 Notices and orders 4.4 Electronic mail: advantages, safety and smartness 4.5 Email etiquettes	6
5	Oral Communication 5.1 Listening Comprehension 5.2 Pronunciation, Intonation, Stress and Rhythm	6

Head of Department

	5.3 Common Everyday Situations: Conversations and Dialogues 5.4 Communication at Workplace 5.5 Interviews 5.6 Group Discussions 5.7 Telephonic Conversation	

Reference Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006.
4. Communication Skills. Sanjay Kumar and PushpLata, Oxford University Press. 2011.
5. Exercises in Spoken English. Parts, I-III, CIEFL, Hyderabad, Oxford University Press
6. Grammar for all. N. Ramalingam, Himalaya publishing house

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STBSC107**

Title of the Course : **Engineering Chemistry Laboratory**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	2	2	1	---	25	25	50

Course Outcome:

After completion of the course, the student will be able to:

1. Illustrate the chemical analysis of water and access the quality of water.
2. Estimation of various property by pH meter and conductivity meter.
3. Perform experiments based on syllabus adopting the proper methodology.
4. Derive scientific conclusions on the basis of experimental data.
5. The process of polymer synthesis.

Minimum eight (8) experiments are to be performed from the list given below.

List of Experiments:

1. Determination of temporary and permanent hardness of water by complexometric method.
2. Estimation of free chlorine in water sample.
3. Estimation of dissolved oxygen in water sample.
4. Determination of chloride content of water
5. Determination of capacity of anion/cation exchange resin.
6. Determination of the copper by-Iodometry.
7. Synthesis of a polymer
8. To estimate the amount of ferrous and ferric ions present in the given solution.
9. Determination of moisture content in coal sample.
10. Determination of the partition coefficient of a substance between two immiscible
11. Liquids Adsorption of acetic acid by charcoal.
12. Determination of cell constant and conductance of solutions
13. Determination of pH of wastewater.
14. Determination of COD in wastewater.
15. Determination of hardness of water due to calcium and magnesium ions separately.
16. Determination of alkalinity of water sample

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STESC108**

Title of the Course : **Engineering Mechanics Laboratory**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	2	2	1	---	25	25	50

Course Outcome: After completion of the course, the student will be able to:

1. To know when theory applies and when theory is limited by simplifying assumptions.
2. Identify reasons why actual measurements will differ from theoretical calculations.
3. Use the laboratory equipment correctly and safely to perform all experiments.
4. Verify the wide field of engineering mechanics in various engineering applications.

Minimum eight (8) experiments are to be performed from the list given below.

List of Experiments:

1. Study of simple lifting machines
2. Determination mechanical advantage, velocity ratio and efficiency of Differential axel and wheel and verification of law of machine.
3. Determination mechanical advantage, velocity ratio and efficiency of single purchase crab winch and verification of law of machine.
4. Determination mechanical advantage, velocity ratio and efficiency of double purchase crab winch and verification of law of machine.
5. Determination mechanical advantage, velocity ratio and efficiency of worm and worm wheel and verification of law of machine.
6. Determination mechanical advantage, velocity ratio and efficiency of simple screw jack and verification of law of machine.
7. Determination of tensile and compressive forces in Jib-Crane apparatus and verification of Law of triangle.
8. Determination of reactions at the support of simply supported beam.
9. Determination of limiting friction, angle of friction and coefficient of friction between two bodies in contact by friction plane apparatus.
10. Determination of belt or coil friction between two bodies in contact by coil friction apparatus.
11. Determination of mass moment of inertia of Fly Wheel.
12. Determination of value of "acceleration due to gravity" and verification of Newton's Second law of Motion by Fleture'strolly equipment.
13. Graphical Methods:
    i. Determination of resultant.
    ii. Determination of support reactions.
    iii. Determination of forces in the members of truss by Maxwell's Diagram Method.
    iv. Determination of frictional forces

Head of Department
Mechanical Engg. Dept.

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : STVSEC109
Title of the Course : Workshop - I

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	4	4	2	---	50	50	100

Course Outcomes:

After successful completion the course, students will be able to:

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes
3. By assembling different components, they will be able to produce small devices of their interest.
4. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Units	Contents (Theory and Practical)	Hours
1	**Welding Shop** Concept of accidents, causes of accidents, safety precautions while working in shop, safety equipments and their use. One job on Arc welding-Lap/Butt/Tee Joint etc.	12
2	**Plumbing Shop** Demonstration on plumbing tools, pipes, types of pipe joints, threading dies, pipe fittings filments, valves etc. One job on plumbing including pipe cutting, threading and other related operations.	12
3	**Foundry Shop** Principles of molding methods, core and core boxes, preparation of foundry sand for casting.	12
4	**Machining Shop** Measuring and Gauging, Semi – Precision Tools – Calipers, depth Gauge, Feeler Gauge Precision Tools – Micrometers, Vernier Calipers, Vernier Height Gauge, etc, General Safety Considerations, Engine Lathes, Introduction to lathe, Physical Construction, Types of Lathe, and Lathe Operations – Facing, Turning, Threading, Introduction to drilling machine, milling machine, grinding machine and operations performed.	12

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.
3. Parmar, R. S., Welding Processes and Technology, Khanna Publishers, 2003.

Head of Department

I Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STCC110**
Title of the Course : **Liberal Learning Course (Yoga and Meditation)**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	4	4	2	---	50	0	50

Course Outcomes:

After completion of the course, the student will be able to:

1. Perform warming up exercises to prepare the body from head to toe for Yoga.
2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warming up.
3. Follow healthy diet and hygienic practices for maintaining good health.

Contents	Hours
Introduction to Yoga, its history and health benefits. Students will be taught to perform and practice. 1. warming up exercises to prepare the body from head to toe for Yoga. 2. all the postures of Surya Namaskar one by one in a very slow pace after warming up 3. Shavasana for self-relaxation 4. Sarvangasna, Halasana, Kandharasana 5. Bhujangasana, Naukasana, Mandukasana 6. Bhastrika, AnulomVilom Pranayam Kriya 7. Kapalbhati Pranayam Kriya 8. Practice Bhramary Pranayam 9. sitting in Dhyan Mudra and meditating. (Trainer will explain the benefits of Meditation before practice) Trainers can add similar asanas in sessions. Students are to be instructed to practice at least twice a week as part of self-learning practices. Live demonstration by the trainer needs to be carried out during teaching hours. Yogic Videos can be used as well.	20

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : STBSC201
Title of the Course : Engineering Mathematics-II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Course Outcome:

After completion of the course, the student will be able to:

1. To apply knowledge of mathematics in formulating and solving problems analytically.
2. To develop mathematical models for various engineering system and their solution using Differential equation.
3. Use of multiple integrations for calculation of area, mass, volume, centre of gravity.
4. To calculate gradient and directional derivatives of scalar point function.
5. To use Green's theorem to evaluate line integrals along simple close contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and the Divergence theorem to give physical interpretation of the divergence of a vector field.

Unit	Contents	Hours
1	Ordinary differential equation I : Solution of first order and first-degree differential equations, (Exact, Linear and reducible to Linear Bernoulli's equation) & Higher order linear differential equations with constant coefficients.	09
2	Ordinary differential equation II: Method of variation of parameters, Cauchy's and Legendre's differential equations, Differential equation of the form, Application of differential equation to electrical circuits, Kinematics and Vibrations (Up to second order)	09
3	Multiple Integrals and their Applications: Elementary double integral, change of order of integration (Cartesian), Elementary Tripple Integral, Applications to Area, Volume, Mass and Centre of gravity.	09
4	Vector Calculus: Vector differentiation, Velocity and Acceleration, Tangential and Normal acceleration, Vector operator Del, Gradient, Directional Derivative of scalar point function.	09
5	Vector Calculus - II: Vector point functions, Divergence and Curl, Solenoidal and Irrotational vector fields. Scalar potential, work done and conservative vector field, Line, Surface and volume integrals. Statements without proof of Gauss Divergence theorem, Greens theorem, Stoke's theorem.	09

Reference Books:

1. A text book of Engineering Mathematics, Volume I and II by D. T. Deshmukh.
2. A text book of Applied Mathematics Volume I and II by J. N. Wartikar and P. N. Wartikar
3. Higher Engineering Mathematics by Dr. B. S. Grewal
4. Advanced Engineering Mathematics by H. K. Dass.
5. Advance Engineering Mathematics by Erwins kreyszig

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STBSC202**

Title of the Course : **Engineering Physics**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Course Outcomes:

After completion of the course, the student will be able to:

1. Apply engineering physics concepts, which form the basis of modern engineering.
2. Elaborate the general nature of concepts learnt and possibility of their cross-disciplinary application.
3. Gain fundamental knowledge in areas like quantum mechanics, semiconductors, crystals, and optics.
4. Solve numerical problems on areas covered.
5. Implement concepts of elementary physics in understanding of engineering applications.

Units	Contents	Hours
1	**Quantum Physics** Dual nature of matter, De-Broglie's concept of matter waves , Davisson-Germer experiment, wave packet concept, wave function interpretation, Heisenberg's uncertainty principle and its experimental illustrations, Schrodinger's wave equations, application: electron in infinite potential well.	09
2	**Semiconductor Physics** Formation of energy bands in solids, classification of solids based on band theory, energy band diagram of germanium & silicon, probability distribution functions, Fermi energy-its dependence on temp and doping concentration, conductivity of semiconductors, energy band structure of p-n junction diode, junction voltage equation.	09
3	**Structure of solids** Crystal structure, Unit cell and its characteristics, Bravais lattices and crystal systems, Unit cell characteristics of cubic lattices, Crystallographic planes and Miller indices, Inter-planar distance in a cubic crystal, Bragg's law.	09
4	**Wave optics & Electron ballistics** Interference due to thin films of uniform and non uniform thickness, Newton's ring, antireflection coating, applications, Motion of electron in uniform electric and magnetic fields, concept of crossed fields. Electric field focussing-electrostatic lens, magnetic field focussing-magnetic lens	09
5	**Lasers and fibre optics** Interaction of radiation with matter, population inversion and pumping, optical resonator, types of laser; Gas laser (He-Ne), solid state laser (Ruby) and semiconductor laser, characteristics and applications. Introduction to optical fibre structure, principle, acceptance angle, Numerical aperture, fractional refractive index, modes of propagation, types and classifications of optical fibre, V – number, attenuation, dispersion, advantages of optical fibre in communication	09
		45

Head of Department
Mechanical Engg. Dept.

Text Book:

1. Avadhanulu & Kshirsagar, Engineering Physics, S. Chand Prakashan.

Reference Books:

1. A. Beiser, Concept of modern Physics, TMH Edition
2. S. L. Gupta & S. Gupta, Concept of modern Physics,
3. David Halliday, Robert Resnik And Jerle Walker, Fundamentals of Physics, John Wiley & Sons
4. Ajay Ghatak, Optics, Mc Grow Hill Publication
5. B. B. Laud, Lasers and Non Linear Optics, New Age Publications
6. John Allison, Electronic Engineering Material & Devices, TMH Edition
7. K. C. Nandi, Applied Physics, Tech. Max. Pune

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STESC203**

Title of the Course : **Basics of Electrical and Electronics Engineering**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	3	3	10	10	80	100

Course Outcomes:

After completion of the course, the student will be able to:

1. To Comprehend the essential elements of an electrical circuit and circuit solving techniques.
2. To Learn the basics of single-phase AC Circuits and Three Phase AC Circuits
3. To Understand the Principles of Different Electrical Machines.
4. To Know the operations Different Rectifiers and Applications of Op-Amp.
5. To Understand the Different Number Systems and Logic Gates

Units	Contents	Hours
1	**DC Circuits** Electrical circuit elements (R, L and C), voltage and current sources, Source Transformation, Star Delta Transformation, Kirchhoff laws, analysis of simple circuits with dc independent excitation with Mesh and Analysis(Excluding Super mesh) ,Superposition, Thevenin and Norton Theorems.	09
2	**AC Circuits** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Three phase balanced circuits, voltage and current relations in star and delta connections.	09
3	**Electrical Machines** Types of Machines (D.C. Machines, A.C. Machines introduction only) **Single Phase Transformers** Construction, working Principle, EMF Equation, Transformation Ratio(K),Rating of Transformer, Losses in Transformer, Ideal and Practical Transformers, Phasor Diagram of a Transformers on No Load, Phasor Diagram of Transformer on Load, Equivalent Circuit, Voltage Regulation, Efficiency, Open Circuit(OC) Test, Short Circuit (S.C.)Test	09
4	**Semiconductor theory** Intrinsic and Extrinsic Semiconductors - N type and P type materials - majority and minority carriers - Semiconductor diode - PN junction - V I characteristics of P N Junction diode **Rectifiers** Working and Waveforms of Half wave - Full wave - Bridge rectifiers (without filters) – Differences **OP Amp** Introduction, Concept of Virtual ground, Different Configurations, Op Amp applications - Adder, Subtractor - Integrator- differentiator	09
5	**Number representation** Decimal, Binary, Octal and Hexa decimal number systems - Conversion of number from one number system to another without decimal points - BCD Codes and limitations – Conversion of BCD to decimal and vice versa. **Logic gates** Symbolic representation - Definition, truth table, symbol, and logical equations of logic gates: AND – OR - NOT- NAND - NOR - EXOR – EXNOR (Only 2-inputs) – Universal gates.	09
		45

Head of Department

Text &Reference Books:

1. D.C. Kulshrehtha, "Basic Electrical Engineering", Tata McGraw Hill, 2012
2. B.L.Theraja,"Electrical Technology",S.Chand
3. Millman Halkias , "Electronic Devices and Circuits",Tata McGraw Hill, 2000
4. R. P. Jain "Modern Digital Electronics" McGraw Hill Education, 2009.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : STESC204
Title of the Course : Engineering Graphics and Design

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	--	0	3	3	4	10	10	80	100

Course Outcomes:

After completion of the course, the student will be able to:

1. Select and Interpret appropriate Scale, dimensioning methods, types of lines, various Engineering Curves. Create 2d and 3D drawings using computer aided software.
2. Apply knowledge of projections and draw the projections of lines, Planes.
3. Draw the projection of solids and interpret the sections of solids.
4. Prepare simple machine/ engineering parts/buildings plan, elevation, and side elevation.
5. Convert the orthographic views in pictorial views.

Units	Contents	Hours
1	General drawing principles for all technological drawings, usage of drawing instruments, geometrical constructions, lettering, different types of lines used in drawing practices, dimensioning, Introduction to scale i.e. full size, reducing scale and enlarging scale. Introduction to computer aided drafting (CAD); using FreeCAD, Google Sketch, introduction of the drafting and modeling tools and demonstration of its application in latest machines Engineering Curves; Ellipse, Parabola, Hyperbola, Cycloid, and Involute	09
2	Principles of orthographic projections, concepts of four quadrants, difference between first and third angle projection, conventions used to represent methods of orthographic projection. Projections of points; in all four quadrants. Projection of straight line; parallel to both reference planes, perpendicular to reference plane, parallel to one and inclined to other reference plane, inclined to both reference planes. Projections of planes: Parallel to reference plane, lying in reference plane, inclined to one & perpendicular to other reference plane, inclined to both reference planes. Concept of auxiliary plane method for projection of planes.	09
3	Projections of Solids: projections of cube, tetrahedron, prism, pyramid, cylinder and cone when axis perpendicular to one of the reference planes, axis inclined to one & parallel to other reference plane, axis inclined to both the reference planes. Sections and sectional views of right angular solids; Section planes, true shape of sections sectional views of geometrical solids like Cube, Tetrahedron, Prism, Cylinder, Pyramid, Cone cut by different section planes (axis of solid is perpendicular to reference plane, axis is parallel to one & inclined to other reference plane only)	09
4	Orthographic Projections; Projections from pictorial view of the object on the principle planes for view from front, top and side using first angle of projection method	09
5	Isometric Projections: Principles of Isometric projection – Isometric scale, isometric projection and views, Isometric axes, conversion of orthographic projections of simple solids, machine parts and mechanical components to isometric projections/views.	09
		45

Head of Department

Text Book:

1. Bhatt N.D. & Panchal V.M., Engineering Drawing, Charotar Publishing House Private Limited.
2. Shah, M. B. & Rana B.C., Engineering Drawing, Pearson Education India
3. D. A. Jolhe, Engineering Drawing, Tata McGraw education private limited.
4. Arunoday Kumar, Engineering Graphics – I, Tech-Max Publications

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : STIKS205
Title of the Course : Indian Knowledge System

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
2	0	0	2	2	---	40	10	0	50

Course Outcomes:

After successful completion the course, students will be able to:

1. Explain the history of Indian Knowledge System and the broad classification of Indian philosophical systems.
2. Describe the characteristics of the Indian number system and how it has helped improve science and technology.
3. Describe historical development of astronomy in India.
4. Illustrate the basic elements of the Indian calendar.

Units	Contents (Theory)	Hours
1	**An overview of Indian Knowledge System (IKS)** Importance of Ancient Knowledge -Definition of IKS - Classification framework of IKS - Unique aspects of IKS. The Vediccorpus: Vedas and Vedangas - Distinctive features of Vedic life. Indian philosophical systems:Different schools of philosophy.The knowledge triangle: Prameya, Pramana, Saṃsaya - Framework for establishing validknowledge - Potential fallacies in the reasoning process.	6
2	**Salient features of the Indian numeral system** Importance of decimal representation – Thediscovery of zero and its importance - Unique approaches to represent numbers. Unique aspectsof Indian mathematics - Great mathematicians and their significant contributions inarithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandah-sastra ofPingala, binary mathematics and Magic squares in India.	6
3	**Historical development of astronomy in India** The CelestialCoordinate System - Astronomical terminologies - Equinoctial points, precession of equinoxes,movable and fixed zodiac - Elements of the Indian Calendar - Panchanga	6
4	**Yoga a holistic approach to health and fitness** History and development of yoga, traditional schools of yoga, Yoga and holistic health, Yoga and its human values, Importance and objectives of yoga practices, guidelines for yoga practices, common yoga practices, Asanas for health and physical fitness, benefits and limitations of asanas.	6
5	**Scientist of Ancient India and their notable works** Baudhayana (800 BCE- 740 BCE), Sushrutha , Kanada , Charaka, Aryabhatta (476-550 CE), Aryabhata II , Brahmagupta (598-668 CE), Bhaskara I, Varahamihiri (505–587 CE), Bhaskara II/ Bhaskaracharya, Nagarjuna.	6

Reference Books:

1. A. K. Bag, History of Technology in India, Vol. I, Indian National Science Academy, New Delhi, 1997.
2. D.N. Bose, S.N. Sen and B. V. Subbarayappa, A Concise History of Science in India, Indian National Science Academy, New Delhi, 2009.

Head of Department
Mechanical Engg. Dept.

3. B. Datta and A. N. Singh, History of Hindu Mathematics: Parts I and II, Asia Publishing House, Bombay, 1962.
4. M. Hiriyanna, M., Outlines of Indian Philosophy, Motilal Banarsidass, New Delhi, 1994
5. B. Mahadevan, Vinayak Rajat Bhat, and R.N. Nagendra Pavana, Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Limited, New Delhi, 2022.
6. S. N. Sen and K. S. Shukla, History of Astronomy in India, Indian National Science Academy, 2nd edition, New Delhi, 2000.
7. Yoga: A healthy way of living, published by NCERT
8. Knowledge tradition and practices of India vol. 1 and 2, published by NCERT.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STBSC206**

Title of the Course : **Engineering Physics Laboratory**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	2	2	1	---	25	25	50

Course Outcome: After completion of the course, the student will be able to:

1. Understand and analyse the theoretical concepts in physics through experimentation
2. Learn and use the proper methods while gathering experimental data.
3. Get familiar with the proper use of basic instruments in physics laboratories.

Minimum eight (8) experiments are to be performed from the list given below.

List of Experiments:

1. Determination of resistivity of a semiconductor by four probe method.
2. A study of transistor characteristics in common base configuration.
3. Determination of the radius of curvature of a plano-convex lens using Newton's rings.
4. Determination of thickness of a thin foil using air wedge.
5. A study of the static characteristics of diodes.
6. A study of the static characteristics of Zener Diode.
7. A study of transistor characteristics in common emitter configuration.
8. Determination of activation energy of a thermistor.
9. Determination of wavelength of Laser light using plane transmission grating.
10. To measure the divergence of laser beam.
11. Determination of numerical aperture and acceptance angle, attenuation in optical fiber.
12. Determination of refractive index of glass prism.
13. Determination of refractive index of quartz/calcite prism.
14. Determination of wavelength of light using reflection grating.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STESC207**

Title of the Course : **Engineering Graphics and Design Laboratory**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	2	2	1	---	25	25	50

Course Outcome: After completion of the course, the student will be able to:

1. Select and Interpret appropriate Scale, dimensioning methods, types of lines as per B.I.S and Draw various Engineering Curves.
2. Apply knowledge of Projections and Draw the projections of Lines, Planes, and Solids.
3. Interpret Sections of solids and develop the surfaces of solids.
4. Convert the Pictorial views in orthographic views and Isometric views from Orthographic Views
5. Create and modify two-dimensional orthographic drawings and three dimensional Isometric drawing using software

In Practical minimum 8 half imperial (A2-594 mm X 420mm) sheets based onabove Syllabus are to be drawn. In each sheet **minimum** 4 problems are to be drawn. Drawing sheets may include

1. Lettering, different types of lines, dimensioning and conventions used to represent first and third angle projection method.
2. Problems on engineering curves
3. Problems on projection of straight line
4. Problems on projection of planes
5. Problems on projection of solids (Two problem on sheet and two problems using CAD)
6. Problems on Sections of solids (Two problem on sheet and two problems using CAD)
7. Problems on Isometric projections (Two problem on sheet and two problems using CAD)
8. Problems on Orthographic Projections (Two problem on sheet and two problems using CAD)

Note:
During End semester examination (external practical examination) of 25 marks,
Students are expected tosolve one/two problems on drawing sheetor using the CAD software on the system or15 Objective type Questions for 15 marks performance examination out of 25 and viva voce examinationfor remaining 10 marks.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STVSECMEC208**

Title of the Course : **Workshop-II**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	4	4	2	---	50	50	100

Course Outcomes:

After successful completion the course, students will be able to:

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes
3. By assembling different components, they will be able to produce small devices of their interest.
4. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Units	Contents (Theory and Practical)	Hours
1	**Welding Shop** Concept of accidents, causes of accidents, safety precautions while working in shop, safety equipments and their use. One job on Arc welding-Lap/Butt/Tee Joint etc.	12
2	**Plumbing Shop** Demonstration on plumbing tools, pipes, types of pipe joints, threading dies, pipe fittings filments, valves etc. One job on plumbing including pipe cutting, threading and other related operations.	12
3	**Foundry Shop** Principles of molding methods, core and core boxes, preparation of foundry sand for casting.	12
4	**Machining Shop** Measuring and Gauging, Semi – Precision Tools – Calipers, depth Gauge, Feeler Gauge Precision Tools – Micrometers, Vernier Calipers, Vernier Height Gauge, etc, General Safety Considerations, Engine Lathes, Introduction to lathe, Physical Construction, Types of Lathe, and Lathe Operations – Facing, Turning, Threading, Introduction to drilling machine, milling machine, grinding machine and operations performed.	12

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.
3. Parmar, R. S., Welding Processes and Technology, Khanna Publishers, 2003.

Head of Department
Mechanical Engg. Dept.

II Semester B.Tech. (Mechanical Engineering) NEP 2020

Course Code : **STCCMEC209**
Title of the Course : **Club Activities (Self Learning Course)**

Course Scheme					Evaluation Scheme (Theory)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	CA	UA	Total
0	0	0	0	2	---	50	0	50

The various clubs and student chapters of the institute provide the students the much-cherished opportunity to come together to discuss and exchange ideas with like-minded people.

- Under the Robo club students participates in the annual events organized throughout the nation. The club conducts workshops for students and also organizes the events.
- The environment club inspires students to participate various activities in and outside of the campus.
- The student chapter MESA, organizes various events and activities round the year for overall development of the students.

Under club activities the student is expected to participate in at least five co curricular and extracurricular activities in and outside of the institute, and submit the report to the allotted guide for the evaluation.

Following activities are expected to be coordinated, participated and assisted by the students voluntarily:

- Cultural activities
- Sports activities
- Technical events
- Socio-environmental activities
- Tree Plantation
- Blood donation camps
- Expert Talks by eminent persons from Industry, academic Institutes, Health experts etc.
- Yogic and meditation activities
- Alumni and Parent meets
- Programs in tribute to great leaders and freedom fighters.

Under this head, students are expected to participate in at least five extra-curricular and co-curricular activities in and outside of the Institute and submit the reports/certificates to the allotted guide/supervisor for evaluation.

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

Mechanical Engineering: UG Certificate Level NEP 2020

(Exit Course after First Year of Engineering)

Course Code : STEXMEC210
Title of the Course : Basics of 3-D Printing

Course Scheme					Evaluation Scheme (Practical)			
Lecture	Tutorial Hrs./week	Practical Hrs./week	Duration of paper, hrs	Credits	Duration of paper hrs.	CA	UA	Total
--	--	8	--	4	---	100	0	100

Course Description: After completing this course, students will understand fundamentals of various 3D printing techniques as per industrial needs.

Course Outcomes:

1. Understand 3D printing process and its classification
2. Select suitable 3D printing process for given application
3. Identify 3-D process tools and use it.
4. Understand the process of additive manufacturing
5. Prepare 3D printed elements

Detailed Syllabus

Basics of 3-D Printing

Introduction - Introduction to Design, Prototyping fundamentals. Introduction to 3D printing, advantages. Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, Classification of 3D printing process.
Liquid based 3-D printing - Stereo lithography apparatus (SLA), models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning. Solid ground curing (SGC), models and specifications, process, working , principle, applications
Solid based 3-D printing- Laminated object manufacturing (LOM),models and specifications, Process, Working principle. Fused Deposition Modelling (FDM): Models and specifications, Process, Working principle,
Additive Manufacturing, Machinespecifications, Material, Case studies, practical demonstration
Comprehensive evaluation through: 1) Assignments (at least 5), 2) 3 D Printing of standard machine components (At least 2) 3)A case study 5)Minor project 6)Test

Text books and Reference books :

1. C.S Rapid prototyping: Principles an Applications,Chua C.K., Leong K.F. and LIM World Scientific publications
2. Rapid Manufacturing,D.T. Pham and S.S.Dimov, Springer
3. Rapid Prototyping and Manufacturing, Paul F. Jacobs, ASME Press
4. 4)Additive Manufacturing Technologies, Ian Gibson, Davin Rosen, Brent Stucker, Springer

Head of Department
Mechanical Engg. Dept.
Govt. College of Engg. Chandrapur

Mechanical Engineering: UG Certificate Level NEP 2020

(Exit Course after First Year of Engineering)

Course Code : **STEXMEC211**
Title of the Course : **Computer Aided Geometric Modelling**

Course Scheme					Evaluation Scheme (Practical)			
Lecture	Tutorial Hrs./week	Practical Hrs./week	Duration of paper, hrs	Credits	Duration of paper hrs.	CA	UA	Total
--	--	8	--	4	---	100	0	100

Course Description: After completing this course student will have basic understanding of types mechanical drawing, drawing tools and its area of application.

Course Outcomes:
Understand basics of machine drawing
Explain part drawing, production drawing and assembly drawing
Identify modeling tools and use it
Describe and use design tools like 2D and 3D drafting software
Use assembly drawing in assembling and dissembling of machines

Detailed Syllabus

Computer Aided Geometric Modeling

Introduction to Machine Drawing, Types of projections, Orthographic projection, Part drawing, Production drawing, Geometric tolerances, Few standard machine components
Assembly Drawing, Introduction to Design Tools like AutoCAD and CREO, Concept Creation and 3D Modeling ,Detail Design, Drawing, Drafting, GD&T and Engineering.
Design for Assembly and Design for Manufacturing, Windchill Features and Functions, Case Studies and Final Assignment, Minor Project and Test.
Comprehensive evaluation through 1)Drawing sheets (Full size) on Orthographic views of standard machine components(at least 3), 2)Assembly Drawing with part details(At least 2) 3) 3 D modeling of standard machine components (At least 2) 4)Design for Assembly (At least 2) 4)A case study 5)Minor project 6)Test

Text books and Reference books :

1. Machine Drawing , N D Bhatt ,Charotar Publications
2. Machine Drawing, Sidhheshwar Shastry,TMH Publications
3. Computer-aided Drawing And Design, Davies, Robotham, Larwood, Chapman and Hall

Head of Department
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