Gondwana University,

Gadchiroli

B.Tech Instrumentation Engineering

NEP 2020 Curriculum

(AY: 2024-25)

Syllabus

Board of Studies in Instrumentation Engineering

C.M. Kadam

Dr. P.S. Londhe

KS Bhokare

N.M. Yewale

Program Outcomes (PO)

Engineering Graduates will be able to:

Sr.No.	Statement of POs
PO1	**Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO4	**Conduct investigations of complex problems** using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**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 under- standing of the limitations.
PO6	**The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering com- munity 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.
PO11	**Project Management and Finance**: Demonstrate knowledge and understanding of 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.
PO12	**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.

K S Bhokare

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 Instrumentation Engineering (INS) (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	Duration (Hrs)	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	03	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC102	Engineering Physics	3	1	–	4	03	10	10	80	100	40	–	–	–	–	4
ESC	Electrical Engineering	STESC103	Basics of Electrical & Electronics Engineering	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Computer Science & Engineering	STESC104	Introduction to IOT	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
IKS	Science and Humanities	STIKS105	Indian Knowledge System	2	–	–	2	02	40	10	–	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC106	Engineering Physics Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
ESC	Electrical Engineering	STESC107	Basics of Electrical & Electronics Engineering Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSEC108	Workshop - I	–	–	4	4		–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC109	Liberal Learning Course (Yoga and Meditation)	-	–	4	4		–	–	–	–	–	50	–	50	25	2
			Total	**14**	**2**	**12**	**28**					**450**				**250**		**22**
Semester Total marks									**700**									

K S Bhuree

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 Instrumentation Engineering (INS) (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	Duration (Hrs)	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	03	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC202	Engineering Chemistry	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Electronics & Telecom. Engineering	STESC203	Digital Circuits	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Computer Science & Engineering	STESC204	Programming for Problem Solving	2	–	–	2	02	–	10	40	50	20	–	–	–	–	2
PCC	Instrumentation Engineering	STPCCINS 205	Sensors and Instruments	2	–	–	2	02	-	10	40	50	20	–	–	–	–	2
AEC	Science and Humanities	STAEC206	Business Communication Skill	1	–	2	3	02	-	10	40	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC207	Engineering Chemistry Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
ESC	Electronics &Telecom. Engineering	STESC208	Digital Circuits Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
VSEC	Instrumentation Engineering	STVSECINS209	Engineering Exploration Workshop (Instrumentation)	–	–	4	4		–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC210	Club Activities (Self learning course)	–	–	–	–		–	–	–	–	–	50	–	50	25	2
			Total	**14**	**1**	**10**	**25**					**450**				**250**		**22**
Semester Total marks and Credits								**700**										

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 Instrumentation Engineering (INS) (Full Time)

Scheme of Instructions: UG Certificate Level

(Exit Course after First Year of Engineering)

Sr. No.	Category	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T (Tutorial / Assignment/ Field work)	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Total Marks	Min. passing marks	Max. Marks TW	Max. Marks POE	Total Marks	Min. passing marks
1.	PCC	STEXINS211	Mechatronics/Relevant technical course	--	--	8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
OR																
2.	PCC	STEXINS212	Internet of Things/Relevant technical course	--	--	8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
			Total	--		8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
			Total		8		4	100								

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 Instrumentation Engineering (INS) (Full Time)

Semester–III

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Max. Marks Sessional IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
PCC	Instrumentation Engineering	STPCCINS301	Sensors and Transducers	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS302	Network Theory	2	-	-	2	2	40	-	10	50	20	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS303	Electronics Devices and Circuits	3	-	-	3	3	80	10	10	100	40	--	--	--	--
OE	Instrumentation Engineering	STOEINS304	Electronic Measurements	3	1	-	4	3	80	10	10	100	40	-	-	-	-
VEC	Science and Humanities	STVECSH305	Introduction to Constitution of India	2	-	-	2	-	40	-	10	50	20	-	-	-	-
PCC	Instrumentation Engineering	STPCCINS306	Sensors and Transducers Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
PCC	Instrumentation Engineering	STPCCINS307	Electronics Devices and Circuits Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
MDM	Instrumentation Engineering	STMDMINS308	Programming Skill-1	-	1	2	2	-	-	-	-	-	-	50	-	50	25
HSSM	Instrumentation Engineering	STHSSMINS309	Environmental Science	-	1	2	2	-	-	-	-	-	-	50	-	50	25
CEP	Instrumentation Engineering	STCEPINS310	Case study on societal issues	-	-	4	2	-	-	-	-	-	-	50	-	50	25
		Total		**13**	**3**	**12**						**400**				**250**	
		Semester Total		**28**			**22**						**650**				

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 Instrumentation Engineering (INS) (Full Time)

Semester–IV

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Max. Marks Sessional IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
PCC	Instrumentation Engineering	STPCCINS401	Industrial Instrumentation	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS402	Automatic Control System (ACS)	2	-	-	2	2	40	-	10	50	20	-	-	-	-
PCC	Instrumentation Engineering	STPCCINS403	Microprocessor and Interfacing	3	-	-	3	3	80	10	10	100	40	--	--	--	--
OE	Instrumentation Engineering	STOEINS404	Linear Integrated Circuits	2	-	-	2	2	40	-	10	50	20	-	-	-	-
HSSM	Instrumentation Engineering	STHSSMINS405	Professional Management Techniques	2	-	-	2	2	40	-	10	50	20	-	-	-	-
PCC	Instrumentation Engineering	STPCCINS406	Industrial Instrumentation Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
PCC	Instrumentation Engineering	STPCCINS407	Linear Integrated Circuits Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
MDM	Instrumentation Engineering	STMDMINS408	Programming Skill-2	-	1	2	2	-	-	-	-	-	-	50	-	50	25
VEC	Instrumentation Engineering	STVECINS409	Human Values and Ethics	-	1	2	2	-	-	-	-	-	-	50	-	50	25
AEC	Instrumentation Engineering	STAECINS410	Language Skills	-	1	2	2	-	-	-	-	-	-	50	-	50	25
VSEC	Instrumentation Engineering	STVSECINS411	MATLAB for ACS	-	1	2	2	-	-	-	-	-	-	25	25	50	25
		Total		**12**	**4**	**12**						**350**				**300**	
		Semester Total		**28**			**22**	**650**									

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 Instrumentation Engineering (INS) (Full Time)

Scheme of Instructions: UG Diploma Level

(Exit Course after Second Year of Engineering)

Sr. No.	Category	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T (Tutorial / Assignment/ Field work)	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Total Marks	Min. passing marks	Max. Marks TW	Max. Marks POE	Total Marks	Min. passing marks
1.	PCC	STEXINS412	Industrial Vocational Training	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
3.	PCC	STEXINS413	Industrial Robotics/Relevant technical course	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	**8**			**4**	**100**								

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 Instrumentation Engineering (INS) (Full Time)

Semester–V

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
										MSE	IE						
PCC	Instrumentation Engineering	STPCCINS501	Process Automation	3	-	-	3	3	80	10	10	100	40	--	--	--	--
MDM	Instrumentation Engineering	STMDMINS502	Control System Design	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS503	Microcontroller and its applications	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS504	Instrumentation System Design	3	1	-	4	3	80	10	10	100	40	--	--	--	--
PEC	Instrumentation Engineering	STPECINS505	PEC-I	3	1	-	4	3	80	10	10	100	40	--	--	--	--
OE	Instrumentation Engineering	STOEINS506	Industrial Drives and Control	2	-	-	2	2	40	-	10	50	20	-	-	-	-
PCC	Instrumentation Engineering	STPCCINS507	Process Automation Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
PCC	Instrumentation Engineering	STPCCINS508	Microcontroller and its applications Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
MDM	Instrumentation Engineering	STMDMINS509	Programming skill-3	-	-	2	1	-	-	-	-	-	-	50	-	50	25
		Total		**17**	**2**	**06**						**550**				**150**	
		Semester Total		**25**			**22**	**700**									

PEC-I: i) Biomedical Instrumentation ii) Opto-electronic Instrumentation iii) Agricultural Instrumentation iv) Fundamentals of communication

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 Instrumentation Engineering (INS) (Full Time)
Semester–VI

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
										MSE	IE						
PCC	Instrumentation Engineering	STPCCINS601	Digital Signal Processing	3	1	-	4	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS602	Control System components	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS603	Analytical Instrumentation	2	-	-	2	2	40	-	10	50	20	-	-	-	-
PEC	Instrumentation Engineering	STPECINS604	PEC-2	3	1	-	4	3	80	10	10	100	40	--	--	--	--
PEC	Instrumentation Engineering	STPECINS605	PEC-3	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS606	Digital Signal Processing Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
PEC	Instrumentation Engineering	STPECINS607	PEC-2 Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
VSEC	Instrumentation Engineering	STVSECINS608	Soft skills	-	1	2	2	-	-	-	-	-	-	50	-	50	25
MDM	Instrumentation Engineering	STMDMINS609	Programming Skill-4	-	1	2	2	-	-	-	-	-	-	50	-	50	25
		Total		**14**	**4**	**08**						**450**				**200**	
		Semester Total		**26**			**22**	**650**									

PEC-2: i) Internet of Things ii) Smart Sensors iii) Embedded Systems iv) Robotic Systems and Control

PEC-3:i) Building Automation ii) Modern Control Theory iii) Distributed Control System iv) Industrial Safety and Hazards

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 Instrumentation Engineering (INS) (Full Time)

Scheme of Instructions: B. Voc. Level

(Exit Course after Third Year of Engineering)

Sr. No.	Category	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T (Tutorial / Assignment/ Field work)	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Total Marks	Min. passing marks	Max. Marks TW	Max. Marks POE	Total Marks	Min. passing marks
1.	PCC	STEXINS610	PLC, SCADA and DCS/Relevant technical course	--	--	8	4	--	--	--	--	--	100	--	100	50
OR																
2..	PCC	STEXINS611	Industrial Automation/Relevant technical course	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	--	--	8	4	--	--	--	--	--	100	--	100	50
			Total	**8**			**4**	**100**								

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 Instrumentation Engineering (INS) (Full Time)

Semester–VII

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional MSE	Max. Marks Sessional IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
PCC	Instrumentation Engineering	STPCCINS701	NPTEL/SWAYAM/MOOCS/ Certificate course	4	-	-	4	-	-	-	100	100	40	-	--	-	-
PEC	Instrumentation Engineering	STPCCINS702	NPTEL/SWAYAM/MOOCS/ Certificate course	2	-	-	2	-	-	-	50	50	20	-	--	-	-
MDM	Instrumentation Engineering	STMDMINS703	NPTEL/SWAYAM/MOOCS/ Certificate course on Multidisciplinary Topic	2	-	-	2	-	-	-	50	50	20	-	--	-	-
Experiential Learning	Instrumentation Engineering	STEXPLINS704	Internship/on-job training		-	24	12	-	-	-	-	-	-	100	200	300	150
		Total		**8***	**-**	**24**						**200**				**300**	
		Semester Total		**32**			**20**	**500**									

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

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 Instrumentation Engineering (INS) (Full Time)
Semester–VIII

Course Category	Board of Studies	Course code	Subject	Teaching Scheme				Examination Scheme									
				Hours Per Week			Number of Credits	THEORY						PRACTICAL			
				L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
										MSE	IE						
PCC	Instrumentation Engineering	STPCCINS801	Project Planning, Estimation and Assessment	3	-	-	3	3	80	10	10	100	40	--	--	--	--
PEC	Instrumentation Engineering	STPECINS802	PEC-4	3	-	-	3	3	80	10	10	100	40	--	--	--	--
RM	Instrumentation Engineering	STRMINS803	Research Methodology& Intellectual Property Rights	3	1	-	4	3	80	10	10	100	40	-	-	-	-
PEC	Instrumentation Engineering	STPECINS804	PEC-5	2	-	-	2	2	40	-	10	50	20	--	--	--	--
PCC	Instrumentation Engineering	STPCCINS805	Project Planning, Estimation and Assessment Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
PEC	Instrumentation Engineering	STPECINS806	PEC- 4 Lab	-	-	2	1	-	-	-	-	-	-	25	25	50	25
MDM	Instrumentation Engineering	STMDMINS807	Programming Skill-5	-	1	2	2	-	-	-	-	-	-	50	-	50	25
Experiential Learning	Instrumentation Engineering	STEXPLINS808	Major Project	-	-	4	4	-	-	-	-	-	-	75	75	150	75
		Total		**11**	**2**	**10**						**350**				**300**	
		Semester Total		**23**			**20**	**650**									

PEC-4: i) Artificial Intelligence for Instrumentation ii) Mechatronics iii) Industrial Data Communication iv) Digital Control

PEC-5: i) Wireless Sensor Network ii) Optimization Techniques iii) Unit Operation and Power plant Instrumentation iv) Non-Linear Dynamics

Gondwana University,

Gadchiroli

B.Tech Instrumentation Engineering

NEP 2020 Curriculum

(AY: 2024-25)

Syllabus

Board of Studies in Instrumentation Engineering

C.M.Kadam

Dr. P.S. Ludhe

KS Bhokare

N.M. Yewale

Program Outcomes (PO)

Engineering Graduates will be able to:

Sr.No.	Statement of POs
PO1	**Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO4	**Conduct investigations of complex problems** using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**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 under- standing of the limitations.
PO6	**The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering com- munity 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.
PO11	**Project Management and Finance**: Demonstrate knowledge and understanding of 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.
PO12	**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.

K S Bhokare

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 Instrumentation Engineering (INS) (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	Duration (Hrs)	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	03	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC102	Engineering Physics	3	1	–	4	03	10	10	80	100	40	–	–	–	–	4
ESC	Electrical Engineering	STESC103	Basics of Electrical & Electronics Engineering	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Computer Science & Engineering	STESC104	Introduction to IOT	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
IKS	Science and Humanities	STIKS105	Indian Knowledge System	2	–	–	2	02	40	10	–	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC106	Engineering Physics Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
ESC	Electrical Engineering	STESC107	Basics of Electrical & Electronics Engineering Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
VSEC	Mechanical Engineering	STVSEC108	Workshop - I	–	–	4	4		–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC109	Liberal Learning Course (Yoga and Meditation)	-	–	4	4		–	–	–	–	–	50	–	50	25	2
			Total	**14**	**2**	**12**	**28**					**450**				**250**		**22**
Semester Total marks									**700**									

K S Bhure

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 Instrumentation Engineering (INS) (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	Duration (Hrs)	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	03	10	10	80	100	40	–	–	–	–	4
BSC	Science and Humanities	STBSC202	Engineering Chemistry	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Electronics & Telecom. Engineering	STESC203	Digital Circuits	3	–	–	3	03	10	10	80	100	40	–	–	–	–	3
ESC	Computer Science & Engineering	STESC204	Programming for Problem Solving	2	–	–	2	02	–	10	40	50	20	–	–	–	–	2
PCC	Instrumentation Engineering	STPCCINS 205	Sensors and Instruments	2	–	–	2	02	-	10	40	50	20	–	–	–	–	2
AEC	Science and Humanities	STAEC206	Business Communication Skill	1	–	2	3	02	-	10	40	50	20	–	–	–	–	2
BSC	Science and Humanities	STBSC207	Engineering Chemistry Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
ESC	Electronics &Telecom. Engineering	STESC208	Digital Circuits Lab	–	–	2	2		–	–	–	–	–	25	25	50	25	1
VSEC	Instrumentation Engineering	STVSECINS209	Engineering Exploration Workshop (Instrumentation)	–	–	4	4		–	–	–	–	–	50	50	100	50	2
CC	Science and Humanities	STCC210	Club Activities (Self learning course)	–	–	–	–		–	–	–	–	–	50	–	50	25	2
			Total	**14**	**1**	**10**	**25**					**450**				**250**		**22**
Semester Total marks and Credits								**700**										

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 Instrumentation Engineering (INS) (Full Time)

Scheme of Instructions: UG Certificate Level

(Exit Course after First Year of Engineering)

Sr. No.	Category	Course Code	Name of Course	Teaching scheme				Examination Scheme								
				Hours per week			No. of Credits	Theory					Practical			
				L	T (Tutorial / Assignment/ Field work)	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. passing marks	Max. Marks	Max. Marks	Total Marks	Min. passing marks
										Sessional						
									ESE	MSE			TW	POE		
1.	PCC	STEXINS211	Mechatronics/Relevant technical course	--	--	8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
OR																
2.	PCC	STEXINS212	Internet of Things/Relevant technical course	--	--	8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
			Total	--		8	4	--	--	--	--	--	**100**	**--**	**100**	**50**
			Total		8		4	100								

Gondwana University,

Gadchiroli

B.Tech Instrumentation Engineering

NEP 2020 Curriculum

SEMESTER I

Syllabus

Board of Studies in Instrumentation Engineering

I Semester B.Tech. 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 Maclaurin'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, Laxmipublication, Reprint, 2008.
4. Higher Engineering Mathematics by B. S. GrewalKhanna Publishers.
5. Advanced Engineering Mathematics by H. K. Dass
6. Advanced Engineering Mathematics by ErwinsKreyszig

I Semester B.Tech. NEP 2020

Course Code : STBSC102

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 lasers; 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

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 ResnikandJerle 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

I Semester B.Tech. NEP 2020

Course Code : STESC103

Title of the Course : Basics of Electrical & 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

Text &Reference Books:

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

I Semester B.Tech. NEP 2020

Course Code : STESC104

Title of the Course : Introduction to Internet of Things (IoT)

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. Understand IoT fundamentals including architecture, enabling technologies, and historical context.
2. Recognize and evaluate wireless communication technologies utilized in IoT deployments.
3. Explore IoT applications in areas like home automation, healthcare, and industry, considering legal and ethical aspects.
4. Gain practical experience with IoT development boards and sensor networks for solution development.

Unit	Contents	Hours
1	**Introduction to IoT** Overview, Definition, Characteristics, Applications, Terms and Features, IoT Architectures, IoT Physical and Logical Design, IoT Enabling Technologies, The Internet of Things (IoT) frameworks, the history of IoT, the things about IoT, the identifiers in IoT, and IoT and M2M.	09
2	**Sensor Networks** Definition, Basic Concepts, Wireless Sensor Networks, Sensor Nodes, Sensor and Actuator Types, Examples, and Operation IoT Development Boards: Raspberry Pi Development Kit, Arduino IDE and Board Types, RFID Principles and Components, Wireless Sensor Networks: Background and Significance The node, networking nodes, WSN nodes, and Internet of Things nodes.	09
3	**IOT Wireless Communication Technologies-I** IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, and Modbus are examples of WPAN technologies.	09
4	**IOT Wireless Communication Technologies-II** IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, and MQTT are IP-based protocols. Protocols and edge connectivity	09
5	**Applications of IoT** Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health, and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.	09
		45

Text Books:

1. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press) HakimaChaouchi, — "The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key Applications and Protocols", Wiley Publications
3. Vijay Madisetti and ArshdeepBahga, — "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016

Reference Books:

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

I Semester B.Tech. NEP 2020

Course Code : STIKS105
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	2	40	10	-	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, Samsaya - 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-sastraofPingala, 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.
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, MotilalBanarsidass, New Delhi, 1994
5. B. Mahadevan, VinayakRajatBhat, and R.N. NagendraPavana, 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.

I Semester B.Tech. NEP 2020

Course Code : STBSC106

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 methods.
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.

I Semester B.Tech. NEP 2020

Course Code : STESC107

Title of the Course : Basics of Electrical & Electronics Engineering 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 basics of Circuit solving Theorems
2. Learn and analyze AC circuits.
3. Learn to calculate different losses and efficiency of Electrical Machines
4. Know the electronic devices and their properties.
5. Use various electronic devices for various applications.

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

List of Experiments:

1. To study and verification of Kirchhoff's Laws applied to direct current circuit
2. To Study Superposition Theorem
3. To Study Thevenin's Theorem
4. To Study Norton's Theorem
5. To study AC series and Parallel circuits
6. To Study OC and SC test on single phase Transformer
7. To study characteristics of P-N Junction diode
8. To study Half and Full wave rectifier
9. To study Integrator or Differentiator on Op-Amp
10. Verification of Gates

I Semester B.Tech. NEP 2020

Course Code : STVSEC108
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. Understand the concept of fitting and able to practice the operations in fitting and black smithy.
2. Understand the concept of black smithy and able to practice the operations in fitting and black smithy.
3. Understand the concept of carpentry and able to practice the operations in Arc welding.
4. Understand the concept of sheet metal and able to practice the operations in foundry.

Units	Contents (Theory)	Hours
1	**Fitting Shop** Study of various tools like files, drills, taps, dies and fitting operations. One job Male/Female fitting with operations-Marking, Cutting, drilling, tapping filing.	12
2	**Black Smithy** Introduction to smithy operations like bending, forming, upsetting, drawing. Introduction to smithy tools, hammers, hot and cold chisel, flatters, tongs, anvil etc. One job in smithy involving upsetting, drawing, bending such as hook, peg, square headed bolt etc.	12
3	**Carpentry** Carpentry Shop: Introduction to carpentry and safety aspects; use of different tools (functions, types and specifications) types of woods, hand tools and wood working machines. Practice on simple carpentry joints.	12
4	**Sheet Metal** Introduction to sheet metal tools (functions, types and specifications); practice on sheet metal operations and joints. Preparation simple jobs like clamp, funnel, cabinet, etc. employing cutting, folding, drilling, riveting etc.	12

Text Books:

1. HajraChoudhury S.K., HajraChoudhury 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 McGraw Hill House, 2017.
3. Parmar, R. S., Welding Processes and Technology, Khanna Publishers, 2003.

I Semester B.Tech. NEP 2020

Course Code : STCC109
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
2	0	0	2	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 at a very slow pace, after warming up.
3. Follow a 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, AnulomVilomPranayamKriya 7. KapalbhatiPranayamKriya 8. Practice BhramaryPranayam 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

Gondwana University,

Gadchiroli

B.Tech Instrumentation Engineering

NEP 2020 Curriculum

SEMESTER II

Syllabus

Board of Studies in Instrumentation Engineering

II Semester B.Tech. 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 Erwinskreyszig

II Semester B.Tech. NEP 2020

Course Code : STBSC202

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
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 :**	9

	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}	

Text Books:

1. Enginnering chemistry, S.S. Dara Chand publication, New Delhi
2. Engineering chemistry Jain and Jain, DhanpatRai and sons, New Delhi

Reference Books:

1. Textbook ofEngineeringChemistry,ShashiChawla, DhanpatRai&Sons,NewDelhi.
2. AppliedChemistrybyN.Krishnamurthy, P.Vallinavagam.,K.Jeysubramanian, TMH.
3. AppliedChemistryfor Engineers, T.S.Gyngell.
4. Introduction to polymers, by Robert J. Young
5. ChemistryofAdvancedMaterials:CNRRao,RscPublication.
6. CorrosionEngineeringbyMarsG.FontanaandNorbertD.GreenMcGrawHillBookCo. Tokyo
7. FuelsandCombustionbyAmirCircar,OrientLongmans
8. FundamentalsofCorrosion:MichaelHenthorne,ChemicalEngineering.
9. WaterTreatment:F.I.Bilane,Mirpublisher

II Semester B.Tech. NEP 2020

Course Code : STESC203

Title of the Course : Digital Circuits

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	**UNIT I** Number System (Binary, Octal, Hexadecimal) and its arithmetic, Signed binary numbers, one's and two's complements arithmetic, Gray code, Cyclic codes, Hamming Code, Logic Gates, Boolean Algebra, NAND and NOR implementation, POS & SOP form and its simplification	9
2	**UNIT II** K-map method up to five variable, Quine Mc-Clusky method, Adder, Subtractor, Multiplier, BCD adder, carry look ahead adder, serial adder, code converters, Magnitude comparator.	9
3	**UNIT III** Multiplexers, Demultiplexer, Parity Checker & Generator, Encoders, Priority Encoders, Decoders for display devices. Single bit storage elements, latches & flip flops, Excitation table, Characteristic Table & Equations of Flip Flops, Flip Flop Conversion.	9
4	**UNIT IV** Shift Registers SISO, SIPO, PISO, PIPO, Asynchronous Counters, Synchronous Counters, Counter Design, Synchronous Finite State Machine design, State reduction and Assignments, ASM Chart, Flow Table.	9
5	**UNIT V** Digital Logic Families TTL, ECL & CMOS etc., Characteristics of digital ICs; Circuits of Logic Families, interfacing CMOS and TTL, Tri-state logic; RAM, ROM, PLA, PAL, CPLD & FPGA; Circuit Implementation using ROM, PLA and PAL.	9

Text Books / Reference books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Morris Mano "Digital logic & computer design" Pearson.
3. Anil K. Maini, "Digital Electronics: Principles, Devices and Applications", John Wiley & Sons, 2007.
4. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill 3rd edition 2009

II Semester B.Tech. NEP 2020

Course Code : STESC204

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	-	10	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 pointer and functions to solve problems.
3. Demonstrate the use structure handling.
4. 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	**Functions** Concepts of user defined functions, definition of function, call by value, call by reference, recursion.	8
4	**Array & String** Concepts of array, declaration, and initialization of arrays, one- and two-dimensional arrays, string, Built-in string functions.	8
5	**Pointers** Basics of pointers, pointer to pointer, various operation on pointer, pointer to array, function returning pointer. **Structure** Introduction of structure, structure members, accessing structure members.	8
		40

Text Books:

1. C Programming: A Modern Approach - K. N. King.
2. Programming in C - Stephen Kochan.

Reference Books:

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

II Semester B.Tech. NEP 2020

Course Code : STPCCINS205

Title of the Course : Sensors and Instruments

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	-	10	40	50

Course Outcome:

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

1. *Define* measurement, units and able to select the appropriate instrument for measurement.
2. *Classify* sensors/transducers according to different physical parameters.
3. *Illustrate* various errors in the measurement of physical parameters.
4. *Understand the* importance of measurement of physical quantities in industries.
5. *Recognize* the type of control system of given example.

Unit	Contents	Hours
1	**Introduction to Measurement system** Measurement units, measurement system applications. Elements of measurement system, Choosing appropriate measuring instrument.	8
2	**Performance Characteristics of an Instrument** Types, Static and dynamic characteristics of instrument, Errors during the measurement process, Calibration of instruments	8
3	**Introduction to Sensors and Transducers** Important physical quantities in industries, Introduction of sensors and transducers. Its classifications. Selection criteria for sensors/transducers.	8
		24

Text Books:

1. Alan S. Morris "Measurement and Instrumentation Principles" Third Edition
2. Sawhney A.K., "Electrical & Electronic Measurements and Instrumentation", Dhanpat RaiPublications,2001
3. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGrawHillEducation,Seconded.,2004.
4. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999.

Reference Books:

1. B.G.Liptak,"ProcessMeasurement&Analysis",ChiltonBookCompany,Fourthed.,2003.
2. E.O.Doebelin,"MeasurementSystems",McGrawHill,Fifthed.,2003.
3. SabrieSoloman, "Sensors Handbook", McGraw Hill Publication, First ed., 1998

II Semester B.Tech. NEP 2020

Course Code : STAEC206
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	-	10	40	50

Course Outcome:

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

1. Basic proficiency in writing and speaking 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 for 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 5.3 Common Everyday Situations: Conversations and Dialogues 5.4 Communication at Workplace	6

	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

II Semester B.Tech. NEP 2020

Course Code : STBSC207

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

II Semester B.Tech. NEP 2020

Course Code : **STESC208**

Title of the Course : **Digital Circuits 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. Compare theoretical and practical performance of logic circuit.
2. Construct basic combinational circuits based on their functionalities.
3. Implement different types of sequential circuit using logic gate.

List of Experiments:

Hands-on experiments related to the course contents: Digital Electronics (TH)

II Semester B.Tech. NEP 2020

Course Code : STVSECINS209

Title of the Course : Engineering Exploration Workshop - Instrumentation Engineering

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

1. *Identify* the electronic components required for the circuit.
2. *Use* the digital multimeter for various measurements.
3. *Operate* multi-range Ammeter and Voltmeter.
4. *Practice* the arrangements of components on breadboard.
5. *Apply* the AC/DC power suppliesin circuit design.

Unit	Contents	Hours
1	**Hands on measurement system** Understanding of measurement system. **Introduction of various electronic components** Experiments based on electronic components.	8
2	**Introduction of various Indicating Instruments** Ammeters, Voltmeters, CRO etc. AC/DC Power supplies. Experiments based on indicating instruments.	8
3	**Circuit design Techniques** Introduction to various circuit design techniques. Experiments based on breadboards, soldering techniques.	8

Text Books:

1. Sawhney A.K., "Electrical & Electronic Measurements and Instrumentation", Dhanpat RaiPublications,2001
2. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGrawHillEducation,Seconded.,2004.
3. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999.

Reference Books:

1. B.G.Liptak,"ProcessMeasurement&Analysis",ChiltonBookCompany,Fourthed.,2003.
2. SabrieSoloman, "Sensors Handbook", McGraw Hill Publication, First ed., 1998

II Semester B.Tech. NEP 2020

Course Code : **STCCS210**
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

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.