Shri Shivaji Education Society, Amravati's

SCIENCE COLLEGE

Congress Nagar, Nagpur - 440 012 (M.S.) INDIA

'A+' Grade with 3.51 CGPA in 3rd Cycle
College with Potential for Excellence
Recognised Centre for Higher Learning & Research
Institutional Member of APQN
A Mentor College under UGC PARAMARSH Scheme
An ISO 21001:2018 Certified Institution
NIRF 2024 Rank-band : 201-300

E-mail: shivajiscience_ngp@yahoo.com Web : www.sscnagpur.ac.in

4th Cycle

Assessment & Accreditation by NAAC

CRITERION- I CURRICULAR ASPECTS

Metric No. :1.3.1-Institution Integrates Crosscutting Issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability in transacting the Curriculum.

Shri Shivaji Education Society, Amravati's
SCIENCE COLLEGE
Congress Nagar, Nagpur- 440 012 (M.S.) INDIA
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Shri Harshvardhan P. Deshmukh
President

Dr. Omraj S. Deshmukh
Principal

- 'A+' Grade with 3.51 CGPA (3rd Cycle) Reassessment College by NAAC, Bangalore
- A College with Potential for Excellence identified by UGC, New Delhi
- Member, APQN (Asia Pacific Quality Network)
- Recognized Centre for Higher Learning & Research
- Mentor College under 'Paramarsh Scheme' UGC, New Delhi
- An ISO 21001 : 2018 Certified Institution

Dr. Panjabrao alias Bhausaheb Deshmukh
Founder President

No. Sc. .....

Date : .....

Self Declaration

This is to certify that, the information, reports, true copies of the supporting documents, numerical data, and weblinks furnished in this file are verified by IQAC and the head of the institution and found correct.

Dr. A. A. Halder
IQAC Coordinator
S.S.E.S.A's
Science College, Nagpur

Dr. O. S. Deshmukh
Principal
S. S. E. S. Amravati's
Science College, Nagpur.

SEAL

INDEX

Activities conducted under gender equality. health, value education, professional ethics and environmental sustainability

Gender Equality		
1	Guest Lecture on Gender Sensitization	https://sscnagpur.ac.in/Department/ICC/merged-2.pdf
2	Guest Lecture on Women's Safety	https://sscnagpur.ac.in/Department/ICC/Guest_Lecture_on_Girls_Safety_23-24.pdf
3	Awareness Program on Sexual Harassment	https://sscnagpur.ac.in/Department/ICC/23-24.pdf
4	Essay Competitions on the occasion of International Women's Day	https://sscnagpur.ac.in/Department/ICC/IEC_24.pdf
5	Safe Working Environment at Workplace	https://sscnagpur.ac.in/Department/ICC/Tushar_Mandlekar_merged.pdf
6.	EWEW-Symposium on Elevate Women-Elevate the World.	https://sscnagpur.ac.in/Department/ICC/EWEW_REport-.pdf
Health		
7	Blood Donation Camp	https://sscnagpur.ac.in/Department/NSS/Report-7-_Blood_Donation_22-23.pdf
8	International Yoga Day	https://sscnagpur.ac.in/Department/NSS/Report_1-_International_Yoga_Day-21_June_22-23.pdf
9	Dental Check-up Camp	https://sscnagpur.ac.in/Department/Micro-Biology/Ext_Dental_checkup_camp_23-24.pdf
10	Nutrition Week Celebration	https://sscnagpur.ac.in/Department/Zoology/NEW_Report_OF_NUTRITION_DAY_23-1.pdf
11	Filariasis Medicine Distribution	https://sscnagpur.ac.in/Department/NSS/filaria_2023.pdf

12	Vaccination drive	https://sscnagpur.ac.in/Department/NSS/report_2021-22_vaccination_drive.pdf
13	RT-PCR Test drive	https://sscnagpur.ac.in/Department/NSS/Report_on_RT-PCR_Test_Drive_2021-22.pdf
Value Education		
14	Independence Day Celebrations	https://sscnagpur.ac.in/Department/NSS/independence_day_2023.pdf
15	Constitution Day Celebration	https://sscnagpur.ac.in/Department/NSS/UPDATED_Constitution_day_2020-21.pdf.pdf
16	Celebration of Mahatma Gandhi and Lal Bahadur Shashtri Jayanti	https://sscnagpur.ac.in/Department/NSS/report_Mahatma_Gandhi_Jayanti_and_Lal_Bahadur_Shastri_Jayanti.pdf
17	Book Exhibition on Swami Vivekananda	https://sscnagpur.ac.in/Department/NSS/Book_Exhibition_Swami_Vivekananda.pdf
18	Celebration of Birth Anniversary of Maa Jijau and Swami Vivekananda	https://sscnagpur.ac.in/Department/Value%20Addition/12-01-2024_Birth_Anniversary_of_Maa_Jijau_and_Swami_Vivekananda.pdf
19	Unity day celebration	https://sscnagpur.ac.in/Department/NSS/Report-6-_Unity_Day_Celebration_22-23.pdf
20	Meri Mati Mera Desh Compaign	https://sscnagpur.ac.in/Department/NSS/meri_mati_mera_desh_2023.pdf
21	Workshop for farmers in Fetri	https://sscnagpur.ac.in/Department/NSS/Farmer_Workshop_2023.pdf
22	Distribution of Stationary in Slum Area.	https://sscnagpur.ac.in/Department/NCC/1._Communal_Harmony_week_and_Flag_day_2022-23.pdf
23	Installation of food stall to the Pilgrims of Dikshabhoomi	https://sscnagpur.ac.in/Department/NCC/1._dasera_19-20_(1).docx.pdf
Ethical Values		
24	Workshop on Intellectual property Rights	https://sscnagpur.ac.in/Department/Innovation%20and%20Incubation/Report_Only_IPR.pdf
25	125 Student registered patents and copyrights	https://sscnagpur.ac.in/Department/Innovation%20and%20Incubation/Final_Final_IPR_Reports.pdf
26	Hands-on -Training IPR	https://sscnagpur.ac.in/Department/Innovation%20and%20Incubation/New_Copyright_demo.pdf

27	Department of Chemistry Workshop on Research Methodology	https://sscnagpur.ac.in/Department/Chemistry/report_on_3_day_worshop_2023_1.pdf
Environment and Sustainability		
28	Tree plantation drive	https://sscnagpur.ac.in/Department/NSS/Report-5-_Tree_plantation_22-23.pdf
29	Swachh Bharat Abhiyan	https://sscnagpur.ac.in/Department/NSS/Report-8-_Swachhya_Bharat_Abhiyan_22-23.pdf
30	Vasundhara Day Celebration	https://sscnagpur.ac.in/Department/NSS/UPDATED_Vasundhara_E-pledge_(2)_2020-21.pdf
31	One student-One plant	https://sscnagpur.ac.in/Department/Green%20Club/Report_%E2%80%9CInauguration_of_Green_Club_and_Plant_Exhibition%E2%80%9D_____16.9.2023.pdf
32	Cleanliness Campaign	https://sscnagpur.ac.in/Department/NSS/cleanliness_Drive__2023.pdf
33	Jal-Self spaced international symposium	https://sscnagpur.ac.in/Department/Chemistry/JAl_symp.pdf

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

Faculty of Science
B.Sc. I Year
Semester-I and II
Environmental Science

Year	Semester	Paper	Paper Title	Total Periods Per Week	Marks		Total Marks	Grand Total
					Theory	Internal		
B.Sc. First Year	I	I	Fundamentals of Environment Science	03	50	10	60	150
		II	Environmental Biology	03	50	10	60	
		Practical	Practical-I	06	30	-	30	
	II	III	Monitoring of Water, Soil and Air	03	50	10	60	150
		IV	Biodiversity Conservation and Environmental Management	03	50	10	60	
		Practical	Practical-II	06	30	-	30	

Note: The syllabus is based on six theory periods/week and six practicals/week/batch

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

The examination shall comprise two theory papers of 3 hours duration of 50 marks each. One internal assessment based on two theory papers for 10 marks each. Practical examination will be of 6 to 8 hours for one day and carry 30 marks. Candidates are expected to pass separately in theory and practical examination.

Theory paper is divided into four Units. Each Unit shall be covered in 7.5 hours.

Semester-I
Environmental Science
Paper–I
Fundamentals of Environmental Science

Unit-I: **Basics of Environmental Science**

Introduction of Environmental Science: Definition, Types, Classification, Characteristics, Components and principles of environment. Scope and need for environmental science, Multidisciplinary nature of environmental science, Environmental ethics.

Environmental Education: Goals, Objectives and principles of environmental education, formal and non-formal environmental education, environmental programme, importance of environmental education, environmental awareness, Environmental days.

Components of Environment: Atmosphere (Structure and composition), hydrosphere – distribution of water, hydrological cycle, global water balance, lithosphere – Internal structure of Earth, types of rocks, Biosphere- Boundaries of biosphere.

(8 Periods)

Unit-II: **Basics of Atmospheric Science**

Atmospheric Chemistry: Structure of atmospherebased on temperature, photochemical reaction in the atmosphere, temperature inversion and lapse rate, smog formation, types of smog (sulphur and photochemical smog), adverse effect of smog on human being, aerosol.

Green House Effect: Greenhouse gases, relative contribution and effects of greenhouse effect, control of greenhouse gases. Ozone depletion: chemistry of ozone depletion, Dobson Unit, ozone depleting substances (ODS), ozone hole, consequences of ozone depletion, mitigation measures and international protocols.

Acid Rain: Chemistry of Acid Rain, effect of acid rain on ecosystem, control measures. Precipitation – Forms of precipitation (rain, drizzle, snow, sleet, and hail), types of precipitation (conventional, orographic, and cyclonic).

(8 Periods)

Unit III: **Aquatic Chemistry**

Characteristics of Water: Physical properties of water (solvent, specific and latent heat, surface tension, viscosity, heat conduction, salinity, transparency, and pressure), chemical properties- solubility of gases in water, CO_2, oxygen, Nitrogen and H_2S.

Physical Parameter of Water: Colour, temperature, taste & odour, turbidity, conductivity, pH, total solids.

Semester-II
Paper-III
Water, Soil and Air Monitoring

Unit-I: Land and Water Resources

Land Resources: Significance of topmost layer, Soil erosion (definition and types), causes of soil erosion (water, wind, and biotic agencies), control measures of soil erosion.

Water Sources: Availability and quality of surface water (River, lake and dam) and ground water (Open well and Bore well), water requirement for domestic consumption, specification for drinking water (physical, chemical and bacteriological)by Bureau of Indian Standards and WHO, significance of World Water Day.

Conservation and Management of Water: Traditional methods, Ground water recharge and Rainwater Harvesting, Concept of Watershed Management.

(8 Periods)

Unit-II: Water Sampling and Monitoring:

Water Sampling and Analysis: Necessity of analysis, water sampling, types of water samples, selection of sample sites, collection, handling and preservation of samples, information to be submitted along with samples, presentation and interpretation of results.

Water Sampling and Monitoring: Water quality monitoring on-field test parameters, off-field parameters, tools/instruments used for water sampling, drinking water standard (IS 10500 and WHO), safety practices.

Environmental Analysis: Theory, principle and working of pH meter, turbidometer and conductivity meter. Application of pH meter,turbidometer and conductivity meter in environmental analysis.

(8 Periods)

Unit-III: Soil Monitoring and Management

Soil Monitoring: Objectives of soil monitoring/testing, sampling and sample units (sample number, frequency and timing), sampling methodology; site selection, in-field sampling technique, soil profile, site description and equipment used.

Soil Analysis: Important soil quality indicators: pH,Electrical Conductivity (EC), Total nitrogen(N), sodium and potassium, useful soil microbes, guidelines for handling and storage of soil samples.

Soil Management: Soil as a sink for waste disposal, remediation of contaminated soil, National Waste Land Development (NWLD), GIS-application for management of soil resources.

(8 Periods)

Unit-IV: Basics of Meteorology

Meteorology: Aims and objectives of meteorology, Primary meteorological parameters (temperature, wind direction, wind speed and wind patterns), Secondary meteorological parameters (humidity, precipitation, atmospheric pressure, and solar radiation), importance of meteorology.

Measurement of Meteorological Parameters: Relative humidity by Psychrometer,Wind speed by Anemometer and Atmospheric pressure by monometer and barometer. weather forecasting (methods and types), role of satellite in weather forecasting.

RTM, NAGPUR UNIVERSITY, PROPOSED SYLLABUS OF B.Sc. (SEMESTER PATTERN) INBOTANY

SEMESTER – VI

PAPER – II

PLANT ECOLOGY, TECHNIQUES & UTILIZATION OF PLANTS

Unit I

Plant succession: Definition, Causes of succession, Hydrosere, Xerosere

Plant adaptations: Morphological, Anatomical & Physiological responses of Hydrophytes, Xerophytes, Halophytes (with one example)

Unit II

Environmental Pollution: Agricultural, noise and thermal pollution, Control of environmental pollution, Environmental management

Natural resources- types (renewable and non-renewable), factors for depletion; conservation of forest and water resources

Unit III

Principle, types and application of: microscopy (Light, fluorescent,SEM, TEM), centrifugation, electrophoresis (SDS-PAGE and Agarose), spectroscopy (UV-Vis), chromatography (Paper chromatography, Thin layer chromatography)

Unit IV

Utilization of **Plants**: Morphology, Utilization and Important chemical constituents of :-

Food: Wheat; Oil: Ground nut; Fibre: Cotton; Spices: Clove; Beverages: Coffee; Medicinal: Neem; and Rubber.

Ethnobotany: Introduction, definition, branches &importance of ethnobotany

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

SYLLABUS for M. Sc. CHEMISTRY

As per National Education Policy (NEP)-2020

With effect from 2023-24

Pre-requisites to enrol for the M. Sc. Chemistry Programme:

The student who has completed the three-year B. Sc. course with Chemistry (or allied subject) as the major subject with not less than 50% of aggregate marks (45% in case of student from reserved category) or equivalent CGPA from any of the recognised university is eligible to enrol for M. Sc. (Chemistry) course. However, the student who has completed four-year B. Sc. course [B. Sc. (Honours) as per NEP- 2020] with Chemistry (or allied subject) as the major subject with not less than 50% of aggregate marks (45% in case of student from reserved category) or equivalent CGPA from any of the recognised university is eligible to enrol directly in semester III of M. Sc. (Chemistry) course.

Credit distribution structure for two years Post Graduate Programme in Chemistry*

Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/FP	RP	Cum. Cr.	Degree
			Mandatory	Electives					
I	6.0	Sem. I	14 (2 theory + 2 practical)	4	4			22	PG Diploma (after 3 Yr Degree)
		Sem. II	14 (2 theory + 2 practical)	4		4		22	
Cum. Cr. For PG Diploma/ 1 year of PG			28	8	4	4	-	44	
Exit option: PG Diploma 44 credits after three-year degree									
II	6.5	Sem. III	14 (3 theory + 1 practical)	4			4	22	PG Degree After 3 Yr UG or PG degree after 4-Yr UG
		Sem. IV	14 (3 theory)	4			6	22	
Cum. Cr. For II year of PG			26	8			10	44	
Cum. Cr. For 2 year of PG degree			54	16	4	4	10	88	

*Source: शासन निर्णय क्रमांक :एसईपी-२०२२/प्र.क्र.०९/विशि-३ शिक्षण विभाग दिनांक १६ मे ,२०२३

Page 3

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

SYLLABUS for M. Sc. CHEMISTRY

As per National Education Policy (NEP)-2020

With effect from 2023-24

Pre-requisites to enrol for the M. Sc. Chemistry Programme:

The student who has completed the three-year B. Sc. course with Chemistry (or allied subject) as the major subject with not less than 50% of aggregate marks (45% in case of student from reserved category) or equivalent CGPA from any of the recognised university is eligible to enrol for M. Sc. (Chemistry) course. However, the student who has completed four-year B. Sc. course [B. Sc. (Honours) as per NEP- 2020] with Chemistry (or allied subject) as the major subject with not less than 50% of aggregate marks (45% in case of student from reserved category) or equivalent CGPA from any of the recognised university is eligible to enrol directly in semester III of M. Sc. (Chemistry) course.

Credit distribution structure for two years Post Graduate Programme in Chemistry*

Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/FP	RP	Cum. Cr.	Degree
			Mandatory	Electives					
I	6.0	Sem. I	14 (2 theory + 2 practical)	4	4			22	PG Diploma (after 3 Yr Degree)
		Sem. II	14 (2 theory + 2 practical)	4		4		22	
Cum. Cr. For PG Diploma/ I year of PG			28	8	4	4	-	44	
Exit option: PG Diploma 44 credits after three-year degree									
II	6.5	Sem. III	14 (3 theory + 1 practical)	4			4	22	PG Degree After 3 Yr UG or PG degree after 4-Yr UG
		Sem. IV	14 (3 theory)	4			6	22	
Cum. Cr. For II year of PG			26	8			10	44	
Cum. Cr. For 2 year of PG degree			54	16	4	4	10	88	

*Source: शासन निर्णय क्रमांक :एसईपी-२०२२/प्र.क्र.०९/विशि-३ दिनांक १५ मे , २०२३

Page 3

SEMESTER I

Paper 4

MCH1T04: Research Methodology

60 h (4 h per week): 15 h per unit *100 Marks*

Course Outcomes: At the end of the course, student will be able to

1. *understand what research is and what is not.*
2. *raise awareness of crucial aspect of the nature of Knowledge and the value of scientific method.*
3. *Introduce the concept at the heart of every research project – the research problem - and to discuss what a researchable problem is.*
4. *evaluate literature, form a variety of sources, pertinent to the research objectives.*
5. *identify and justify the basic components of the research framework, relevant to the tackled research problem.*
6. *explain and justify how researchers will collect research data.*
7. *discuss how to cite sources, and justify this choice.*
8. *put forward a credible research proposal, and*
9. *warn the common mistakes in the field of research methodology.*

Unit – I: Foundations of Research

Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific, method - Understanding the language of Research - Concept, Construct, Definition, Variable. Research Process. Problem Identification and Formulation - Research Question – Investigation, Question - Measurement Issues - Hypothesis - Qualities of a good Hypothesis Null Hypothesis and Alternative Hypothesis. Hypothesis Testing - Logic and Importance. Research Design: Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Concept of Independent and Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research - Concept of measurement, causality, generalization, replication. Merging the two approaches.

Unit – II: Statistical analysis for Chemists

Errors in chemical analysis. Classification of errors- systematic and random, additive and proportional, absolute and relative. Accuracy and precision. Mean, median, average deviation and standard deviation. Significant figures and rules to determine significant figures. Calculations involving significant figures. Confidence limit, correlation coefficient and regression analysis. Comparison of methods: F-test and T-test. Rejection of data based on Q-test. Least squares method for deriving calibration graph. Application of Microsoft Excel in statistical analysis (statistical functions and spreadsheets in MS-Excel). Validation of newly developed analytical method. Certified reference materials (CRMs). Numerical problems.

Unit – III:

A] Scientific Writing and Presentation

Scientific writing. Basics in Scientific grammar. Importance of abbreviations and acronyms. Types of scientific publications- magazines, journals, reviews, news-letters, structure of scientific paper. Various reference styles.

Report Writing, Significance of report writing, different steps in report writing, types of Journals and reports, layout of research paper.

Research Ethics (Issues relating to referencing and documentation, copyrights, plagiarism), Impact Factor, CiteScore, *h*-Index, i10-Index, Citation Index, references/bibliography, structuring the thesis, use of software in thesis writing.

B] Intellectual Property Rights (IPR)

Introduction to IPR (Patents, Trademarks, Geographical indicators, Copyright and neighbouring rights), Concept and theories, kinds of IPR, Economic analysis of IPR, Need for private rights versus public interests, Advantages and disadvantages of IPR.

Unit – IV: Use of tools / techniques for Research

Methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX, Beamer presentation, preparation of bibliography database, MS Word, MS Excel, Graph and chart preparation, MS Power Point, Microcal Origin, ChemSketch, ChemDraw, Other computational software like Guassian, Mathematica, Software for detection of Plagiarism.

References

1. Research Methodology- C. R. Kothari
2. Best and Kahn, Research Methodology, PHI Limited
3. Design of Experience: Statistical Principles of Research Design and Analysis, by Robert O. Kuehl Brooks/cole.
4. Patrick Carey, Katherine T. Pinard, Ann Shaffer, Mark Shellman, New Perspectives Microsoft Office 365 and Office 2019 Introductory, 2020.

SEMESTER III

Practical 7

MCH3P07: Research Project (RP)

8 h per week *100 Marks*

The objective of research project is to train the student in identifying the problem of research, develop the hypothesis, design the experiments/surveys to test the hypothesis, collect and analyse the data and draw conclusions from it. In addition, the aim is also to prepare the student to present the data in various forms such as project report, presentation in conferences and seminars and research paper. Research project is also aimed to prepare the student for doctoral research after the completion of the programme.

The student will have to carry out a research-based project work in the third and fourth semester. The project work may be carried out in the parent department or any other institute in collaboration with the parent institute. For this, the student will be attached to any of the national/regional/private research institute/organization for the duration of the third semester. If the student is working in the organisation other than the parent department, then it will be the responsibility of the student to attend the classes and other departmental activities in order to be eligible to appear for the examination. The student will be allotted the supervisor in the third semester; after which the student will finalize the topic of the project work in consultation with the supervisor.

The research project of the student will be evaluated on the basis of the project report submitted by him/her and the power point presentation made by him/her in the presence of internal and external examiner during the examination.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY

TWO YEAR POSTGRADUATE PROGRAMME

M. Sc. Physics

(Courses effective from Academic Year 2023-24)

SYLLABUS as per NEP-2020

Semester I - IV

Paper 4 (RM) Research Methodology (MPH1T04)

Course Outcomes (COs): On completion of the course students will be able to,

- Understand the basic concepts regarding importance of research.
- Impart knowledge about research problems identification, research question and formulation of hypotheses.
- Understand the differences of qualitative vs. quantitative research methodology, field experiments vs. laboratory experiments.
- Execute the methods of data collection and strategies of data processing and analysis.
- Learn the ethical issues including copy right, royalty, intellectual property rights, patent law, and plagiarism in publishing research.

Unit-1

Foundations of Research: Meaning, objectives, motivation and significance of research, types and parameters of research, research process, research methods versus methodology, research and scientific method, importance, research process, criteria of good research, multidisciplinary and interdisciplinary research, creativity in research.

Unit-2

Research Problem, Literature Review & Hypotheses:

Concept and need, identification of research problem, defining and delimiting research problem. Meaning, necessity, sources and functions of literature review. Precautions in library use. variables and their linkages, characteristics of good hypothesis. Research question and formulation of hypotheses-directional and non-directional hypotheses, basis for hypotheses.

Unit-3

Research Design & Measurements: Need for research design, pure and applied research design, exploratory and descriptive design methodology, qualitative vs. quantitative research methodology, field studies, field experiments vs. laboratory experiments, research design in social and physical sciences. Execution of the research - Observation and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies - Data Analysis with Statistical Packages - Hypothesis-testing - Generalization and Interpretation.

Unit-4

Ethics in Scientific Research: Environmental impacts - Ethical issues - ethical committees - Commercialisation – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

Reference books:

1. Kothari ,C.R.,**1985**, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
2. Kumar,Ranjit, **2005**,Research Methodology-A Step-by Step Guide for Beginners,(2nd Ed.) ,Singapore,Pearson Education.
3. Peter, Pruzan, **2016**, Research Methodology-The Aims, Practices and Ethics of Science, Springer International Publishing Ltd.
4. Bendat, J. S. and A. G. Piersol (2010). Random Data: Analysis and Measurement Procedures. 4th edition. New York, USA: John Wiley & Sons, Inc.
5. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
6. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes

Semester I Practical (Lab 1 & Lab 2)

Practical 1: General and Research Methodology (MPH1P01)

1. Study of Focault pendulum
2. Study of Bifilar pendulum
3. Fibre optics
4. Study of waveguide
5. Thickness of thin wire with lasers
6. Measurement of wavelength of He-ne laser light using ruler.
7. To study Faraday effect using He-Ne laser.
8. Simulation of simple pendulum
9. Simulation of compound pendulum
10. Simulation of planetary motion.
11. Study of B-H Curve
12. Particle size distribution using ImageJ software.
13. Thermal analysis of thermogravimetry and differential scanning calorimetry data
14. Crystallite size determination from X-ray diffraction data
15. Analysis of research impact from published research papers.
16. Plot and analysis of given data using Microsoft excel and/or origin.

Practical 2: Electronics (MPH1P02)

1. Design of a regulated power supply.
2. Characteristics and applications of silicon controlled rectifier.
3. Design of common emitter Power transistor amplifier.
4. Experiments on bias stability.
5. Negative feedback (Voltage series / shunt and current series / shunt).
6. Astable, Monostable and Bistablemultivibrator.
7. Experiment on FET and MOSFET characterization and application as an
8. amplifier.
9. Experiment on Uni-junction transistor and its application.
10. Digital – I: Basic, TTL, NAND and NOR.
11. Digital – II: Combinational logic.
12. Flip-Flops.
13. Study of modulation (FM, AM, etc.).
14. Operational Amplifier.
15. Differential Amplifier.
16. Microprocessor.

RASHTRASANT TUKADOJI MAHARAJ
NAGPUR UNIVERSITY, NAGPUR

Scheme of Teaching and Examination

for

Two year Post Graduate Programme

M. Sc. (Microbiology)

(As per NEP 2020 Structure and Credit Distribution)

Course Effective from 2023-2024

M. Sc. Semester-I
MICROBIOLOGY - Paper-4 (MMI1T04)
(RESEARCH METHODOLOGY)

Course Outcomes:

After learning research methodology course, students will be able to

1. Identify and describe the characteristics of different types of research, including basic, applied, and patent-oriented research.
2. Apply scientific thinking and problem identification techniques in the research process.
3. Apply descriptive and inferential statistical analysis techniques to analyze and interpret research data and understand the concept of hypothesis and its importance in research, and apply appropriate research methods.
4. Develop skills in technical writing, research reporting, and the proper structure and organization of research documents and gain awareness of research ethics, academic integrity, and the importance of avoiding plagiarism and academic malpractice.

RM-THEORY	Hours: 04 Hours /Week	Marks: 80+20=100	Credit: 04
	Unit-I		
Research basics & objectives	1.1 Definitions; research, research methodology, discovery, invention & innovation. 1.2 General & specific characteristics of research. Types of research- Descriptive & analytical, Applied & fundamental, Qualitative & quantitative, Conceptual and empirical. 1.3 Steps of action- Genesis of problem, defining of problem & formulation of the problem. 1.4 Literature survey- Importance of literature survey in defining the problem-Primary & secondary sources-reviews , monographs, patents, web as a source of literature. 1.5 Identifying gaps in present knowledge. Research questions & development of working hypothesis.		**15 Hrs**

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

Scheme of Teaching and Examination for Master of Science (M.Sc.) in Mathematics

Two Year (Four Semester) Post Graduate Choice Based Credit System Degree Program in Mathematics as per NEP-2020 with effect from Academic Year 2023-24

2/8/2023

Table I: Scheme of Teaching and Examination for First Semester M.Sc. Mathematics (CBCS) Program

Structure and Credit distribution for M.Sc. Mathematics Semester-I												
Course Category	Code	Title of Course	Teaching Scheme (Hours /Week)			Credits	Examination Scheme					
								Maximum Marks			Minimum Passing Marks	
			Theory	Practical/Project	Total		Duration (hrs.)	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total Marks	Theory	Practical
Mandatory (DSC)	MMT1T01	Paper M1: Algebra	4	--	4	4	3	80	20	100	40	--
	MMT1T02	Paper M2: Topology	4	--	4	4	3	80	20	100	40	--
	MMT1T03	Paper M3: Ordinary Differential Equations	4	--	4	4	3	80	20	100	40	--
	MMT1P01	Practical 1: Computation with C/C++	--	4	4	2	3	50	50	100	--	50
Elective 1 (DSE)	Select any one											
	MMT1T04	Paper M4: (A) Integral Equations	4	--	4	4	3	80	20	100	40	--
		Paper M4: (B) Fuzzy Mathematics										
		Paper M4: (C) Equivalent MOOC Course										
RM	MMT1T05	Paper M5: Research Methodology in Mathematics	3	--	3	3	3	60	15	75	30	---
		Practical on Research Methodology	--	2	2	1	2	--	25	25	--	10
		Total	**20**	**4**	**24**	**22**	**--**	**430**	**170**	**600**	**190**	**60**

SYLLABUS: RESEARCH METHODOLOGY

Unit I: Research Process:
Introduction, Philosophy of Mathematics, Pure Mathematics, Applied Mathematics. The current state and Prospects of Geometry and Nonlinear differential equations. Meaning, objective and motivation in research. Types of research. Research approaches and significance. Research process, criteria of good research, Challenges for research in India. Defining research problem. Research design, Hypothesis: Formation – Techniques – Testing, Methods of theoretical research. Scientific communication, Presentations.

Unit II: **Research Project**:
Problem and project-based learning, the group process. The project work process. Structure of Project report. Sponsored research, Ethics of research.

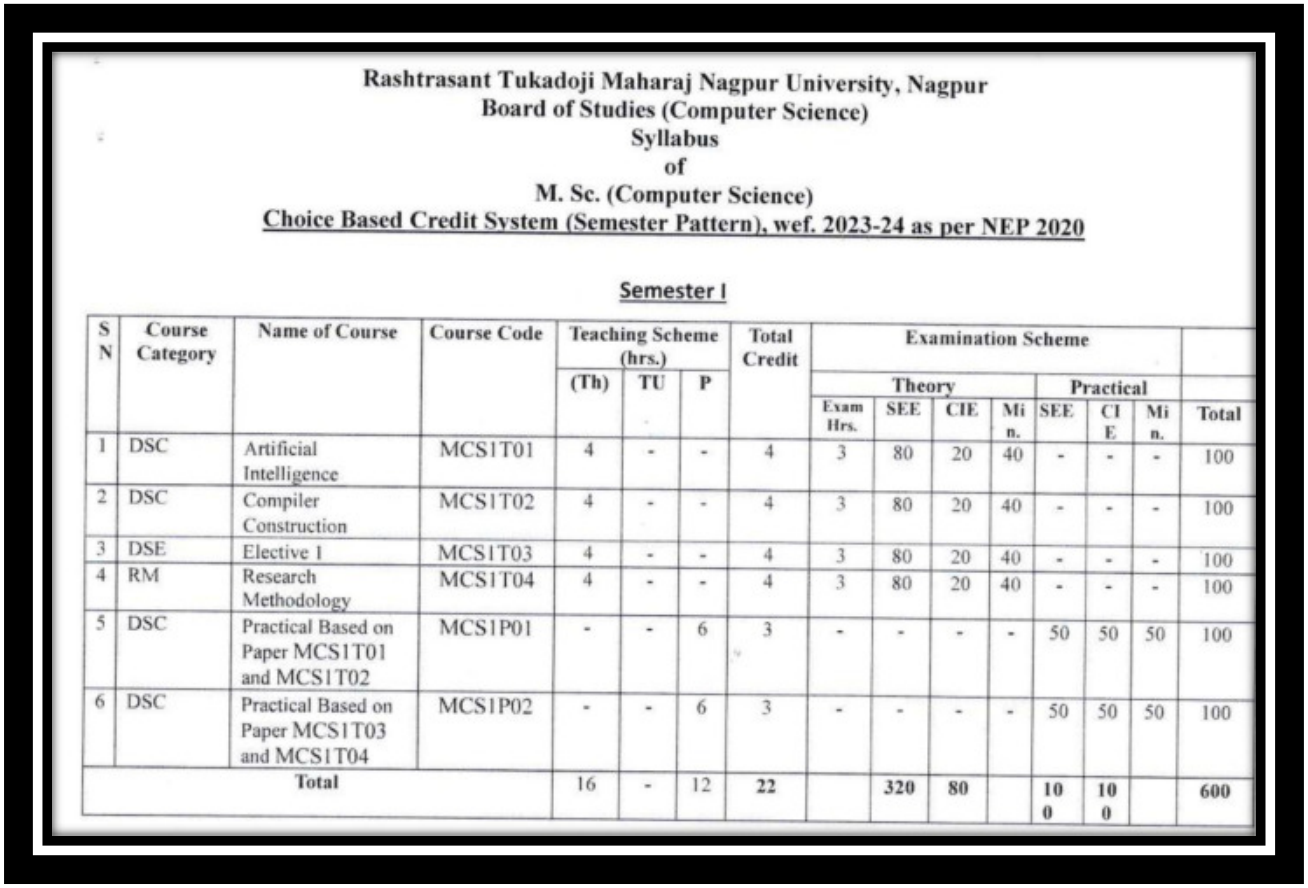
Unit III: Intellectual Property Rights (IPR): Types of IPR: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resource and Traditional Knowledge – Trade Secrets. IPR in India: Genesis and development. IPR in abroad - Major International Instruments concerning IPR: Paris Convention, 1883.

Unit IV: Use of tools / techniques for Research

Methods to search required information effectively, MS Word, MS Excel, Graph and chart preparation, MS Power Point, Software for paper formatting, LaTeX, Beamer presentation, Preparation of bibliography database, Software for detection of Plagiarism.

Reference Books:

1. Rama Nand Singh, *Research Methodology and Techniques in Mathematics*, Centrum Press,
New Delhi, India.
2. C.R. Kothari, *Research Methodology*, New Age International (P)Ltd., India.
3. John Kuda, *Research Methodology*: A Project Guide for University Students,
Samfunds Litterature.
4. B.L. Wadera, *Patents, trademarks, copyright, Designs and Geographical Judications.*
5. P. Narayanan (Eastern Law House), *Intellectual Property Law.*
6. Nithyananda, K V. (2019). *Intellectual Property Rights: Protection and Management in India*:
Cengage Learning India Private Limited.
7. Neeraj, P., & Khusdeep, D. (2014). *Intellectual Property Rights in India*:
PHI learning Private Limited.
8. Ahuja, V K. (2017). *Law relating to Intellectual Property Rights in India*:
Lexis Nexis.
9. *Journal of Intellectual Property Rights (JIPR): NISCAIR*



Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Board of Studies (Computer Science)
Syllabus
of
M. Sc. (Computer Science)
Choice Based Credit System (Semester Pattern), wef. 2023-24 as per NEP 2020

Semester I

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme							
				(Th)	TU	P		Theory				Practical			
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.	Total
1	DSC	Artificial Intelligence	MCS1T01	4	-	-	4	3	80	20	40	-	-	-	100
2	DSC	Compiler Construction	MCS1T02	4	-	-	4	3	80	20	40	-	-	-	100
3	DSE	Elective 1	MCS1T03	4	-	-	4	3	80	20	40	-	-	-	100
4	RM	Research Methodology	MCS1T04	4	-	-	4	3	80	20	40	-	-	-	100
5	DSC	Practical Based on Paper MCS1T01 and MCS1T02	MCS1P01	-	-	6	3	-	-	-	-	50	50	50	100
6	DSC	Practical Based on Paper MCS1T03 and MCS1T04	MCS1P02	-	-	6	3	-	-	-	-	50	50	50	100
Total				16	-	12	**22**		**320**	**80**		**100**	**100**		**600**

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
Syllabus for Bachelor of Science/ B.Sc (IT)/ BCA/ Part-I
Supplementary English
(To be implemented from the session 2020-2021 and onwards)

Semester - I

Theory Examination - Full Marks : 60
Internal Assessment – Full Marks : 15

Prescribed Text Book:
Pearls of Wisdom - Board of Editors (Raghav Publishers & Distributors)

Theory

Unit I : The following Short Stories from the prescribed Text:

1. The Postmaster - Rabindranath Tagore
2. After Twenty Years - O. Henry
3. A Happy Man - Anton Chekov

Unit II: The following Short Stories from the prescribed Text:

4. The Three Questions - Leo Tolstoy
5. The Story of an Hour - Kate Chopin
6. Mr. Know-All - W.S.Maugham

Unit III: Vocabulary Expansion
(Some Common Foreign Words Used in English; One Word for a Group of Words; Idioms and Phrases)

Unit IV : 1. Essay Writing
(Topics - Science and Technology; Environment Issues; Social Issues; Personal, Reflective Essay)
2. Email (Official)

Recommended Book for Units III & IV :

1. **Macmillan Foundation English** by R.K.Dwivedi & A.Kumar (Macmillan)
2. **English for Practical Purposes** (Macmillan) by Z.N. Patil, B.S.Valke, Ashok Thorat, Zeenat Merchant

Internal Assessment: 2 assignments to be given to the students on the basis of the items prescribed in Units I & II. These assignments should be submitted by the students for evaluation to the concerned Teacher

राष्ट्रसंत तुकडोजी महाराज नागपूर विद्यापीठ, नागपूर

Syllabus for Bachelor of Science / B.Sc.(IT)/ BCA - Part - I

मराठी

(To be implemented from the session 2020-21 and onwards)

विज्ञान स्नातक भाग १, सत्र १व सत्र २

अनुक्रमणिका

सत्र पहिले

पाठ्यपुस्तक — साहित्यसेतू

गद्य विभाग

१ उमाइं नमस्कारे — म्हाइंभट
२ सार्वजनिक सत्यधर्म — महात्मा जोतीराव फुले
३ वाचन — गोपाळ गणेश आगरकर
४ भारतीय संविधानाची विज्ञाननिष्ठा — यशवंत मनोहर
५ ही श्रीची ईच्छा — श्रीनिवास ठाणेदार

पद्य विभाग

१ संतवाणी — ज्ञानेश्वर, नामदेव, चोखामेळा, तुकाराम
२ या भारतात बंधुभाव नित्य वसू दे — राष्ट्रसंत तुकडोजी महाराज
३ झपूर्झा — केशवसूत
४ माझ्या मना बन दगड — विंदा करंदीकर
५ पाऊस — ग्रेस

व्यावहारिक मराठी

१ प्रसारमाध्यमांसाठी लेखन — डॉ. संजय भक्ते
२ शुध्दलेखन

(प्र. कार्यालय ठाकरे)

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY

"(Established by Government of Central Provinces Education Department by Notification No. 513 dated the 1st of August, 1923 & presently a State University governed by Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017).)"

DIRECTION NO. 32 OF 2024

ADMISSIONS AND EXAMINATIONS LEADING TO THE AWARD OF THE CERTIFICATE, DIPLOMA OR DEGREE OF BACHELOR OF TECHNOLOGY (MAJOR) WITH HONOURS/HONORS WITH RESEARCH/DOUBLE MINOR DEGREE', DIRECTION, 2024

Whereas, the Maharashtra Public Universities Act, 2016 (VI of 2017) (hereinafter the "Act") has been made applicable to the Rashtrasant Tukadoji Maharaj Nagpur University (herein after the "University") w.e.f. 1st March 2017;

AND

Whereas, the University has issued Direction No.27 of 2022 dealing with the composition of the four faculties created by the Act;

AND

Whereas, the Board of Studies in various subjects in science in their meetings held on 12/03/2024 & 13/03/2024 has prepared the scheme of examination and recommended for Four Year Bachelor of Technology with multiple Entry and Exit options as per the NEP 2020;

AND

Whereas, the faculty of Science and Technology in its meeting held 21/3/2024 vide item No. 1J has considered, accepted and recommended to Academic Council;

AND

Whereas, the Academic Council in its meeting held on 22/4/2024 has considered & accepted for Bachelor of Technology (Major) in the Faculty of Science and Technology syllabi with draft direction and the Scheme of examination of Semester-I to VIII;

AND

Whereas, Direction Nos. 43 of 2023, governing B.Tech. programs till date have been lapsed;

AND

Whereas, National Education policy 2020 is required to be implemented in the faculty of Science and Technology for under graduate programmes with multiple Entry and Exit options'

AND

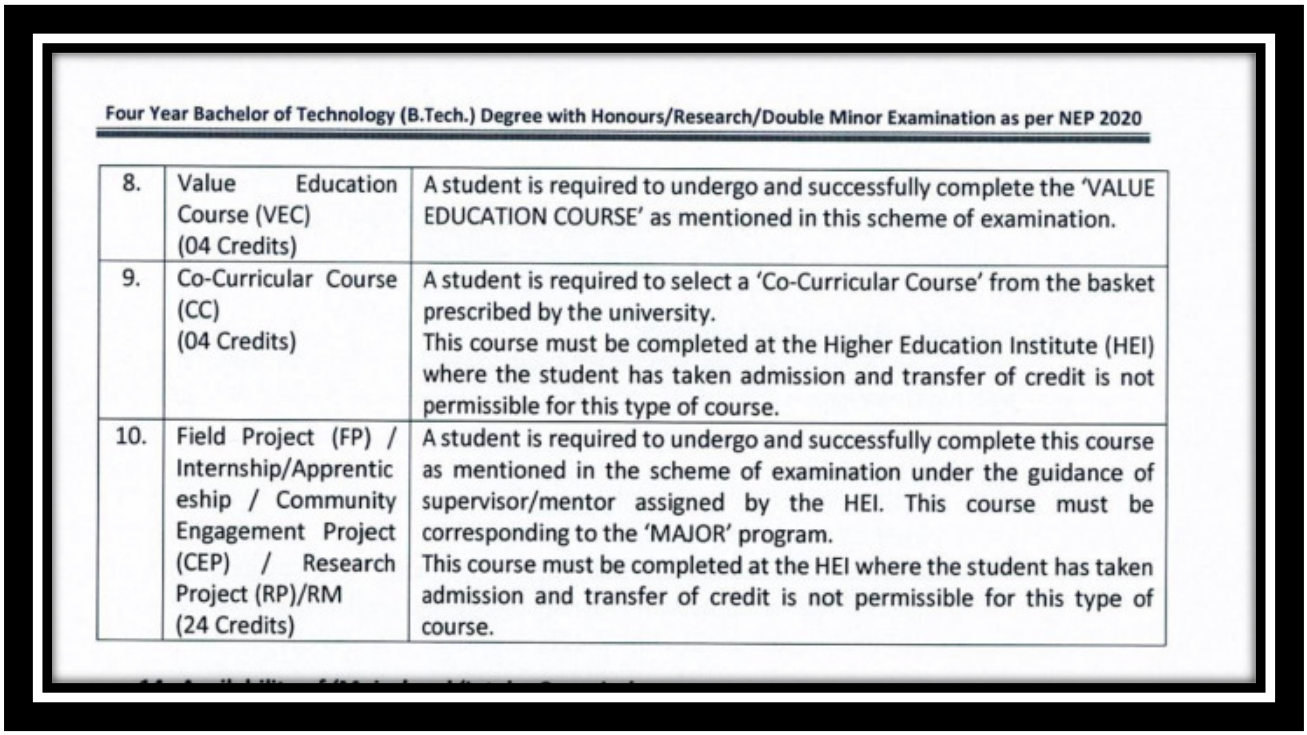
Whereas, Government of Maharashtra has issued G.R. dated 04.07.2023 in order to implement the provisions of NEP 2020;

AND

Whereas, as per the provisions of section 73 (1) of the Act an Ordinance is required to be made for laying down the conditions under which students can be admitted to any course of study leading to the award of degrees, diplomas, certificates, and other academic distinctions;

AND

Whereas, making of an Ordinance is a time-consuming process and there was urgency in introducing the degree course of "Bachelor of Technology (Major)" in the faculty of Science



Four Year Bachelor of Technology (B.Tech.) Degree with Honours/Research/Double Minor Examination as per NEP 2020

8.	Value Education Course (VEC) (04 Credits)	A student is required to undergo and successfully complete the 'VALUE EDUCATION COURSE' as mentioned in this scheme of examination.
9.	Co-Curricular Course (CC) (04 Credits)	A student is required to select a 'Co-Curricular Course' from the basket prescribed by the university. This course must be completed at the Higher Education Institute (HEI) where the student has taken admission and transfer of credit is not permissible for this type of course.
10.	Field Project (FP) / Internship/Apprenticeship / Community Engagement Project (CEP) / Research Project (RP)/RM (24 Credits)	A student is required to undergo and successfully complete this course as mentioned in the scheme of examination under the guidance of supervisor/mentor assigned by the HEI. This course must be corresponding to the 'MAJOR' program. This course must be completed at the HEI where the student has taken admission and transfer of credit is not permissible for this type of course.

Table 2: Types of Courses and Choice for Selection

SN	Course Type	Choice for Selection
1.	Major (Core) Subject (92 Credits)	A student is required to select her/his 'MAJOR' program from amongst the choices provided in this scheme of examination before filling the examination form for 1st Semester. Change of major program shall not be permitted after the examination form is submitted. Major program comprises of Mandatory and Elective Course.
2.	Compulsory Multidisciplinary Minor Courses (MDM) (14 Credits)	The semester wise Multidisciplinary Minor courses are mentioned in the scheme of each program. These Minor subjects are from the different disciplines of the Engineering/Technology faculty or from different faculty altogether. The credits of compulsory Multidisciplinary Minor courses shall be completed as mentioned in the scheme of respective program.
3.	Open Elective Course (OE) (08 Credits)	A student is required to select an 'OPEN ELECTIVE' course from the 'Open Elective Basket' prepared faculty-wise by the university before filling the examination form for the semester concerned. Such an 'OPEN ELECTIVE' course is to be chosen compulsorily from the faculty other than that of Major Discipline. A student is allowed to earn credits for 'OPEN ELECTIVE' course by successfully completing online courses of equivalent credits from SWAYAM/NPTEL learning platforms or from other Higher Education Institutions affiliated to RTM Nagpur University. However, this needs to be informed by student to the college before commencement of the semester and an application for transfer of credits is required to be made by student.
4.	Vocational Skill Course (VSC) (04 Credits)	A student is required to successfully complete the 'VOCATIONAL SKILL COURSE' as mentioned in this scheme of examination. This course shall be corresponding to the 'MAJOR' program selected by a student.
5.	Skill Enhancement Course (SEC) (04 Credits)	A student is required to select a 'SKILL ENHANCEMENT COURSE' from the basket provided by the university for this purpose. A student is allowed to earn credits for 'SKILL ENHANCEMENT COURSE' by successfully completing online courses of equivalent credits from SWAYAM/NPTEL learning platforms or from other Higher Education Institutions affiliated to RTM Nagpur University provided they are approved by the competent authority of RTM Nagpur University or the courses from Sector Skill Council. However, this needs to be informed by student to the college before commencement of the semester and an application for transfer of credits is required to be made by student.
6.	Ability Enhancement Course (AEC) (04 Credits)	A student is required to undergo and successfully complete the 'ABILITY ENHANCEMENT COURSE' as mentioned in the scheme of examination of respective program.
7.	Indian Knowledge System Course (IKS) (02 Credits)	A student is required to undergo and successfully complete the 'INDIAN KNOWLEDGE SYSTEM COURSE' as mentioned in this scheme of examination.

Four Year Bachelor of Technology (B.Tech.) Degree with Honours/Research/Double Minor Examination as per NEP 2020

8.	Value Education Course (VEC) (04 Credits)	A student is required to undergo and successfully complete the 'VALUE EDUCATION COURSE' as mentioned in this scheme of examination.
9.	Co-Curricular Course (CC) (04 Credits)	A student is required to select a 'Co-Curricular Course' from the basket prescribed by the university. This course must be completed at the Higher Education Institute (HEI) where the student has taken admission and transfer of credit is not permissible for this type of course.
10.	Field Project (FP) / Internship/Apprenticeship / Community Engagement Project (CEP) / Research Project (RP)/RM (24 Credits)	A student is required to undergo and successfully complete this course as mentioned in the scheme of examination under the guidance of supervisor/mentor assigned by the HEI. This course must be corresponding to the 'MAJOR' program. This course must be completed at the HEI where the student has taken admission and transfer of credit is not permissible for this type of course.

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Congress Nagar, Nagpur

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Dr. O. S. Deshmukh
Principal
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