AMITY UNIVERSITY

---UTTAR PRADESH---

Outcome Assessment Plan

Domain: Science and Technology

Name of the Institution: AIAS

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SECTION I

INTRODUCTION TO DOMAIN

The Science and engineering education system in India has witnessed rapid progress in recent years to become one of largest in the world. Considering the wide diversities in the system and the need to enhance its *quality, standard and relevance* so that the *Science, Engineering & Technology* graduates passing out from the system can meet the global challenges of 21st century ahead of them.

There are several challenges being faced by science and engineering professionals in the on-going 21st century, recognized as the *Knowledge Age*, like:

1) Rapidly changing technological scene worldwide, with a shrinking time scale for new developments and for obsolescence of old practices, leading to:

- Increase in investment on R&D in industry and other sectors;
- Demand for innovative products and services, based on contemporary technologies; and,
- Growing need for enhancement of abilities to manage change, so frequent, now a days;

2) Globalization and liberalization of Indian industry, leading to:

- Comprehensive restructuring of industry sector for enhancing efficiency;
- Increase in world-wide mobility of *Science, Engineering & Technology* professionals; and,
- Growth of competitive environment globally and also in the country;

3) Emergence of new career opportunities for Science, Engineering & Technology professionals, leading to:

- Demand for broad-based, flexible education in multi/inter- disciplinary subjects.

- Emphasis on PG courses, research training and institute-industry interaction.
- Advances in learner-centric programmes and life-long learning opportunities.

4) *Penetration of IT in all sectors of the Science, Engineering & Technology profession, leading to:*

- Increased demand for IT-based solutions to industrial and societal problems.
- Expertise in emerging IT developments to solve complex, *Science, Engineering & Technology* problems; and,
- Improved access to worldwide information/data bases and *knowledge* centers.

5) *Increased social/environmental concerns in the Science, Engineering & Technology context, leading to:*

- Effective means for protection of endangered environment and depleting energy sources.
- Seeking environment- and energy- friendly solutions to *Science, Engineering & Technology* problems.
- Wealth generation using environmentally benign and energy efficient techniques.

These challenges require appropriate orientation of *Science, Engineering & Technology* education and research in the country at all levels, particularly at PG. Further the industrial needs are changing while the global environment of Science & Engineering education around the world is witnessing huge changes in education. In the era of globalization, national boundaries are vanishing. The Science & Engineering institutions need to benchmark their curriculum with the best institutions in the world and seek accreditation from National and International accreditations for recognition and mobility of students. Consequently, the All-India Council of Technical Education (AICTE), University Grants Commission (UGC), NAAC, NBA and Knowledge Commission have been continuously rethinking on the modifications / improvements in the curriculum structure of various programmes of higher education at large. UGC has formulated Choice Based Credit System (CBCS) for higher education in 2009, which has been adopted by many of the Universities /institution in the country.

Amity University is continuously striving for excellence in education. It is therefore, important to review and upgrade the curriculum of Bachelors Programmes in Science Engineering & Technology in line with the norms of UGC, National and International Accreditation bodies such as NAAC, ABET, IET, WASC, Global Benchmarking, industry and other stakeholders' feedback. After a series of discussions and

deliberations with concerned groups, model framework/Programme structure and implementation guidelines for Bachelor's programme in Science, Engineering and Technology domain have been evolved in line with the requirements of UGC / AICTE, National & international Accreditation bodies and industry requirements. *Model Framework /Programme Structure and Scheme of Instructions* would be of help to the institutions offering Bachelor's programme in Science, Engineering & Technology domain *to* finalize the detailed programme structure, syllabus and CBCS of various programmes of study.

Approach to Curriculum:

As a major objective of Bachelor's programme in Science, Engineering and Technology domain is to lay special emphasis on educating/preparing the students well for being able to demonstrate the following abilities to meet the requirement of 4.0:

(a) Effective application of *knowledge* of mathematics, science and technical subjects;
(b) Planning and design to conduct scientific and technical experiments;
(c) Analysis and interpretation of scientific, technical and economic data collected;
(d) Design of parts, subsystems, systems and/or processes to meet specific needs;
(e) Identification, formulation and solving of problems using simulation or otherwise;
(f) Use of techniques/tools including software in all disciplines, as may be required;
(g) Effective communication skills and leadership/participation in team work;
(h) Fulfillment of professional, social and ethical responsibilities;
(i) Sensitivity to environmental and energy issues and concerns;
(j) Planning, development and implementation of strategies for life-long learning.

These requirements call for the following objectives to the *Approach to Curriculum* relating to *Bachelor's programme in Science, Engineering and Technology Degree* in the country:

1) *Preparation:* To prepare the students to excel in various educational programmes or to succeed in industry / technical profession through further education/training;

2) *Core Competence:* To provide the students with a solid foundation in mathematical, Science, Engineering & Technology fundamentals required to solve Science, Engineering and Technology related problems;

3) *Breadth:* To train the students with a breadth of Science, Engineering and Technology knowledge to comprehend, analyze, design & create novel products and solutions for real life problems;

4) *Professionalism:* To inculcate in the students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate Science, Engineering and Technology issues to a broader context;

5) *Learning Environment:* To provide the students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long/productive career.

Amity University is continuously striving for excellence in education. It is therefore, important to review and upgrade the curriculum of Programmes in line with the ever changing requirements of industry /profession based on stakeholders' feedbacks. Amity University Offers Outcome Based Education (OBE) with Flexi Choice Based Credit System (CBCS) by benchmarking its programmes with best universities globally. UGC has formulated Choice Based Credit System (CBCS) for higher education in 2009, which have been further modified in 2014 to be adopted by the Universities /institution in the country.

SECTION II:

INTRODUCTION OF OUTCOME ASSESMENT PLAN

Outcomes Assessment

Outcomes assessment is a systematic, evaluative process that is implemented to secure learning experiences that are congruent with original goals and objectives; thereby providing a basis for the effectiveness and continuous quality improvement of the academic unit.

1) The annual **outcome assessment** process is more **qualitative** and focuses on improving teaching by **analyzing student learning outcomes**.
2) The programme **review process** is more **quantitative** and focuses on the programme/discipline as a whole, how effective it is, and that our students are learning.

3) To achieve the above, some aspect of each programmes goals and objectives needs to be assessed on an annual basis.
4) All programme and general education goals shall be evaluated annually

The outcome assessment plan includes:

1. Mission: The Mission is defined for the domain which flows down to the Institution level and finally to the programme level. The mission at the institution and programme level is aligned with the domain mission.

2. Graduate Attributes (GAs) : Graduate Attributes is a set of individually assessable outcomes that are indicative of the graduate's potential to acquire competencies in that programme.

3. Educational Objectives: The Educational Objectives are defined at Domain, Institution and Programme level. The Educational Objectives at the institution\and programme level are aligned with the domain mission. Educational Objectives are the broad statements that described what graduates are expected to attend within few years of graduation.

4. Operational Objectives: The Operational Objectives are defined at Domain, Institution and Programme level. The Operational Objectives at the institution and programme level are aligned with the domain mission.

5. Outcomes: The Outcomes are defined under the following categories:

- **Operational Outcomes:** The operational outcomes are defined for the domain and assessed at the domain level.

- **Programme Learning Outcomes (PLOs) -** Programme Learning Outcomes represent the knowledge, skills and attitudes a student attain at the end of the year/programme. The PLOs are defined for each programme and each PLO is assessed to identify that the established Educational Objectives are achieved.

6. **Mapping of PEOs and PLOs –** The relationship of PEOs and PLOs are clearly indicated through the mapping of learning outcomes with the established Objective. Each outcome addresses some objective and achievement of outcome indicates the attainment of Objective.

7. **Assessment of Learning and Operational Outcomes** – Each learning outcome is assessed by at least one direct and one indirect method. Similarly Operational outcomes are also assessed using the operational assessment tools. It also ensures that outcomes achieved are consistent with the mission. The results of the annual assessments and other data are used to determine the effectiveness of the programme during the programme review process.

8. **Programme Review:** Through the review of programmes, we seek to demonstrate that**:**

    - Students are **learning** the knowledge, skills, and habits necessary to achieve the programme/discipline goals and objectives
    - The **programme/discipline objectives** are derived from and support the institute mission
    - The **curriculum** is coherent, current and consistent and meet the requirement of Industry 4.0.
    - The **instruction** is effective in enabling student
    - The **resources** are adequate for the production of student learning.
    - The academic **support services** are adequate to facilitate student learning.

SECTION III:

DOMAIN MISSION AND EDUCATIONAL OBJECTIVES

---------- SCIENCE AND TECHNOLOGY --------

3.1 Mission Statement:

Mission Statement
To provide education of modern times at all levels in Science & Technology and in the futuristic and emerging frontier areas of knowledge, learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regard for human values, pride in their heritage and culture, a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

3.2 Educational Objectives at Domain /Faculty level:

S.No	Educational Objectives
1	Students shall be able to acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills aligned with Industry 4.0
2	Students shall be able to develop and demonstrate the understanding of global environment and relate scientific issues to the broader social, economic, legal, cultural and environmental contexts
3	Students shall be able to develop and apply understanding to analyze and formulate scientific approach for solving real life problems
4	Students shall be able to analyze the scientific information and infer the results for successful and productive careers or advance studies/research in the field of Science& Technology
5	Students shall be able to compile the skill set to design and develop scientific models and products.
6	Students shall be able to assess and compare the scientific information to enable them to effectively participate and contribute to the society
7	Students shall be able to demonstrate professional attitudes, effective communication and behavioral skills that support and enhance individual's performance

3.3 Graduate Attributes and its Indicators at Domain/Faculty Level:

#	AUUP Graduate Attribute	Domain Graduate Attributes	AUUP Indicators	Domain Indicators
1.	Discipline Knowledge & Expertise	Knowledge and Expertise of Education	Graduates of university will have the ability: To demonstrate comprehensive knowledge and skills of both theoretical and experimental Discipline specific concepts to achieve academic excellence	Graduates of Domain of Science and Technology will have the ability: To demonstrate comprehensive knowledge and skills of both theoretical and experimental concepts of Science & Technology to achieve academic excellence.
2.	Self-Directed and Active Learning	Scientific Research and Enquiry	To choose self–directed and active learning through strong intellectual engagement in independent work relevant to discipline	To choose self–directed and active learning through strong intellectual engagement in independent work relevant to Science & Technology discipline
3	Research and Enquiry	Scientific Research and Enquiry	To demonstrate enquiry and research aptitude through conduct of innovative research in thrust areas of discipline which will benefit the society and enhance the intellectual capital specific to the discipline	To demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Science & Technology which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Information & Communication Technology Skills	Information & Communication Technology Skills in Science & Technology	To efficiently use and apply information and communication technologies and participate in collaborative networks specific to the discipline for developing requisite skills of Industry 4.0	To efficiently use and apply information and communication technologies and participate in collaborative networks related to Science and technology for developing requisite skills of Industry 4.0
5	Critical Thinking & Problem-Solving Abilities	Critical thinking and Problem-Solving Abilities	To formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to discipline specific problems.	To formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Science & Technology and allied areas
6	Communication Skills	Communication Skills	To employ effective listening and communication skills to enhance interpersonal relationship.	To employ effective listening and communication skills to enhance interpersonal relationship.

7	Creativity, Innovation & Reflective Thinking	Creativity, Innovation & Reflective Thinking	To combine creativity and reflective thinking to develop discipline specific innovative ideas for developing processes and products relevant to societal educational needs	To combine scientific creativity and reflective thinking to develop innovative ideas in Science & Technology for developing processes and products relevant to societal educational needs
8	Analytical & Decision-Making Ability	Analytical & Decision-Making Ability	To compare, contrast and analyze data in order to take appropriate and effective decisions related to discipline.	To compare, contrast and analyze scientific data in order to take appropriate and effective decisions
9	Leadership & Teamwork	Leadership & Teamwork	To attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented	To attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented
10	Multicultural Understanding & Global Outlook	Multicultural Understanding & Global Outlook	To demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.	The student shall demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Integrity and Ethics	Integrity and Ethics	To practice ethical behavior and demonstrate professional integrity in their conduct	The students shall practice ethical behavior and demonstrate professional integrity in their conduct
12	Social & Emotional Skills	Social & Emotional Skills	To acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.	The students shall be able to acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Employability, Enterprise & Entrepreneurship	Employability, Enterprise & Entrepreneurship	To define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Lifelong Learning	Lifelong Learning	To gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available	The student shall be able to gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available
15	Environment & Sustainability	Environment and sustainability	To analyze and implement the initiative to conserve natural resources and use sustainable	The students shall be able to analyze and implement the initiative to conserve natural

			technologies by using knowledge and experience of their discipline.	resources and use sustainable technologies by using knowledge and experience in Science and Technology.

3.4 Domain Operational Objectives (Resources Required) at Domain/Faculty level:

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	Domain will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GAS, Analytical & Decision-Making Ability	Domain will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3.	GA4: ICT usage and communication technology skills	Domain will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	GA13: Employability, Enterprise & Entrepreneurship	Domain will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities	Domain will continually improve the quality of facilities, services, resources and processes with

6	GA6: Communication Skills GA9: Leadership and Team Work	Domain will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	Domain will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	Domain will create opportunities for international exposure for its students and faculty.

SECTION IV

INSTITUTION MISSION AND EDUCATIONAL OBJECTIVES

Name of the Institution: AIAS

4.1 Mission Statement:

Mission of Institution
To provide education at all levels in Physical , Chemical & Mathematical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

4.2 Educational Objectives at Institution Level:

S.No	Educational Objectives
1	Students shall be able to acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills aligned with Industry 4.0
2	Students shall be able to analyze the scientific information and infer the results for successful and productive careers or advance studies/research in the field of Science & Technology
3	Students shall be able to compile the skill set to design and develop scientific models and products
4	Students shall be able to assess and compare the scientific information to enable them to effectively participate and contribute to the society
5	Students shall be able to demonstrate professional attitudes, effective communication and behavioral skills that support and enhance individual's performance
6	Students shall be able to develop professional ethics and academic integrity and demonstrate these as an individual/ team member/ leader in diverse teams
7	Students shall be able to critically evaluate and reflect learning and development throughout their career
8	Students shall be able to develop and demonstrate the understanding of global environment and relate scientific issues to the broader social, economic, legal, cultural and environmental contexts
9	Students shall be able to develop and apply understanding to analyze and formulate scientific approach for solving real life problems

4.3 Graduate Attributes and its Indicators at Institute Level:

#	Domain Graduate Attributes	Domain Indicators	Graduate Attributes	Indicators
1.	Knowledge and Expertise of Education	Graduates of Domain of Science and Technology will have the ability: To demonstrate comprehensive knowledge and skills of both theoretical and experimental concepts of Science & Technology to achieve academic excellence.	Knowledge and Expertise of Education	Develop knowledge and skills to integrate principles of Chemical Sciences to achieve academic excellence
2.	Self-directed and Active learning	To choose self–directed and active learning through strong intellectual engagement in independent work relevant to Science & Technology discipline	Self-directed and Active learning	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Chemical Sciences.
3	Scientific Research and Enquiry	To demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Science & Technology which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.	Scientific Research and Enquiry	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Chemical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Information & Communication Technology Skills in Science & Technology	To efficiently use and apply information and communication technologies and participate in collaborative networks related to Science and technology for developing requisite skills of Industry 4.0	Information & Communication Technology Skills in Science & Technology	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0
5	Critical thinking and Problem-Solving Abilities	To formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize	Critical thinking and Problem-Solving Abilities	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Chemical Sciences

		solutions to scientific problems in Science & Technology and allied areas		
6	Communication Skills	To employ effective listening and communication skills to enhance interpersonal relationship.	Communication Skills	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Creativity, Innovation & Reflective Thinking .	To combine scientific creativity and reflective thinking to develop innovative ideas in Science & Technology for developing processes and products relevant to societal educational needs	Creativity, Innovation & Reflective Thinking	Combine scientific creativity and reflective thinking to develop innovative ideas in Chemical Sciences for developing processes and products relevant to societal educational needs
8	Analytical & Decision-Making Ability	To compare, contrast and analyze scientific data in order to take appropriate and effective decisions	Analytical & Decision-Making Ability	Compare, contrast, and analyze data in order to take appropriate and effective decisions
9	Leadership & Teamwork	To attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented	Leadership & Teamwork	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented
10	Multicultural Understanding & Global Outlook	The student shall demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.	Multicultural Understanding & Global Outlook	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Integrity and Ethics	The students shall practice ethical behavior and demonstrate professional integrity in their conduct	Integrity and Ethics	Practice ethical behavior and demonstrate professional integrity in their conduct
12	Social & Emotional Skills .	The students shall be able to acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.	Social & Emotional Skills	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Employability, Enterprise & Entrepreneurship	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen	Employability, Enterprise & Entrepreneurship	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student

		profession (corporate career, student start up, family business, higher education etc.).		start up, family business, higher education etc.).
14	Lifelong Learning	The student shall be able to gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available	Lifelong Learning	Gain knowledge and learn skills throughout life focussing on self-directed learning using a range of sources and tools available
15	Environment and sustainability	The students shall be able to analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience in Science and Technology.	Environment and sustainability	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

4.4 Operational Objectives (Resources Required) at Institution level

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	AIAS will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GA8: Analytical & Decision-Making Ability	AIAS will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0

3	GA4: ICT usage and communication technology skills GA3:Investigation	AIAS will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	GA13: Employability, Enterprise & Entrepreneurship	AIAS will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities GA14: Lifelong Learning	AIAS will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	GA6: Communication Skills GA9: Leadership and Team Work	AIAS will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	AIAS will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	AIAS will create opportunities for international exposure for its students and faculty.

SECTION V:

PROGRAMME MISSION, PEO's, PLO's and ASSESMENT PLAN FOR EACH PROGRAMME

5.1 BACHELOR'S-Level Programme – B.Sc (H) Chemistry

5.1.1Mission Statement

Programme Mission
To provide education at all levels in Chemical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.1.2 Programme Educational Objectives (PEOs)

S.No	Programme Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of chemical sciences aligned with industry 4.0.
2	Apply the scientific concepts and knowledge to the development of new and innovative techniques in various areas of research in chemical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	Develop and demonstrate the understanding of chemical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.1.3. Programme Operational Objectives (OGs)

S.No	Programme Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Create opportunities for international exposure for its students and faculty

5.1.4 Programme Learning Outcomes (PEOs):

S. No.	Graduate Attributes	Programme Learning Outcomes
1.	Knowledge and Expertise of Education	Develop knowledge and skills to integrate principles of Chemical Sciences to achieve academic excellence
2	Self-directed and Active learning	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Chemical Sciences.

3	Scientific Research and Enquiry	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Chemical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Information & Communication Technology Skills in Science & Technology	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0
5	Critical thinking and Problem-Solving Abilities	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Chemical Sciences
6	Communication Skills	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Creativity, Innovation & Reflective Thinking	Combine scientific creativity and reflective thinking to develop innovative ideas in Chemical Sciences for developing processes and products relevant to societal educational needs
8	Analytical & Decision-Making Ability	Compare, contrast, and analyze data in order to take appropriate and effective decisions
9	Leadership & Teamwork	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented
10	Multicultural Understanding & Global Outlook	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.

11	Integrity and Ethics	Practice ethical behavior and demonstrate professional integrity in their conduct
12	Social & Emotional Skills	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Employability, Enterprise & Entrepreneurship	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Lifelong Learning	Gain knowledge and learn skills throughout life focussing on self-directed learning using a range of sources and tools available
15	Environment and sustainability	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.1.5 Programme Operational Outcomes (POOs) :

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	Department of Chemistry will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GA8: Analytical & Decision-Making Ability	Department of Chemistry will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0

3	GA4: ICT usage and communication technology skills GA3:Investigation	Department of Chemistry will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	GA13: Employability, Enterprise & Entrepreneurship	Department of Chemistry will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities GA14: Lifelong Learning	Department of Chemistry will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	GA6: Communication Skills GA9: Leadership and Team Work	Department of Chemistry will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	Department of Chemistry will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	Department of Chemistry will create opportunities for international exposure for its students and faculty.

5.1.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
B.Sc. (H) Chemistry							
PLO 1	X	X	X	X	X	X	
PLO 2				X		X	
PLO 3	X			X		X	
PLO 4			X				
PLO 5				X			X
PLO 6	X						
PLO 7		X					
PLO 8				X			X
PLO 9	X			X	X	X	
PLO 10		X					
PLO 11	X						
PLO 12	X						

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 13	X	X					
PLO 14	X	X		X			
PLO 15						X	X

5.1.7 Semester Wise Course Curriculum Coherence Matrix:

Course Coherence Matrix
B.Sc. (H) Chemistry

Course Title	CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15
SEMESTER 1																
Fundamentals of Chemistry and Quantitative Analysis CHM101	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: **Demonstrate** the variation in atomic properties with position in the periodic table	√										√		√		√
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√											

	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√					√							
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√			√	√					√	
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts															
SEMESTER 2																
Bioorganic and Medicinal Chemistry	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table		√									√		√		√
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√											
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√					√							
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√	√		√	√					√	

	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√	√					√	√	
SEMESTER 3																
Principles of Analytical Chemistry	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√										√		√		√
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√											
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√												
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√				√					√	
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√							√	
Chemical Dynamics & Coordination Chemistry	**CLO 1: Recall** the atomic structure and various bonding models.	√						√						√	√	
	CLO2: D**emonstrate** the variation in atomic properties with	√							√							

	position in the periodic table															
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√							√				
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√						√					√	
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√					√		√		√	
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√								
SEMESTER 4																
Chemistry for Industrial Application	**CLO 1: Recall** the atomic structure and various bonding models.	√													√	
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√							√							
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√					√				√		
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures		√	√							√					

	and important bonding parameters.															
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√								√	√	
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√						√	√	
Quantum Mechanics and Analytical Techniques	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√														
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√											
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√					√							√
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√				√					√	
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√	√			√			√	

SEMESTER 5																
Organic Synthesis A	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√												√		
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√				√						√	
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√					√					√	√	
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√			√					√		
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√						√	√	
Rearrangements and chemistry of group elements	**CLO 1: Recall** the atomic structure and various bonding models.	√														
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√														
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√				√							√

	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√							√					
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√					√					√
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√							√	√	
SEMESTER 6																	
Chemical Energetics and Radio Chemistry	**CLO 1: Recall** the atomic structure and various bonding models.	√															
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√															
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√				√								√
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√								√					
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√					√						√

	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√						√	√	
Organic Synthesis B	**CLO 1: Recall** the atomic structure and various bonding models.	√										√		√	√	
	CLO2: D**emonstrate** the variation in atomic properties with position in the periodic table	√														
	CLO 3: Identify Molecular geometries, physical and chemical properties of the molecules.		√		√											
	CLO 4: Analyze the current bonding models for simple inorganic and organic molecules to predict structures and important bonding parameters.		√	√					√			√		√		
	CLO 5: Prove the mechanism of reaction with using stereochemistry.		√	√		√	√				√					√
	CLO 6: Estimate by experiments the various water parameters, amount of acid base present, metal ions and hydrated salts		√	√				√		√						

5.1 BACHELOR'S-Level Programme – Bachelor of Statistics

5.1.1Mission Statement

Programme Mission
To provide education at all levels in Chemical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.1.2 Programme Educational Objectives (PEOs)

S.No	Programme Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of statistical sciences aligned with industry 4.0.
2	Apply the scientific concepts and knowledge to the development of new and innovative techniques in statistical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyse and formulate scientific approach for solving the real-life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioural skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	Develop and demonstrate the understanding of statistical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.1.3. Programme Operational Objectives (OGs)

S.No	Programme Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students.
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research.
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.

4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs.
8	Create opportunities for international exposure for its students and faculty.

5.1.4 Programme Learning Outcomes (PLOs):

S. No.	Graduate Attributes	Programme Learning Outcomes
1.	Knowledge and Expertise of Education	Develop knowledge and skills to integrate principles of Statistical Sciences to achieve academic excellence.
2	Self-directed and Active learning	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Statistical Sciences.
3	Scientific Research and Enquiry	Demonstrate scientific enquiry and research aptitude in Statistical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Information & Communication Technology Skills in Science & Technology	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0.

5	Critical thinking and Problem-Solving Abilities	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Statistical Sciences.
6	Communication Skills	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Creativity, Innovation & Reflective Thinking	Combine scientific creativity and reflective thinking to develop innovative ideas in Statistical Sciences for developing processes and products relevant to societal educational needs.
8	Analytical & Decision-Making Ability	Compare, contrast and analyze data in order to take appropriate and effective decisions.
9	Leadership & Teamwork	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.
10	Multicultural Understanding & Global Outlook	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Integrity and Ethics	Practice ethical behaviour and demonstrate professional integrity in their conduct.
12	Social & Emotional Skills	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Employability, Enterprise & Entrepreneurship	Define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Lifelong Learning	Gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available.

15	Environment and sustainability	Analyse and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.1.5 Programme Operational Outcomes (POOs) :

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	Department of Statistics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GA8: Analytical & Decision-Making Ability	Department of Statistics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	GA4: ICT usage and communication technology skills GA3:Investigation	Department of Statistics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	GA13: Employability, Enterprise & Entrepreneurship	Department of Statistics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities GA14: Lifelong Learning	Department of Statistics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.

6	GA6: Communication Skills GA9: Leadership and Team Work	Department of Statistics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	Department of Statistics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	Department of Statistics will create opportunities for international exposure for its students and faculty.

5.1.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
Bachelor of Statistics							
PLO 1	X		X	X	X	X	X
PLO 2		X	X	X	X	X	
PLO 3	X	X		X		X	
PLO 4	X	X	X	X	X	X	
PLO 5		X		X	X	X	
PLO 6		X		X	X	X	X
PLO 7		X					
PLO 8	X	X	X	X	X	X	
PLO 9		X	X	X	X	X	
PLO 10	X	X		X	X	X	X
PLO 11		X	X	X	X	X	
PLO 12		X	X	X	X	X	X

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 13	X	X					
PLO 14	X	X		X			
PLO 15	X					X	X

5.1.8 Semester Wise Course Curriculum Coherence Matrix:

Course Coherence Matrix (B.Stat)I

Course Title	PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15
Descriptive Statistics (Univariate) and Theory of Probability (STAT125)	**CLO 1:** Relate the methods used to summarize data sets including common graphical tools such as boxplots, histograms, stem plots, etc.	X														
	CLO 2: Demonstrate the conceptual understanding of sample vs population and different types of data.	X														

	CLO 3: Apply tools of descriptive Statistics and basic probability principles to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Descriptive Statistics (Bivariate) and Probability Distributions (STAT126)	**CLO l:** Relate the methods used to summarize data sets and concepts of probability theory including distributions.	X														
	CLO 2: Demonstrate the conceptual understanding of descriptive Statistics and Probability distributions.	X														

	CLO 3: Apply tools of descriptive Statistics and probability distributions to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Theory of Estimation and Sampling Survey (STAT237)	**CLO 1:** Relate the methods of estimation to estimate the output of the problems under study.	X														
	CLO 2: Demonstrate the conceptual understanding of various sampling techniques for collection and analysis of different data sets.	X														

	CLO 3: Apply estimation and sampling tools to programme monitoring, industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Statistical Modeling and Applications (STAT238)	**CLO 1**: Relate the methods of modeling to the data sets for analysis and future prediction.	X														
	CLO 2: Demonstrate the conceptual understanding of different type of statistical linear models.	X														
	CLO 3: Apply tools of statistical modeling techniques to industrial, field		X		X											

	based and real-life problems.															
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Testing of Hypothesis and Applied Statistics (STAT239)	**CLO 1:** Relate the methods of testing of hypothesis including applied statistical techniques with the statistical problems under study.	X														
	CLO 2: Demonstrate the conceptual understanding of different techniques of hypothesis testing and applied statistics.	X														

	CLO 3: Apply techniques of hypothesis testing and applied statistics to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Real Analysis and Laplace Transformation (STAT240)	**CLO 1:** Relate the methods of real analysis to find the output of the problems under study.	X														
	CLO 2: Demonstrate the conceptual understanding of Laplace and inverse Laplace transformation.	X														

	CLO 3: Apply real analysis techniques, Laplace and inverse Laplace transformation to industrial and field, based problems.		X		X											
	CLO 4: Analyze industrial and field, based problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial problems.		X	X				X								
Multivariate Analysis and Nonparametric Methods (STAT337)	**CLO 1:** Relate the techniques of matrices and vector space used to solve the statistical equations such as multivariate models, nonparametric models etc.	X														
	CLO 2: Demonstrate the conceptual understanding of multivariate distribution and nonparametric tests.	X														

	CLO 3: Apply tools of multivariate statistics and nonparametric tests to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Analysis of Variance and Design of Experiment (STAT338)	**CLO 1:** Relate the concept of Analysis of Variance (ANOVA) and Design of Experiments.	X														
	CLO 2: Demonstrate the conceptual understanding of ANOVA for one-way and two-way classification.	X														
	CKO 3: Apply tools of Design of experiment and its basic principles to industrial, field based and real-life problems.		X		X											

	CLO 4: Analyze the basic symmetric designs CRD, RBD and LSD with and without missing observations in industrial, field based and real-life problems.		X	X												
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Statistical Computing and Introduction to Statistical Software (STAT339)	**CLO 1:** Relate the programming techniques of R to analyze different type of data sets.	X														
	CLO 2: Demonstrate the graphics in R and SPSS.	X														
	CLO 3: Apply tools of R and SPSS to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems with STATA/SAS.		X	X												

	CLO 5: Evaluate the results obtained from analysis by different techniques of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Operations Research Techniques	**CLO 1:** Relate the methods to analyze linear programming problem, transportation and assignment problems, replacement problems, etc.	X														
	CLO 2: Demonstrate the operational research techniques from the verbal description to the real-life problems.	X														
	CLO 3: Apply tools of operations research to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												

	CLO 5: Evaluate the results obtained from problems of operations research effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								

6

7 **Course Coherence Matrix (B.Stat)II**

Course Title	PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15
Descriptive Statistics (Univariate) and Theory of Probability (STAT125)	**CLO 1:** Relate the methods used to summarize data sets including common graphical tools such as boxplots, histograms, stem plots, etc.	X														
	CLO 2: Demonstrate the conceptual understanding of sample vs population and different types of data.	X														
	CLO 3: Apply tools of descriptive Statistics and basic probability principles to industrial, field based and real-life problems.		X		X											
	CLO 4: Analyze industrial, field based and real-life problems.		X	X												

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X										
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X								
Differential Calculus & Integral Calculus (MAT101)	**CLO l:**	X														
	CLO 2: Explain the logical structure of, and facilities provided by, a modern operating system.	X														
	CLO 3: Analyze the tradeoffs inherent in operating system design.		X		X											
	CLO 4: Categorize different ways of implementing virtual memory.		X	X												
	CLO 5: Demonstrate practical experience of mechanisms for handling situations of deadlock among processes.		X	X		X										
	CLO 6: Demonstrate Linux operating system and able to write shell programs.		X	X				X								
	CLO 1:															

Mathematical Physics & Newtonian Mechanics (PHY101)	**CLO 2:** Extend knowledge about design and development of various types of software projects and Information system tools.															
	CLO 3: Apply standard coding practice in developing a software project.															
	CLO 4: Apply planning and management techniques on software projects as per industry standards.															
	CLO 5: Examine a variety of topics such as software testing methods, costing techniques.															
Problem Solving Using Computer & Python Programming (CSIT143)	**CLO 1**: Explain Computer Fundamentals & develop the concept of algorithm and algorithmic thinking.	X														
	CLO 2: Apply techniques of problem-solving in real life.	X	X					X	X							
	CLO 3: Use concepts of python programming.	X	X					X	X							
	CLO 4: Demonstrate basic Python decisions and iterations.	X	X	X		X		X	X							

	CLO 5: Create basic Python programs.	X	X		X	X		X	X							
Object Oriented Programming Using Java Language (CSIT247)	**CLO 1:** Evaluate how to use the concepts of object-oriented programming and define Java features.	X	X		X	X		X	X							
	CLO 2: Understand the concept of use of packages and exception handling in programs.	X	X					X	X							
	CLO 3: Classify various types of constructors, wrapper classes and string functions in programming.	X	X					X	X							
	CLO 4: Describe and apply interfaces and thread in programming.	X														
	CLO 5: Develop applet based applications.	X	X		X	X		X	X							
	CLO 6: Apply DBMS connectivity and server technologies in developing real time applications.	X	X					X	X							
Advanced Web Technology (CSIT248)	**CLO 1:** Understand the principles of coherent web coding and how to use a digital product.	X	X					X	X							

	CLO 2: Apply the incorporation of valid standards-conformant HTML document involving a variety of element types	X	X					X	X							
	CLO 3: Design web pages using CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements	X	X					X	X					X		
	CLO 4: Demonstrate the use of both a debugger and a DOM inspector in order to understand the execution of a client-side program	X	X		X	X		X	X							
	CLO 5: Create a reasonably sophisticated web application using PHP and database connectivity using MySQL.	X	X		X	X		X	X							
	CLO 6: Evaluate the skills and project-based experience needed for entry into web application and development careers	X	X		X	X		X	X							

Android Programming and Web Applications for Mobile Devices (CSIT249)	**CLO 1:** Understand the concepts of Mobile Application Development Environment and Android SDK	X	X					X	X					X		
	CLO 2: Design android applications using various Views and View Groups.	X	X					X	X					X		
	CLO 3: Identify and evaluate application programming interfaces for the development of database oriented applications.	X	X		X	X		X	X					X		
	CLO 4: Analyse the concepts of Maps, Getting Location Data, Monitoring a Remote Location.	X	X					X	X					X		
	CLO 5: Apply the concepts of Threading, Networking and Security issues in android	X	X					X	X					X		
	CLO 6: Effectively use information and communication technologies, 16 including the engineering graphics, responsible for the mobile web applications development.	X						X	X					X		

Big Data and Data Mining (CSIT363)	**CLO 1:** Identify Big Data and its Business Implications.	X	X	X	X			X	X					X	X	
	CLO 2: Identify components of Hadoop and Hadoop Eco-System.	X	X	X	X			X	X					X	X	
	CLO 3: Access and Process Data on Distributed File System. Manage Job Execution in Hadoop Environment.	X	X	X	X											
	CLO 4: Apply Machine Learning Techniques using Big data analytics.	X	X	X	X			X	X					X	X	
Software Testing and Software Quality Assurance (CSIT364)	**CLO 1:** Apply standard coding practice in developing of software project	X	X					X	X					X		
	CLO 2: Review the principles and procedures of software planning and management in the development of software projects.	X	X		X	X		X	X					X		
	CLO 3: Demonstrate the ability to perform software testing for different types of software applications.	X	X					X	X					X		
	CLO 4: Discuss the fundamentals of Test Design and Test Management.	X	X					X	X					X		

Analysis of Algorithms and Data Structures (CSIT365)	**CLO 1:** Apply advance Java programming techniques such as encapsulation, dynamic memory allocation, structures to developing solutions for problems.	X	X					X	X							
	CLO 2: Development of stack and queue data structures for solving real world problems.	X	X		X			X	X							
	CLO 3: Describe and implement abstract data types such as linked list, stack, queue and tree by using 'Java'for static and dynamic implementations.	X	X		X			X	X							
	CLO 4: Analyze, and evaluate appropriate abstract data types and algorithms to solve problems.	X	X	X		X		X	X							
	CLO 5: Describe and implement trees by using 'Java' for static and dynamic implementations,	X	X		X			X	X							
	CLO 6: Analyze and implement graph theory and its applications.	X	X	X		X		X	X							

Principles of Computer Graphics	**CLO 1: Apply mathematics and logic to develop Computer programs for elementary graphic operations**	X	X			X										
	CLO 2: Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics	X	X			X										
	CLO 3: Develop the competency to understand the concepts related to Computer Vision and Virtual reality	X	X					X	X							
	CLO 4: Apply the logic to develop animation and gaming programs	X	X	X				X	X							
	CLO 5: Describe the logic on 2D Transformations	X	X		X	X		X	X	X	X					
Fundamentals of Data Science and Analytics (CSIT366)	**CLO 1:** Describe what Data Science is and the skill sets needed to be a data scientist.	X	X			X										
	CLO 2: Describe the Data Science Process and how its components interact.	X	X			X										
	CLO 3: Differentiation of semantic and discourse in terms of NLP.	X	X					X	X							

	CLO 4: Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling.	X	X	X				X	X							
	CLO 5: Create effective visualization of given data (to communicate or persuade).	X	X		X	X		X	X	X	X					
Principles of E-Commerce (CSIT334)	**CLO 1:** Identify the nature of e-Commerce	X														
	CLO 2: Recognize the business impact and potential of e-Commerce	X	X	X		X		X	X							
	CLO 3: Explain the technologies required to make e-Commerce viable	X	X					X	X							
	CLO 4: Manage the current drivers and inhibitors facing the business world in adopting and using e-Commerce	X	X		X	X		X	X							
	CLO 5: Explain the economic consequences of e-Commerce	X	X					X	X							
	CLO 6: Discuss the trends in e-Commerce and use of Internet for Communication, shopping and social networking	X	X					X	X							

Introduction to Soft Computing Techniques (CSIT368)	**CLO 1:** Apply basics of Fuzzy logic and neural networks.	X	X	X				X	X		X					
	CLO 2: Evaluate with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations	X	X	X	X			X	X		X					
	CLO 3: Develop some familiarity with current research problems and research methods in Soft Computing Techniques.	X	X		X			X	X		X					
	CLO 4: Understand the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience	X	X			X										
Introduction to Data Communication and Computer Networks (CSIT369)	**CLO 1:** To develop understanding of computer networks and communication basics.	X	X	X		X	X									
	CLO 2: To understand design services at different layers of reference models.	X	X	X	X	X		X	X							
	CLO 3: To learn various error detection/correction techniques, routing protocols, congestion	X	X	X	X			X	X							

	CLO 4: Control algorithms, and connection establishment/release.	X	X	X	X		X									
	CLO 5: To describe and analyze related technical, administrative, and social aspects of networking.	X	X					X	X							
Cloud Computing and Services (CSIT370)	**CLO 1:** Explain the components of cloud computing showing how business agility in an organization can be created.	X	X		X			X	X							
	CLO 2: Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.	X	X	X		X		X	X							
	CLO 3: Examine the consistency of services deployed from a cloud architecture	X	X	X		X		X	X							
	CLOE 4: Define_best practice model to apply when developing and deploying cloud based applications	X	X		X											

Cyber Security and Cyber Laws (CSIT371)	**CLO 1:** Recognize Cyber Crimes and Information Security Issues.	X	X													
	CLO 2: Explain existing Cyber Laws.	X	X											X		
	CLO 3: Interprets Intellectual Property Rights.	X	X					X	X			X		X		
	CLO 4: Identify standards related to information security	X	X	X	X	X		X	X		X			X		
	CLO 5: Experimental evaluation of industry-based case study	X	X	X				X	X		X	X		X		
IT Project Management and Practices (CSIT372)	**CLO 1:** Explain project planning, scheduling, and cost management.	X	X					X		X	X		X	X		
	CLO 2: Identify the issues and risks in a realistic project scenario	X										X				
	CLO 3: Apply IT Projects techniques, which is very useful in future as IT Professionals	X	X	X	X			X	X		X	X		X		X
	CLO 4: To develop a professional project proposal	X	X	X	X			X	X		X	X		X		X
Introduction to IoT (CSIT373)	**CLO 1:** Analyze in a concise manner how the general Internet as well as Internet of Things works.	X		X		X									X	

	CLO 2: Understand constraints and opportunities of wireless and mobile networks for Internet of Things.	X	X	X		X		X	X	X	X			X	X	X
	CLO 3: Evaluate different protocols and standards associated with IoT.	X	X	X		X		X	X	X	X			X	X	X
	CLO 4: Apply knowledge of IoT to find out different application areas of IoT.	X	X					X	X		X			X	X	X
	CLO 5: Investigate different security and privacy challenges associated with IoT	X	X	X		X		X	X	X	X			X	X	X
Introduction to Artificial Intelligence and Robotics (CSIT374)	**CLO 1:** Describe human intelligence and AI	X												X		
	CLO 2: Explain how intelligent system works.	X	X	X	X	X								X		
	CLO 3: Understand Prepositional logic	X	X	X	X	X								X		
	CLO 4: Apply Knowledge representation and semantic in Knowledge representation.	X	X	X	X	X								X		
	CLO 5: Develop some familiarity with current research problems and research methods in AI.	X	X	X	X	X								X		

Introduction to Blockchain Technologies (CSIT375)	**CLO 1:** Define different types of database management system and cryptography system.	X												X		
	CLO 2: Identify the advantages of block chain network and concept of consensus.	X	X					X						X		
	CLO 3: Explain distributed consensus.	X	X					X						X		
	CLO 4: Demonstrate knowledge of block chain challenges and vulnerability issues.	X	X	X	X	X		X	X		X	X	X	X	X	
	CLO 5: Design block chain in different application areas	X	X	X	X	X		X	X		X	X	X	X	X	
Animation and Gaming (CSIT323)	**CLO 1:** Identify the principle Skills of Animation Artist.	X												X	X	
	CLO 2: Analyze examples of basic principles of animation.	X	X	X		X		X	X					X	X	
	CLO 3: Demonstrate the Frame by frame animation.	X	X					X	X					X	X	
	CLO 4: Demonstrate the Drawing & Modifying Shapes of objects.	X	X		X	X		X	X							
	CLO 5: Create animation on objects.	X	X					X	X							
	CLO 6: Utilize their skills by creating short animation movies	X	X					X	X							

Switched Networks (CSIT242)	**CLO 1:** Describe basic switching concepts and the operation of Cisco switches	X												X		
	CLO 2: Configure and troubleshoot basic operations of a small switched network	X	X	X		X		X	X					X	X	X
	CLO 3: Describe how VLANs create logically separate networks and how routing occurs between them	X	X					X	X					X	X	
	CLO 4: Configure and troubleshoot VLANs, trunking on Cisco switches, inter-VLAN routing, VTP, and RSTP	X	X		X	X		X	X					X	X	
	CLO 5: Configure and troubleshoot DHCP and DNS operations for IPv4 and IPv6	X	X					X	X		X	X	X	X	X	
	CLO 6: Describe the purpose of the components in a small wireless network	X	X					X	X		X	X	X	X	X	
	CLO 7: Configure and troubleshoot basic operations of a small wireless network	X	X	X		X		X	X					X	X	X

5.1 BACHELOR'S-Level Programme – B.Sc (H) Physics

5.1.1Mission Statement

Programme Mission
To provide education at undergraduate level in Statistical Sciences and emerging areas of knowledge, learning and research aligned with industry 4.0 and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture, a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.1.2 Programme Educational Objectives (PEOs)

S.No	Programme Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of Physical Sciences aligned with industry 4.0.
2	Demonstrate the scientific concepts and knowledge to the development of new and innovative techniques in Physical Sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	Develop and demonstrate the understanding of Physical Sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability

5.1.3. Programme Operational Objectives (OGs)

S.No	Programme Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Create opportunities for international exposure for its students and faculty

5.1.4 Programme Learning Outcomes (PEOs):

S. No.	Graduate Attributes	Programme Learning Outcomes
1.	Knowledge and Expertise of Education	Be able to develop knowledge and skills to integrate principles of Physical Sciences to achieve academic excellence.
2	Self-directed and Active learning	Able to choose self–directed and active learning through strong intellectual engagement in independent work relevant to physical Sciences.
3	Scientific Research and Enquiry	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Physical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.

4	Information & Communication Technology Skills in Science & Technology	Able to efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0
5	Critical thinking and Problem-Solving Abilities	Formulate critical thinking, interpret and comprehend research-based knowledge to provide solutions to scientific problems in Physical Sciences
6	Communication Skills	Able to employ effective listening and communication skills to enhance interpersonal relationship.
7	Creativity, Innovation & Reflective Thinking	Able to combine scientific creativity and reflective thinking to develop innovative ideas in Physical Sciences for developing processes and products relevant to societal educational needs.
8	Analytical & Decision-Making Ability	Able to compare, contrast and analyze data in order to take appropriate and effective decisions.
9	Leadership & Teamwork	Able to attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.
10	Multicultural Understanding & Global Outlook	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Integrity and Ethics	Practice ethical behavior and demonstrate professional integrity in their conduct.
12	Social & Emotional Skills	Able to acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.

13	Employability, Enterprise & Entrepreneurship	Able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Lifelong Learning	Able to gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available
15	Environment and sustainability	Able to analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.1.5 Programme Operational Outcomes (POOs) :

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	Department of Physics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GA8: Analytical & Decision-Making Ability	Department of Physics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	GA4: ICT usage and communication technology skills GA3:Investigation	Department of Physics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.

4	GA13: Employability, Enterprise & Entrepreneurship	Department of Physics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities GA14: Lifelong Learning	Department of Physics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	GA6: Communication Skills GA9: Leadership and Team Work	Department of Physics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	Department of Physics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	Department of Physics will create opportunities for international exposure for its students and faculty.

5.1.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
B.Sc (H)Physics							
PLO 1	X	X	X	X	X	X	
PLO 2				X		X	
PLO 3	X			X		X	
PLO 4			X				
PLO 5				X			X
PLO 6	X						
PLO 7		X					
PLO 8				X			X
PLO 9	X						
PLO 10		X					
PLO 11	X						

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 12		X					
PLO 13	X						
PLO 14	X						
PLO 15	X					X	

7.1.7 Semester Wise Course Curriculum Coherence Matrix:

Semester 1															
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PLO13**	**PLO14**	**PLO15**
Mathematical Physics and Newtonian Mechanics(PHY101)	**CLO1:** Define scalars, vectors, pseudo-scalars and pseudo-vectors and the origin of pseudo forces in rotating frame and the response of the classical systems to external forces **and their elastic deformation.**	√	√	√	√	√		√	√					√		
	CLO2: Demonstrate, with physical examples, the concept of gradient, divergence and curl	√	√	√				√	√					√		

	and the dynamics of planetary motion.														
	CLO3: Apply appropriate concepts to solve qualitatively, problems involving the application of the fundamental principles of physics to real world situations.	√	√	√	√	√		√	√				√		
	CLO4: Analyze the difference and connection between Cartesian, spherical and cylindrical coordinate systems.	√	√	√				√	√				√		
	CLO5: Evaluate different problems related to dynamics of rigid body and planetary motion.	√	√	√		√		√	√				√		
	CLO 6: Develop the skills to do data analysis with experimental and theoretical results .	√	√	√	√	√		√	√				√		
Semester 2															
Thermal Physics and Semiconductor Devices (PHY102)	**CLO 1**: Define the fundamental principles of thermal physics and recognize the difference between reversible	√	√	√			√						√		

	and irreversible processes.														
	CLO 2: Demonstrate the physical significance of thermodynamical potentials and the kinetic model of gases w.r.t. various gas laws.	√	√	√									√		
	CLO 3: Apply the implementations and limitations of fundamental radiation laws.	√	√	√	√			√					√		√
	CLO 4: Analyzing the basic components of electronic devices Utility of AC bridges.	√	√	√		√		√					√	√	
	CLO 5: Evaluate the applications of various electronic instruments.	√	√	√		√		√	√				√	√	
	CLO 6: Create and design simple electronic circuits.	√	√	√		√		√	√				√	√	
Semester 3															
Physics of Vibrations and Waves(PHY202)	**CLO1: 1.** Define displacement, velocity, acceleration and energy of different oscillating system	√	√	√	√	√		√	√				√		

	CLO2: Demonstrate with physical examples, the concept of damped, forced and coupled oscillations. Principle, production and properties of Ultrasonic waves	√	√	√				√	√				√		
	CLO3: Apply the principle of superposition to obtain the resultant of two mutually perpendicular harmonic oscillations having different amplitudes and different frequencies.	√	√	√	√	√		√	√				√		
	CLO4: 4. Analyze: Sabine's formula for determination of reverberation time and absorption coefficient.	√	√	√				√	√				√		
	CLO5: 5. Evaluate quality factor, band width, logarithmic decrement in damped and forced harmonic oscillator different problems and energy of progressive and stationary waves.	√	√	√		√		√	√				√		
	CLO 6: 6. Develop the relation between acceleration, velocity displacement and energy of different	√	√	√	√	√		√	√				√		

	oscillating system change with time.															
Electromagnetic Theory & Modern Optics [PHY201]	**CLO 1**: 1. Define the concept of gradient, divergence and curl and the basic concepts of ray optic and wave Optics	√	√	√									√		
	CLO 2: • 2. Demonstrate, with physical examples, the concept of Interference, Diffraction and Polarization and understand the concepts related to Faraday's law, induced emf and Maxwell's equations	√	√	√		√			√				√		
	CLO 3 Apply appropriate concepts to solve qualitatively, problems involving the application of the fundamental principles of physics to real world situations.	√	√	√	√	√		√	√				√		

	CLO 4: • Analyze the theory of optics to design optical devices and apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.	√	√	√	√	√		√	√					√		
	CLO 5: • . Evaluate and Interpret Demonstrates how observation, experiment, and theory work together to continue to expand the frontiers of knowledge of the physical Universe	√	√	√	√	√		√	√					√		
	CLO 6:. Develop the ability to formulate, discuss and interpret experiments related to Optics and electromagnetism.	√	√	√	√	√		√	√					√		
Semester 4																
Course Title	**PLO**	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Computational Methods for Physics[PHY204]	**CLO 1**: Define gauss method, Jacobi method, Newton Raphson method.	√	√	√	√	√		√	√					√		
	CLO 2: Demonstrate, with physical examples, the concept of different techniques to solve numericals.	√	√	√				√	√					√		

	CLO 3: Apply appropriate concepts to solve qualitatively, problems involving the application of the fundamental principles of physics to real world situations.	√	√	√	√	√		√	√					√		
	CLO 4: Analyze the difference and connection between roots and real roots of the system	√	√	√				√	√					√		
	CLO 5: Evaluate different problems related to numerical methods and data analysis.	√	√	√		√		√	√					√		
	CLO 6: Develop the ability to formulate, discuss and interpret experiments related to Numerical Methods.	√	√	√	√	√		√	√					√		
Perspective of Modern Physics & Basic Electronics [PHY203]	**CLO 1**: Define inertial & non-inertial frames. Galilean transformations. Newtonian relativity, time dilation, length contraction, matter waves, group velocity, phase velocity and wave function, numerical aperture, acceptance angle	√	√	√												

	CLO 2: Demonstrate the physical significance of consequences of Lorentz transformation equations with examples (CLO2)	√		√		√										
	CLO 3:Apply appropriate concepts to solve qualitatively, problems involving the application of the fundamental principles of physics to real world situations. (CLO3)	√	√		√											
	CLO 4: Analyze the difference between structure of space and time in Newtonian and relativistic mechanics (CLO4)		√	√		√										
	CLO 5: Evaluate different problems related to relativistic kinematics and wave particle duality (CLO5)		√	√		√										
	CLO 6:6. Develop the ability to design electronic instruments/components related to transistor, amplifier and oscillator circuits (CLO6)		√	√		√	√	√								
Semester 5																

Classical and Statistical Mechanics[PHY301]	**CLO I:** Find the connection between Newtonian mechanics and analytical mechanics and need for statistical mechanics.	√	√	√									√		
	CLO 2: Demonstrate the understanding of analytical mechanics and statistical mechanics for macroscopic systems.	√	√	√		√			√				√		
	CLO 3: Apply Lagrangian & Hamiltonian formalisms and statistical distribution laws in solving problems of constrained motion, central force and statistical thermodynamics.	√	√	√	√	√		√	√				√		
	CLO 4: Analyze the difference between Lagrangian & Hamiltonian formalisms, three types of ensembles and statistical distribution laws and their applications.	√	√	√	√	√		√	√				√		

	CLO 5: Evaluate equation of motion and thermodynamic potentials of macroscopic systems using Lagrangian & Hamiltonian formalisms and partition function, respectively.	√	√	√	√	√		√	√					√		
	CLO 6: Develop the ability to formulate the equation of motion and partition function, use Lagrangian & Hamiltonian formalisms and statistical distribution laws to discuss and interpret the dynamics of macroscopic systems.	√	√	√	√	√		√	√					√		
Quantum Mechanics and Spectroscopy [PHY302]	**CLO 1**: Define operators, commutators, eigen and expectation values, quantum numbers and selection rules for quantum mechanical systems.	√	√	√										√		
	CLO 2: Demonstrate the use of concept of Schrödinger equation and vector atomic model in understanding the dynamics of quantum mechanical systems.	√	√	√										√		

	CLO 3: Apply Schrödinger equation and vector atomic model to quantum mechanical problems to obtain eigen values, eigen vectors and selection rules.	√	√	√	√	√		√	√					√		
	CLO 4: Analyze the difference between eigen values & eigen functions (degenerate and non-degenerate) and atomic & molecular spectra for quantum mechanical systems.	√	√	√	√	√		√	√					√		
	CLO 5: Evaluate the eigen values & eigen functions of 1D and 3D quantum mechanical problems using Schrödinger equation, atomic spectra using vector atomic model.	√	√	√	√	√		√	√					√		
	CLO 6: 6. Develop the ability to use the concepts of quantum mechanics and spectroscopy to understand the dynamics of quantum mechanical systems.	√	√	√	√	√		√	√					√		
Demonstrative Aspects of Optics and Laser [PHY303]	**CLO 1**: Define interference, diffraction and polarization, resolving power, dispersive power and specific rotation	√														

	CLO 2: Demonstrate the procedure and experimentation of optics.	√														
	CLO 3: Utilize optical instrument such as grating, telescope, collimator, plano-convex lens, spherometer, biprism, polarimeter etc.		√		√											
	CLO 4:Analyze and distinguish the different types apparatus used for calculating the same optical parameters..		√	√												
	CLO 5: Determine the refractive index, specific rotation and dispersive power of the material and the wavelength of different types of light sources (sodium, mercury light source)		√	√		√										
	CLO 6: Develop the ability to design simple optical experiment used for determining the optical properties of the material.		√	√				√								
Semester 6																

Analog and Digital Principles & Applications[PHY304]	**CLO 1**: Define semiconductors, semiconductor devices, Number systems and the function of various electronics components (UJT, FET)	√														
	CLO 2: Demonstrate the switching and amplification application of the semiconductor devices.	√														
	CLO 3: Apply the Boolean laws and K-map to simplify the digital circuits.		√		√											
	CLO 4: Analyze the synchronous and asynchronous sequential circuits using flip-flops.		√	√												
	CLO 5: Evaluate different problems related to analogue and digital circuits.		√	√		√										
	CLO 6: Develop the ability to design electronic instruments/components related to transistor, amplifier and Flip flops.		√	√				√								

Solid State & Nuclear Physics [PHY305]	**CLO 1**: Understand the crystal geometry with respect to different symmetry operations and general properties of nucleus.	√	√													
	CLO 2: Comprehend the power of X-ray diffraction, concept of crystal lattice and applications of nuclear accelerators & detectors. (CLO2)	√		√	√											
	CLO 3:Recognize various properties based on crystal bindings and nuclear accelerator. (CLO3)		√		√											
	CLO 4: Analyze the importance of Free electron & band theories in understanding the crystal properties. (CLO4)		√	√					√							
	CLO 5: Evaluate the problems salient features of lattice vibration, nuclear forces & radioactive decays. (CLO5)		√	√		√										
	CLO 6:Study the importance of crystal dynamics, nuclear models & nuclear reactions. (CLO6)		√	√				√								√

5.1 BACHELOR'S-Level Programme – B.Sc (H) Mathematics

5.1.1Mission Statement

Programme Mission
To provide education at undergraduate level in Statistical Sciences and emerging areas of knowledge, learning and research aligned with industry 4.0 and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture, a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.1.2 Programme Educational Objectives (PEOs)

S.No	Programme Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of mathematical sciences aligned with industry 4.0.
2	Demonstrate the scientific concepts and knowledge to the development of new and innovative techniques in mathematical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	Develop and demonstrate the understanding of mathematical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.1.3. Programme Operational Objectives (OGs)

S.No	Programme Operational Objectives
1	Create appropriate teaching learning resources, infrastructure, and conducive environment for excellence in teaching, learning, research and professional development of students.
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research.
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Continuously strive to build strong industry interaction, alumni networks, and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources, and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs.
8	Create opportunities for international exposure for its students and faculty.

5.1.4 Programme Learning Outcomes (PEOs):

S. No.	Graduate Attributes	Programme Learning Outcomes
1.	Knowledge and Expertise of Education	Develop knowledge and skills to integrate principles of mathematical sciences to achieve academic excellence.

2	Self-directed and Active learning	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to mathematical sciences.
3	Scientific Research and Enquiry	Demonstrate scientific enquiry and research aptitude in Mathematical sciences.
4	Information & Communication Technology Skills in Science & Technology	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0.
5	Critical thinking and Problem-Solving Abilities	Formulate critical thinking, interpret, and comprehend research-based knowledge to design and synthesize solutions to scientific problems in mathematical sciences
6	Communication Skills	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Creativity, Innovation & Reflective Thinking	Combine scientific creativity and reflective thinking to develop innovative ideas in mathematical sciences for developing processes and products relevant to societal educational needs.
8	Analytical & Decision-Making Ability	Compare, contrast and analyze data to take appropriate and effective decisions.
9	Leadership & Teamwork	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.

10	Multicultural Understanding & Global Outlook	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Integrity and Ethics	Practice ethical behavior and demonstrate professional integrity in their conduct.
12	Social & Emotional Skills	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Employability, Enterprise & Entrepreneurship	Define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Lifelong Learning	Gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available
15	Environment and sustainability	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.1.5 Programme Operational Outcomes (POOs) :

S. No.	Graduate Attributes	Operational Objectives
1.	GA1:Engineering Knowledge GA2: Self-Directed and Active Learning	Department of Mathematics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2.	GA4: ICT usage and communication technology skills GA8: Analytical & Decision-Making Ability	Department of Mathematics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0

3	GA4: ICT usage and communication technology skills GA3:Investigation	Department of Mathematics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	GA13: Employability, Enterprise & Entrepreneurship	Department of Mathematics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	GA5: Critical Thinking & Problem-Solving Abilities GA14: Lifelong Learning	Department of Mathematics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	GA6: Communication Skills GA9: Leadership and Team Work	Department of Mathematics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	GA11: Integrity and Ethics GA15: Environment and Sustainability	Department of Mathematics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	GA7: Creativity, Innovation & Reflective Thinking	Department of Mathematics will create opportunities for international exposure for its students and faculty.

5.1.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
B.Sc (H)Mathematics							
PLO 1			X				
PLO 2	X	X					
PLO 3						X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 4	X						
PLO 5						X	
PLO 6							
PLO 7					X		
PLO 8				X			
PLO 9				X			
PLO 10							X
PLO 11			X				
PLO 12					X		
PLO 13	X						
PLO 14		X	X	X			

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 15				X	X		

8.1.7 Semester Wise Course Curriculum Coherence Matrix:

Coherence Matrix

B.Sc. (H) Mathematics

Program Learning Outcomes (PLOs)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15
Course Title	Course Learning Outcomes (CLOs)															

Number Theory & Game Theory	**CLO1: Define the concepts of number theory and game theory that find its various applications in the relevant fields.**	X													X	
	CLO 2: Demonstrate skills to solve problems in elementary number theory and also apply it to problems of cryptography.	X	X						X							
	CLO 3: Make use of concepts of players, strategies, payoffs, rationality, equilibrium to solve the games.	X	X		X				X							X
	CLO 4: Analyze dominant strategy equilibrium, pure and mixed strategy Nash equilibrium.	X	X	X					X							

	CLO 5: Assess rectangular game problems by Graphical and Simplex methods.	X	X	X		X			X						X	
	CLO 6: Investigate cryptographic algorithm and develop its relation with number theory.	X	X	X		X		X	X						X	X
Program Learning Outcomes (PLOs)		**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Course Title	**Course Learning Outcomes (CLOs)**															
Graph Theory & Discrete Mathematics	**CLO 1: Relate basic knowledge of path, circuits, adjacency matrix, tree, coloring of the graph with real life applications**	X				X									X	X

	CLO 2: Demonstrate problem solving skills of various form of graph coloring, color problem, vertex coloring and Karnaugh maps by using truth tables.			X							X	X				
	CLO 3: Apply the principles of Graph Theory and Discrete Mathematics in variety of practical problems in science, engineering and examine the fundamental ideas about automation theory, transition function and table.				X											

	CLO 4: Analyze the rules of Boolean Algebra and propositional logic to solve a variety of problems.								X							X
	CLO 5:Assess the knowledge in mathematical reasoning, combinatorial analysis, discrete structures, logic, counting, relations, hasse diagram, Boolean Algebra and Automation Theory.	X				X									X	X

	CLO 6: Create shortest path in road or network, present organized data, design circuit connections, color various maps and create 3D structure of molecules.															
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Metric Spaces and Complex Analysis	CLO 1: Find limit points of a set and check the continuity, uniform continuity of functions on metric space.	**X**													**X**	
	CLO 2: Illustrate the concept of convergence and compactness.	**X**	**X**			**X**			**X**							
	CLO 3: Make use of topology in metric space to utilize metric space arguments to obtain a variety of results.	**X**	**X**		**X**				**X**							**X**

	CLO 4: Examine the differentiability and analyticity of functions using Cauchy-Riemann Equations and learn to apply Cauchy Integral Theorem and Cauchy Integral Formula.	X	X	X					X							X
	CLO 5: Evaluate residues at singular points and learn to expand complex function in uniform convergent series using Taylor/Laurent Series.	X	X			X			X						X	
	CLO6: Building the basic concepts for Advance Complex Analysis and Topological Spaces.	X	X	X	X	X		X	X						X	X
Numerical Analysis and Operations Research	CLO 1: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	X				X										

	CLO 2: Demonstrate the skills to analyze and evaluate the accuracy of common numerical methods.	X	X			X			X		X				X	
	CLO 3: Apply numerical methods such as interpolation, differentiation, integration to solve a variety of practical problems in science and engineering.	X	X	X		X		X							X	
	CLO 4: Analyze the fundamental theory of optimization to solve a variety of problems on LPP and applications of operations research.	X	X		X	X			X		X					X
	CLO 5: Evaluate the solution of Transportation/Assignment Problems and discuss degeneracy/duality/sensitivity analysis.	X	X	X		X	X									

	CLO 6: Create the graphs of solution to critically analyze and interpret the experimental data to reach at substantial outcomes.	**X**	**X**			**X**			**X**						**X**	**X**
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PLO13**	**PLO14**	**PLO15**
Differential Calculus and Integral Calculus(MAT101)	**CLO 1**: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	X														
	CLO 2: Demonstrate the skills to analyze real valued function such as sequence, curvature, envelop and evolutes.	X	X					X	X							
	CLO 3: Apply the principles of differential and integral calculus to solve a variety of practical problems in science and engineering	X	X					X	X							

	CLO 4: Analyze the rules of vector calculus to solve a variety of problems	X	X	X		X		X	X							
	CLO 5: Evaluate the concavity and convexity of the functions through plotting various graphs.	X	X		X	X		X	X							
	CLO6: Create the graphs of complex numbers and their representations															
Matrices and Differential Equations & Geometry(MAT 102)	**CLO 1:** Find eigen values of matrices and solution of linear homogeneous and non-homogeneous equations	X	X					X							X	
	CLO 2: Demonstrate problem solving skills for solving various types of differential equation using different methods.	X	X		X	X			X						X	

	CLO 3: Make use of geometrical interpretation of differential equation and apply techniques of differential equations to solve real life problems	X	X	X		X		X							X	
	CLO 4: Examine the fundamental ideas about coordinate geometry and learn to describe some of the surfaces	X	X		X	X			X						X	
	CLO 5: Evaluate regular geometrical figures and their properties.	X	X	X		X										
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**

Differential Geometry and Tensor Analysis	CLO1: **Understand** gradient of scalars, divergence of a contravariant vector, Laplacian of an invariant, curl of a covariant vector, irrotational vector etc.	X														
	CLO2; **Demonstrate** the notion of Serret-Frenet frame for space curves and the involutes and evolutes of space curves with the help of examples.	X	X													
	CLO3: **Apply** the concepts of geodesics on various surface and their characterization	X	X		X											
	CLO4: **Examine** the fundamental ideas about curvature and learn to describe some of the curvatures.	X	X	X					X						X	

	CLO5: **Evaluate** regular geometrical interpretation of geometrical interpretation of curvature tensor, Ricci tensor, scalar curvature, Einstein space and Einstein tensor.	X	X	X		X			X						X	X
	CLO6: **Create** and analyze different types of curves and planes.	X	X	X		X		X	X						X	
Differential Equations & Mechanics	CLO1: **Relate** basic concepts of mechanics such as force, work, motion with their various principles.	X														
	CLO2: **2. Demonstrate** problem solving skills for finding solution of partial differential equations of first and second order.	X	X						X							
	CLO3: **Apply** the methods of solving differential equations to solve a variety of practical problems in science and engineering	X	X	X	X				X						X	X
	CLO4: **Analyze** various laws of force and motion with various applications.	X	X	X					X						X	X

	CLO5: **Evaluate** motion of particles of varying mass, Rocket motion, Central orbit etc.	X	X	X		X			X						X	X
	CLO6: **Solving** mathematical models using differential equations and mechanics.	X	X	X		X		X	X						X	X
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Metric Spaces and Complex Analysis	CLO 1: Find limit points of a set and check the continuity, uniform continuity of functions on metric space.	**X**													**X**	
	CLO 2: Illustrate the concept of convergence and compactness.	**X**	**X**			**X**			**X**							
	CLO 3: Make use of topology in metric space to utilize metric space arguments to obtain a variety of results.	**X**	**X**		**X**				**X**							**X**

	CLO 4: Examine the differentiability and analyticity of functions using Cauchy-Riemann Equations and learn to apply Cauchy Integral Theorem and Cauchy Integral Formula.	X	X	X					X							X
	CLO 5: Evaluate residues at singular points and learn to expand complex function in uniform convergent series using Taylor/Laurent Series.	X	X			X			X						X	
	CLO6: Building the basic concepts for Advance Complex Analysis and Topological Spaces.	X	X	X	X	X		X	X						X	X
Numerical Analysis and Operations Research	CLO 1: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	X				X										

	CLO 2: Demonstrate the skills to analyze and evaluate the accuracy of common numerical methods.	X	X			X			X		X				X	
	CLO 3: Apply numerical methods such as interpolation, differentiation, integration to solve a variety of practical problems in science and engineering.	X	X	X		X		X							X	
	CLO 4: Analyze the fundamental theory of optimization to solve a variety of problems on LPP and applications of operations research.	X	X		X	X			X		X					X
	CLO 5: Evaluate the solution of Transportation/Assignment Problems and discuss degeneracy/duality/sensitivity analysis.	X	X	X		X	X									

	CLO 6: Create the graphs of solution to critically analyze and interpret the experimental data to reach at substantial outcomes.	**X**	**X**			**X**			**X**						**X**	**X**
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Differential Calculus and Integral Calculus(MAT101)	**CLO 1**: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	X														
	CLO 2: Demonstrate the skills to analyze real valued function such as sequence, curvature, envelop and evolutes.	X	X					X	X							
	CLO 3: Apply the principles of differential and integral calculus to solve a variety of practical problems in science and engineering	X	X					X	X							

	CLO 4: Analyze the rules of vector calculus to solve a variety of problems	X	X	X		X		X	X							
	CLO 5: Evaluate the concavity and convexity of the functions through plotting various graphs.	X	X		X	X		X	X							
	CLO6: Create the graphs of complex numbers and their representations															
Matrices and Differential Equations & Geometry(MAT 102)	**CLO 1:** Find eigen values of matrices and solution of linear homogeneous and non-homogeneous equations	X	X					X							X	
	CLO 2: Demonstrate problem solving skills for solving various types of differential equation using different methods.	X	X		X	X			X						X	

	CLO 3: Make use of geometrical interpretation of differential equation and apply techniques of differential equations to solve real life problems	X	X	X		X		X							X	
	CLO 4: Examine the fundamental ideas about coordinate geometry and learn to describe some of the surfaces	X	X		X	X			X						X	
	CLO 5: Evaluate regular geometrical figures and their properties.	X	X	X		X										
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**

Differential Calculus and Integral Calculus(MAT101)	**CLO 1**: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	X														
	CLO 2: Demonstrate the skills to analyze real valued function such as sequence, curvature, envelop and evolutes.	X	X					X	X							
	CLO 3: Apply the principles of differential and integral calculus to solve a variety of practical problems in science and engineering	X	X					X	X							
	CLO 4: Analyze the rules of vector calculus to solve a variety of problems	X	X	X		X		X	X							
	CLO 5: Evaluate the concavity and convexity of the functions through plotting various graphs.	X	X		X	X		X	X							

	CLO6: Create the graphs of complex numbers and their representations															
Matrices and Differential Equations & Geometry(MAT 102)	**CLO 1:** Find eigen values of matrices and solution of linear homogeneous and non-homogeneous equations	X	X					X							X	
	CLO 2: Demonstrate problem solving skills for solving various types of differential equation using different methods.	X	X		X	X			X						X	
	CLO 3: Make use of geometrical interpretation of differential equation and apply techniques of differential equations to solve real life problems	X	X	X		X		X							X	
	CLO 4: Examine the fundamental ideas about coordinate geometry and learn to describe some of the surfaces	X	X		X	X			X						X	

	CLO 5: Evaluate regular geometrical figures and their properties.	X	X	X		X										
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
Differential Geometry and Tensor Analysis	CLO1: **Understand** gradient of scalars, divergence of a contravariant vector, Laplacian of an invariant, curl of a covariant vector, irrotational vector etc.	X														
	CLO2; **Demonstrate** the notion of Serret-Frenet frame for space curves and the involutes and evolutes of space curves with the help of examples.	X	X													

	CLO3: **Apply** the concepts of geodesics on various surface and their characterization	X	X		X											
	CLO4: **Examine** the fundamental ideas about curvature and learn to describe some of the curvatures.	X	X	X					X						X	
	CLO5: **Evaluate** regular geometrical interpretation of geometrical interpretation of curvature tensor, Ricci tensor, scalar curvature, Einstein space and Einstein tensor.	X	X	X		X			X						X	X
	CLO6: **Create** and analyze different types of curves and planes.	X	X	X		X		X	X						X	
Differential Equations & Mechanics	CLO1: **Relate** basic concepts of mechanics such as force, work, motion with their various principles.	X														
	CLO2: **2. Demonstrate** problem solving skills for finding solution of partial differential equations of first and second order.	X	X						X							

	CLO3: **Apply** the methods of solving differential equations to solve a variety of practical problems in science and engineering	X	X	X	X				X						X	X
	CLO4: **Analyze** various laws of force and motion with various applications.	X	X	X					X						X	X
	CLO5: **Evaluate** motion of particles of varying mass, Rocket motion, Central orbit etc.	X	X	X		X			X						X	X
	CLO6: **Solving** mathematical models using differential equations and mechanics.	X	X	X		X		X	X						X	X

5.2 MASTER'S-Level Programme : M.Sc Applied Chemistry

5.2.1 Mission Statement

Programme Mission
To provide education at all levels in Chemical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.2.2 Programme Educational Objectives (PEOs)

S.No	Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of chemical sciences aligned with industry 4.0.
2	Apply the scientific concepts and knowledge to the development of new and innovative techniques in various areas of research in chemical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.

6	Develop and demonstrate the understanding of chemical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.2.3. Programme Operational Objectives (OG)

S.No	Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Create opportunities for international exposure for its students and faculty

5.2.4 Programme Learning Outcomes (PEOs):

S.No	Learning Outcomes
1	Develop knowledge and skills to integrate principles of Chemical Sciences to achieve academic excellence
2	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Chemical Sciences.
3	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Chemical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0
5	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Chemical Sciences
6	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Combine scientific creativity and reflective thinking to develop innovative ideas in Chemical Sciences for developing processes and products relevant to societal educational needs
8	Compare, contrast and analyze data in order to take appropriate and effective decisions
9	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented
10	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Practice ethical behavior and demonstrate professional integrity in their conduct
12	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Gain knowledge and learn skills throughout life focussing on self-directed learning using a range of sources and tools available
15	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.2.5 Programme Operational Outcomes (POOs) :

S.No	Operational Outcomes
1	Department of Chemistry will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2	Department of Chemistry will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	Department of Chemistry will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Department of Chemistry will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Department of Chemistry will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	Department of Chemistry will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Department of Chemistry will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Department of Chemistry will create opportunities for international exposure for its students and faculty.

5.2.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
M.Sc. (H) Applied Chemistry							
PLO 1	X						
PLO 2	X						
PLO 3	X	X	X	X	X	X	
PLO 4				X		X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 5	X			X		X	
PLO 6			X				
PLO 7				X			X
PLO 8	X						
PLO 9		X					
PLO 10				X			X
PLO 11	X						
PLO 12		X					
PLO 13	X						
PLO 14	X						
PLO 15	X						

5.2.7 Assessment of Program Learning Outcomes through Comprehensive Examination

Course Coherance Matrix
Course Title: M.Sc. (A.C.)

	CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15
SEMESTER 1																
PHYSICAL CHEMISTRY CHEM603	Understand the concepts and applications of physical chemistry in the development of science and technology.	√			√		√				√					√
	Understand the significance of course and applicatio			√						√				√		

	ns in real life															
	Demonstrate knowledge of skills and techniques which prove to be highly beneficial for studies in analytical and physical chemistry					√			√				√			
	Apply them for future research in these and allied areas.		√					√				√			√	
Organic Chemistry CHEM602	Propose and compose a mechanism of an organic reaction taking take involving nucleophil			√							√					√

	ic and electrophilic reagents on aliphatic or aromatic molecules.															
	Describe and distinguish the structural, geometric and optical isomers.		√			√							√			
	Predict the aromatic, non-aromatic and anti-aromatic nature of compounds.				√		√				√					√
	Outline all the reactions with the reactant, reagents and products.			√										√		
	Evaluate and Interpret	√				√			√				√			

	the unknown compound by chromatographic separation.															
	Differentiate between substitution, addition and elimination reactions involving organic molecules.	√						√		√		√			√	
Inorganic Chemistry CHEM604	Describe and distinguish the compounds of s& p-block elements and bonding theories	√									√					√
	Predict the nature of compounds having metal		√			√							√			

	carbon bond															
	Outline all the classification of ligands and products				√		√				√					√
	Differentiate between substitution, addition and elimination reactions in inorganic reaction mechanism			√										√		
	Evaluate and Interpret the unknown solution strength by volumetric analysis	√				√			√				√			
	Propose and compose a mechanis	√						√		√		√			√	

	m and methods for the synthesis of the compounds															
Course Title: M.Sc. (A.C.)	CLO	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
SEMESTER 2																
Spectroscopic Methods of Analysis CHEM601	Understand the major concepts, theoretical principles and experimental findings in chemistry.		√		√		√				√					√
	Outline the problem-solving skills in the spectroscopic analysis of chemistry.			√										√		
	Able to identify unknown					√			√				√			

	compounds.															
	Interpret the results.	√						√		√		√			√	
	Differentiate between various functional groups involving organic molecules															
PRINCIPLES OF ORGANIC SYNTHESIS CHEM611	Describe and distinguish the mechanisms of various rearrangements.		√			√							√			
	Predict the usage of various organic reagents for interconversion of compounds.				√		√				√					√
	Outline all the reactions with the reactant,			√										√		

	reagents and products.															
	Differentiate between pericyclic, concerted and photochemical reactions involving organic molecules.	√				√			√				√			
	Propose and compose a mechanism of an organic reaction involving various oxidizing and reducing agents.	√						√		√		√			√	
CHEM705 Introduction to Materials	Describe and distinguish various materials.	√			√		√				√					√

Chemistry	Predict the science behind them and the need of R & D in the field of materials.			√						√				√		
	Differentiate and interpret the data obtained for their for characterization by various advanced techniques.					√			√				√			
	Propose and compose new materials and proceses.		√					√				√			√	
CHEM 613- Applied Chemistry Lab -I	Understand the basic knowledge related to oils and fats, their			√					√							

	applications, and the quality check parameters of any unknown oil sample.															
	Application of titrimetric, gravimetric and TLC analytical techniques in quality check of various oil, water, and food sample.		√		√		√				√	√				√
	Evaluate and estimate the quality of any water sample in terms of its hardness, alkalinity, nitrates, sulphates, total dissolved			√				√		√				√		

	solids, and dissolved oxygen .															
	Analyze the quality of ground water, potable water and waste water and predict the treatment required.	√				√			√				√		√	
CHEM-614-INSTRUMENTAL LAB I	Describe the working and handling of instruments.	√			√		√				√					√
	Demonstrate a deep practical knowledge of experiments.			√						√				√		
	Analyze the data obtained by experimental					√			√				√			

	observations.															
	Remember and Understand the procedure and experimentation.		√					√				√			√	
CHEM612 Bioinorganic and Organometallic	Describe the fundamental principles of organotransition-metal chemistry and know how chemical properties are affected by metals and ligands.		√		√		√				√					√
	Demonstrate a deep knowledge about structure and bonding issues to			√				√		√				√		

	understand the stability and reactivity of simple Bioinorganic complexes															
	Analyze the fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes	√				√			√			√	√		√	
CHEM711 Drugs and dyes	Describe the fundamentals of drugs.		√			√							√			
	Predict the relation between the structure of different class of				√		√				√					√

	drugs with the disease.															
	Outline information regarding pharmacological activity and toxicity characteristics of a given drug or drug class.			√										√		
	Propose and compose a mechanism of various dyes.	√				√			√				√			
	Differentiate and understanding of the fundamental chemical principles, underlying theories, behind the colour of organic	√						√		√		√			√	

	compounds.															
CHEM616-Advanced Quantum Chemistry	Understand and grasp the concepts and applications of quantum mechanics in the development of science and technology.		√		√		√				√	√				√
	Demonstrate knowledge of skills, techniques, principles and theories which prove to be highly beneficial for their further studies.			√				√		√				√		

	Remember, analyze and apply the concept for future research in in quantum chemical calculations and allied areas.	√				√			√				√		√	
Course Title: M.Sc. (A.C.)	CLO	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
SEMESTER 3																
Chem 701- Instrumental Methods of Analysis	Recall and demonstrate a basic understanding of the various instrumental techniques used for qualitative and quantitative analysis	√			√		√				√					√

	Apply the principles and methodology of the techniques to analysis of samples.			√						√				√		
	Analyze and interpret data based on the observations.					√			√				√			
	Predict the best method for a specific application and compare it to other methods.		√					√				√			√	
CHEM703- Instrumental Lab II	Describe the working and handling of instruments.				√		√				√					√
	Demonstrate a deep			√						√				√		

	practical knowledge of experiments.															
	Analyze the data obtained by experimental observations.	√				√			√				√			
	Remember and Understand the procedure and experimentation.		√					√				√			√	
CHEM713-Applied Chemistry Lab II	Understand simple polymers from their starting material, their synthesis and evaluate their properties.	√				√		√				√				
	Apply the knowledge and understan				√						√				√	

	ding of Synthetic Organic Chemistry in various fields.															
	Analyze active compounds from natural products.		√				√			√				√		
	Evaluate the constituents of simple drugs.			√					√				√			√
	Prepare and analyze Dyes.															
CHEM605-Industrial Chemistry	Describe the industrial importance of various products.		√			√							√			
	Demonstrate the basic knowledge of adhesives, coating				√		√				√					√

	materials, silicates materials, oil, fats, ferrous and non-ferrous and petrochemical products and their preparation, properties and commercial applications.															
	Evaluate the quality/performance of products.			√										√		
	Synthesis of anti-corrosive coating materials in lab. Establish the performance of coating	√				√			√				√			

	materials on metal surface.															
	Analyze the development and manufacturing of various useful products for enhancement of quality and improve living standards.	√						√		√		√			√	
CHEM704-Solid State Chemistry	Describe the type, nature, characteristics and optical properties of various solid materials.				√		√				√					√
	Understand and grasp the concepts and applicatio			√						√				√		

	ns of properties of various solid materials.															
	Explain the theory and application of basic technique of X-ray analysis.	√				√			√				√			
	Analyze and apply the concept/ the knowledge gained to structural elucidation.		√					√				√			√	
CHEM714- Polymer Chemistry	Describe the mechanistic insight to polymeric reactions used for synthesis.		√			√							√			
	Understands the morphology and concepts				√		√				√					√

	related to solubility, thermodynamics etc and is able to explain them.															
	Demonstrate a deep knowledge of polymeric properties and is able to analyze its relation with structure.			√				√		√		√		√		
	Evaluate the polymer properties and able to synthesize some of them in lab.	√				√			√				√		√	
CHEM615-Natural Products Chemistry	**Identify** the classes of natural products.		√			√							√			
	Understand the biogenic pathway of				√		√				√					√

	formation of a natural product compound at its source.															
	Compare and contrast various steroids, terpenoids and carbohydrates.			√										√		
	Explain their utilization for drug development and importance as a food adjunct.	√				√			√				√			
	Describe the various metabolic compounds of different classes having natural origin.	√						√		√		√			√	

Chem 706- Surface Chemistry	To master a broad knowledge in the field of surface chemistry.	√				√							√			
	Apply their knowledge of chemistry to reactions occurring at surfaces.				√		√				√					√
	They will understand adsorption and its applications in various fields.			√										√		
	Analyze and apply the concept/ the knowledge gained for surface characterization.	√				√			√				√			

	Understand and grasp the concepts and applications of various surface spectroscopic techniques.		√					√		√		√			√	
Course Title: M.Sc. (A.C.)	CLO	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**	**PLO 14**	**PLO 15**
SEMESTER 4																
MAJOR PROJECT STMJ600	NTCC															

5.2 MASTER'S-Level Programme : M.Sc Chemistry (Org/Inorg/Phy)

5.2.1Mission Statement

Programme Mission
To provide education at all levels in Chemical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.2.2 Programme Educational Objectives (PEOs)

S.No	Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of chemical sciences aligned with industry 4.0.
2	Apply the scientific concepts and knowledge to the development of new and innovative techniques in various areas of research in chemical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.

6	Develop and demonstrate the understanding of chemical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.2.3. Programme Operational Objectives (OG)

S.No	Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Create opportunities for international exposure for its students and faculty

5.2.4 Programme Learning Outcomes (PEOs):

S.No	Learning Outcomes
1	Develop knowledge and skills to integrate principles of Chemical Sciences to achieve academic excellence
2	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Chemical Sciences.
3	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Chemical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0
5	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Chemical Sciences
6	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Combine scientific creativity and reflective thinking to develop innovative ideas in Chemical Sciences for developing processes and products relevant to societal educational needs
8	Compare, contrast and analyze data in order to take appropriate and effective decisions
9	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented
10	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Practice ethical behavior and demonstrate professional integrity in their conduct
12	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	The students shall be able to define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Gain knowledge and learn skills throughout life focussing on self-directed learning using a range of sources and tools available
15	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.2.5 Programme Operational Outcomes (POOs) :

S.No	Operational Outcomes
1	Department of Chemistry will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2	Department of Chemistry will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	Department of Chemistry will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Department of Chemistry will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Department of Chemistry will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	Department of Chemistry will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Department of Chemistry will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Department of Chemistry will create opportunities for international exposure for its students and faculty.

5.2.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
M.Sc. (H) Chemistry (Org./Inorg./Phy.)							
PLO 1	X						
PLO 2	X						
PLO 3	X	X	X	X	X	X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 4				X		X	
PLO 5	X			X		X	
PLO 6			X				
PLO 7				X			X
PLO 8	X						
PLO 9		X					
PLO 10				X			X
PLO 11	X						
PLO 12		X					
PLO 13	X	X					

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 14	X	X		X			
PLO 15	X					X	X

5.2.8 Assessment of Program Learning Outcomes through Comprehensive Examination

Amity Institute of Applied Sciences (AIAS) M Sc Chemistry (Org/Inorg/Phy)																
Course Coherance Matrix																
Course Title	**CLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PLO13**	**PLO14**	**PLO15**
SEMESTER 1																
Physical Chemist	Understand and grasp the concepts and applications of physical chemistry in the development of science and technology	√		√		√										

ry I PG (CHEM 617)	Demonstrate knowledge of skills and techniques which prove to be highly beneficial for studies in analytical and physical chemistry and	√	√						√							
	Remember, analyze and apply the concept for future research in these and allied areas, such as, quantum chemistry, electrochemistry and solid state chemistry.			√		√		√								
Physical Chemistry Lab I PG (CHEM 618)	Remember and understand to determine the adsorption, colligative properties, solubility and phase equilibrium.	√		√				√								
	Understanding of handling instruments and apparatus.			√		√								√		
	Analyzing the data so obtained.			√				√	√							
	Apply the concept/ knowledge gained from the experiments for designing new experiments and also help them in their experimental research.			√				√	√							
Organic Chemistry I PG (CHEM 627)	Describe and distinguish the structural, geometric and optical isomers and apply knowledge of their structure.	√		√		√		√	√							
	Predict the aromatic, non-aromatic and anti-aromatic nature of compounds					√		√	√							
	Outline all the reactions with the reactant, reagents and products.	√	√													√
	Differentiate between substitution, addition and elimination reactions involving organic molecules.	√	√						√							
	Propose and compose a mechanism of an organic reaction involving nucleophilic and electrophilic reagents on aliphatic or aromatic molecules.	√		√					√							
Organic Chemistry Lab I PG (CHEM 628)	Describe the various mechanistic pathways leading to rearrangements.			√				√	√							
	Predict suitable reagent, oxidant or reductant to carry out desired conversions.							√	√					√		
	Apply this to the application of reagents in designing newer pathways for organic synthesis.			√				√	√					√		
	Analyze / Interpret concepts for identification of physical and chemical properties of organic molecules		√	√					√							
	Evaluate and Interpret the unknown compound by chromatographic separation.		√	√				√	√							

	Evaluate/Relate the identification of compounds to their purity			√		√		√									
Inorganic Chemistry I PG (CHEM 619)	Describe the fundamental principles of Inorganic chemistry and know how chemical properties are affected by metals and ligands.	√							√								
	Demonstrate a deep knowledge about structure and bonding issues to understand the stability and reactivity of simple Inorganic complexes.	√				√		√	√								
	Analyze the fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes		√	√				√	√								
Inorganic Chemistry Lab I PG (CHEM 620)	Describe the working and handling of instruments.			√	√	√		√									
	Demonstrate a deep practical knowledge of experiments.		√	√					√								
	Analyze the data obtained by experimental observations.	√		√		√		√									
	Remember and Understand the procedure and experimentation.			√				√	√								
Spectroscopic Methods of Analysis (CHEM 601)	Understand the major concepts, theoretical principles and experimental findings in chemistry.	√		√				√	√								
	Outline the problem-solving skills in the spectroscopic analysis of chemistry			√	√	√		√	√								
	Able to identify unknown compounds	√		√					√								
	Interpret the results of spectral data																
	Differentiate between various functional groups involving organic molecules	√				√			√								
Communication Skill							√			√	√		√	√	√		
FBL-I							√				√		√	√			
SEMESTER 2																	
Physical Chemist	Understand and grasp the concepts and applications of physical chemistry in the development of science and technology	√		√				√									

ry II PG (CHEM 623)	Demonstrate knowledge of skills and techniques which prove to be highly beneficial for studies in analytical and physical chemistry		√			√			√								
	Remember, analyze and apply the concept for future research in these and allied areas, such as, Chemical Kinetics, Molecular spectroscopy and thermodynamics		√			√			√								
Physical Chemistry Lab II PG (CHEM 624)	Remember and understand the way to determine kinetic of a reaction. They will also be able to remember and understand the potentiometric and conductometric measurements.	√		√		√		√									
	Understanding of handling instruments and apparatus.			√		√		√									
	Analyzing the data so obtained.			√		√			√								
	Analyze and apply the concept/ knowledge gained from the experiments for designing new experiments and also help them in their experimental research.			√		√			√								
Organic Chemistry II PG (CHEM 629)	Demonstrate their knowledge of pericyclic and photochemical reactions by proposing the products of photochemical and pericyclic reactions.	√		√		√											
	Describe the various mechanistic pathways leading to rearrangements.					√		√	√								
	Select suitable reagent, oxidant or reductant to carry out desired conversions.			√		√		√									
	Apply this to the application of reagents in designing newer pathways for organic synthesis.			√		√		√									
	Describe and distinguish the structural, geometric and optical isomers and apply knowledge of their structure	√		√		√		√									
Organic Chemistry Lab II PG (CHEM 630)	Describe the importance of different functional groups in organic synthesis			√		√			√								
	Predict suitable reagent, oxidant or reductant to carry out desired conversions	√				√		√			√						
	Apply this knowledge in designing newer pathways for organic synthesis.			√		√			√								
	Analyze / Interpret spectra of different natural compounds			√		√		√	√								
	Evaluate and Create the methods for identification of newly synthesized compounds with the help of spectroscopic techniques	√	√			√		√									

Inorganic Chemistry II PG (CHEM 625)	Describe and explain inorganic ring, cages, polymers and metal cluster.	√		√				√									
	Demonstrate and evaluate competing technologies using the principles of Green Chemistry along with other technical metrics.	√		√				√									
	Analyze the chemical toxicology and air pollution								√				√	√		√	
Inorganic Chemistry Lab II PG (CHEM 626)	Describe the working and handling of instruments.	√		√													
	Demonstrate a deep practical knowledge of experiments.					√			√								
	Analyze the data obtained by experimental observations.			√					√								
	Remember and Understand the procedure and experimentation.		√			√		√	√								
Medicinal Chemistry (CHEM 621)	Describe the connection between the structural features of the drugs and their physico-chemical characteristics	√				√		√						√			
	Predict how lead modification strategies can be used in drug development process and understand wide applications			√				√									
	Outline the reaction mechanisms of the mode of drug action	√				√		√							√		
	Differentiate between different concepts involved in drug design and drug interaction, drug synthesis and biological evaluation		√	√		√			√								
	Design and create new strategies and technologies in drug synthesis		√			√		√									
Solid State Chemistry (CHEM 704)	Describe the type, nature, characteristics and optical properties of various solid materials.	√							√								
	Understand and grasp the concepts and applications of properties of various solid materials	√				√											
	Explain the theory and application of basic technique of X-ray analysis			√					√								
	Analyze and apply the concept/ the knowledge gained to structural elucidation.					√			√								
	Describe the knowledge of fundamentals of various sensors .	√						√									

Chemical sensors and Biosensors (CHEM 715)	Differentiate the applications of sensors.			√												
	Predict the information regarding pharmacological activity, and toxicity characteristics of a given drug or drug class.				√			√				√		√		
	Propose and compose a sound understanding of the fundamental chemical principles, underlying theories, behind the colour of organic compounds.	√	√						√							
Behavioural Science										√	√	√			√	
FBL-II											√		√	√		
Semester III																
Instrumental Methods of Analysis (CHEM 701)	Recall and demonstrate a basic understanding of the various instrumental techniques used for qualitative and quantitative analysis.	√	√	√												
	Apply the principles and methodology of the techniques to analysis of samples.			√		√			√							
	Analyze and interpret data based on the observations					√		√	√							
	Predict the best method for a specific application and compare it to other methods.		√	√		√		√								
Polymer Chemistry (CHEM 714)	Describe the mechanistic insight to polymeric reactions used for synthesis	√		√		√										√
	Understands the morphology and concepts related to solubility, thermodynamics etc and is able to explain them.	√														
	Demonstrate a deep knowledge of polymeric properties and is able to analyze its relation with structure.	√		√		√		√								
	Evaluate the polymer properties and able to synthesize some of them in lab							√	√							√
Surface Chemistry	Master a broad knowledge in the field of surface chemistry.	√														
	Apply their knowledge of chemistry to reactions occurring at surfaces.				√											

(CHEM 706)	Understand adsorption and its applications in various fields.	√				√											
	Understand and grasp the concepts and applications of various surface spectroscopic techniques.	√		√													
	Analyze and apply the concept/ the knowledge gained for surface characterization.							√	√					√	√		
Advanced Organic Chemistry (CHEM 707)	Describe and distinguish the conventional and green methods of organic synthesis	√	√														
	Predict the methods of protection and deprotection of functional groups			√		√											
	Outline all the reactions with the reactant, reagents and products.				√			√									
	Propose and compose a method for synthesis of compounds by retro approach using various reagents	√		√		√											
	Apply this knowledge in designing newer pathways for organic synthesis.			√					√					√			
	Analyze / Interpret the components present in different natural compounds					√			√					√			
Advanced Inorganic Chemistry (CHEM 716)	describe and explain catalytic processes using an organometallic compound as a catalyst.	√	√														
	show and explain how organometallic compounds are used as catalysts in organic synthesis.	√		√		√											
	elaborate electron transport chain and its role in energy generation, nitrogen fixation and photolysis of water.				√			√									
	appreciate the role of molecular orbital theory in explaining geometry of molecules.	√		√		√											
	analyze the bonding and structural aspects of chemical species of main group elements using group theory.			√					√					√			
	Perform qualitative and quantitative analysis and analyze the results.					√			√					√			
	Operate some of the instruments and perform analysis using the same.					√								√	√		

Advanced Physical Chemistry (CHEM 719)	Describe and distinguish the Concepts of Physical Chemistry in the development of Science and Technology	√	√														
	Understand the concepts and applications of advanced physical chemistry in the development of science and technology	√	√	√													
	Demonstrate knowledge of skills and techniques which prove to be highly beneficial for studies in analytical and physical chemistry (				√		√	√									
	Remember, analyze and apply the concept for future research in these and allied areas, such as, Complex reactions in Chemical Kinetics, Advanced Electrochemistry and statistical mechanics and thermodynamics	√		√		√											
	Demonstrate the knowledge of experiments and techniques which prove to be highly beneficial for studies the physical chemistry			√		√			√						√		
	Good understanding of handling instruments, analyzing the data so obtained and apply them for future research in these areas			√		√			√						√		
Photochemistry and Pericyclic Reactions (CHEM 708)	Describe the orbital interactions that are involved in typical pericyclic reactions	√	√														
	Distinguish between the photo physical processes			√		√											
	Apply all the concepts to different applications of interest				√			√									
	Predict the course of various reactions and identify the functional group present in the product	√		√		√											
	Propose and compose mechanisms of an organic reaction different conditions			√					√						√		
Bioinorganic and Organometallic Chemistry (CHEM 612)	Describe the fundamental principles of organotransition-metal chemistry and know how chemical properties are affected by metals and ligands.	√		√													
	Demonstrate a deep knowledge about structure and bonding issues to understand the stability and reactivity of simple Bioinorganic complexes.	√		√		√											

	Analyze the fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes		√			√		√	√							
Biophysical Chemistry (CHEM 720)	Understand and grasp the concept of physical basis of biochemistry and applications of key physically-based techniques used in Biochemistry	√		√				√								
	Demonstrate and apply various physical techniques available for separation and characterization of biological molecules depending on their physical and chemical properties		√	√		√										
	Remember, analyze and apply the concept for future research in these and allied areas, such as, role of complex biomolecules in Life, chemistry of macromolecules and biological systems					√		√	√							
FBL-III											√		√	√		
Summer Internship (STSI600)										√				√	√	
Professional Ethics							√			√		√				
Community Outreach													√		√	√
Semester IV																
Introduction to Material	Describe and distinguish various materials		√			√			√							
	Predict the science behind them and the need of R & D in the field of materials			√		√			√							

Chemistry (CHEM 705)	Differentiate and interpret the data obtained for their for characterization by various advanced techniques			√	√	√			√								
	Propose and compose new materials and proceses		√			√									√		
Heterocyclic Chemistry (CHEM 710)	Demonstrate their knowledge of synthesis of heterocyclic compounds.	√															
	Co-relate structure and reactivity of heterocyclic compounds.	√		√		√											
	Select suitable reagent for synthesis of three, four, five or six membered heterocyclic compounds	√						√									
	Apply this to the application of organometallic reagents in designing newer pathways for synthesis of heterocycles.			√		√		√	√								
	Propose and compose a mechanism of an organic reaction in heterocyclic chemistry		√	√		√		√									
Spectral Techniques in Inorganic Chemistry (CHEM 718)	Describe the fundamental principles of spectrum application of Inorganic molecules and know how chemical properties are affected by metals and ligands.	√		√				√	√								
	Demonstrate a deep knowledge about structure and bonding issues to understand the stability and reactivity of simple Inorganic complexes.		√			√		√									
	Analyze the fundamentals of metalloenzyme and group theory application	√				√			√								
Advanced Molecular	Understand and grasp the concepts and applications of molecular spectroscopy, in the development of science and technology	√		√				√									
	Demonstrate knowledge of skills and techniques which prove to be highly beneficial for studies in spectroscopy and physical chemistry and	√						√							√		

Spectroscopy (CHEM 725)	Remember, analyze and apply the concept for future research in these areas, such as, rotational spectroscopy, vibrational spectroscopy, nuclear magnetic resonance spectroscopy and electronic spectroscopy			√		√			√					√			
Major Project (STSJ600)																	

5.2 MASTER'S-Level Programme : Masters of Statistics

5.2.1Mission Statement

Programme Mission
To provide education at all levels in Statistical Sciences and in the futuristic and emerging frontier areas of knowledge, learning and research aligned with industry 4.0 and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture, a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.2.2 Programme Educational Objectives (PEOs)

S.No	Educational Objectives
1	Acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of statistical sciences aligned with industry 4.0.

2	Apply the scientific concepts and knowledge to the development of new and innovative techniques in various areas of research in statistical sciences.
3	Use appropriate information and digital literacy to demonstrate the understanding of scientific principles
4	Develop and apply understanding to analyze and formulate scientific approach for solving the real-life problems and contribute to the society.
5	Demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	Develop and demonstrate the understanding of statistical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.
7	Value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability

5.2.3. Programme Operational Objectives (OG)

S.No	Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students.
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research.
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.

7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs.
8	Create opportunities for international exposure for its students and faculty.

5.2.4 Programme Learning Outcomes (PEOs):

S.No	Learning Outcomes
1	Develop knowledge and skills to integrate principles of Statistical Sciences to achieve academic excellence.
2	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to Statistical Sciences.
3	Demonstrate scientific enquiry and research aptitude in Statistical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0.
5	Formulate critical thinking, interpret and comprehend research-based knowledge to design and synthesize solutions to scientific problems in Statistical Sciences.
6	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Combine scientific creativity and reflective thinking to develop innovative ideas in Statistical Sciences for developing processes and products relevant to societal educational needs.
8	Compare, contrast and analyse data in order to take appropriate and effective decisions.
9	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.
10	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Practice ethical behaviour and demonstrate professional integrity in their conduct.
12	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations

13	Define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available.
15	Analyse and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.2.5 Programme Operational Outcomes (POOs) :

S.No	Operational Outcomes
1	Department of Statistics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2	Department of Statistics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	Department of Statistics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Department of Statistics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Department of Statistics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	Department of Statistics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.

7	Department of Statistics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Department of Statistics will create opportunities for international exposure for its students and faculty.

5.2.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
Master of Statistics							
PLO 1	X	X	X			X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 2	X	X	X			X	X
PLO 3	X			X		X	X
PLO 4	X	X				X	X
PLO 5	X	X			X	X	X
PLO 6	X	X	X	X	X	X	X
PLO 7	X	X	X			X	X
PLO 8		X	X	X	X	X	X
PLO 9		X	X		X		X
PLO 10			X	X		X	X
PLO 11				X	X	X	X

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 12		X	X	X	X	X	X
PLO 13	X	X					
PLO 14	X	X		X			
PLO 15	X					X	X

5.2.9 Assessment of Program Learning Outcomes through Comprehensive Examination

Amity Institute of Applied Sciences (AIAS)

Course Coherence Matrix (M.Stat)

Course Title	PLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15

Advance Real Analysis (STAT602)	**CLO 1:** Relate the methods used to summarize the continuity of functions.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understandi ng of the concepts of real analysis.	X					X		X			X				
	CLO 3: Apply tools of real analysis to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Probability Theory (STAT605)	**CLO l:** Relate the methods used to summarize data sets and concepts of probability theory including distributions.	X		X					X		X		X			

	CLO 2: Demonstrate the conceptual understanding of Probability distributions.	X					X		X			X				
	CLO 3: Apply tools of probability theory to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the		X	X		X			X							

	problems effectively.															
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Statistical Methods (STAT613)	**CLO 1:** Relate the methods of statistical analysis to estimate the output of the problems under study.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of various	X					X		X			X				

	statistical methods for analysis of different data sets.															
	CLO 3: Apply statistical methods to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							

	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Optimization Techniques and Applications (STAT621)	**CLO 1**: Relate the methods of optimization techniques to the data sets for analysis.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of different type of optimization techniques and their applications.	X					X		X			X				

	CLO 3: Apply various optimization techniques to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial,		X	X				X	X						X	

	field based and real-life problems.															
Advance Statistical Inference-I (STAT625)	**CLO 1:** Relate the various statistical inference techniques with the statistical problems under study.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of different inferential techniques.	X					X		X			X				
	CLO 3: Apply inferential techniques to industrial, field based	X	X		X				X		X					

	and real-life problems.															
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	

Statistical Lab-I (STAT635)	**CLO 1:** Relate the methods statistical analysis to find the output of the problems under study.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of various statistical tools.	X					X		X			X				
	CLO 3: Apply statistical techniques to industrial and field, based problems.	X	X		X				X		X					
	CLO 4: Analyze industrial and field,	X	X	X	X	X			X					X		

	based problems.															
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial problems.		X	X				X	X						X	
Statistical Lab-II (STAT624)	**CLO 1:** Relate the programming techniques of R to analyze different type of data sets.	X		X					X		X		X			

	CLO 2: Demonstrate the graphics in R and SPSS.	X					X		X			X				
	CLO 3: Apply tools of R to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems with R.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis by different techniques of the problems effectively.		X	X		X			X							

	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Advance Sampling Theory (STAT632)	**CLO 1:** Relate the concept of sampling and various sampling techniques.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of sampling and sampling techniques.	X					X		X			X				

	CKO 3: Apply tools of sampling and its basic principles to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze the collected samples from industries and surveys.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results		X	X				X	X						X	

	related to the industrial, field based and real-life problems.															
Linear Model and Regression Analysis (STAT633)	**CLO 1:** Relate the linear models and regression analysis techniques to analyze different type of data sets.	X		X					X		X		X			
	CLO 2: Demonstrate the linear modelling and regression analysis techniques.	X					X		X			X				
	CLO 3: Apply tools of modelling and regression	X	X		X				X		X					

	analysis to industrial, field based and real-life problems.															
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis by different techniques of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based		X	X				X	X						X	

	and real-life problems.															
Mathematical Demography (STAT642)	**CLO 1:** Relate the various mathematical techniques to demographic data.	X		X					X		X		X			
	CLO 2: Demonstrate the application of mathematical tools to the demographic problems.	X					X		X			X				
	CLO 3: Apply tools of mathematical demography to field based	X	X		X				X		X					

	and real-life problems.															
	CLO 4: Analyze field based and real-life demographic problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from demographic data.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the various demographic problems.		X	X				X	X						X	
Advance Biostatistics (STAT643)	**CLO 1:** Relate the methods	X		X					X		X		X			

	used to summarize biostatistical data sets.															
	CLO 2: Demonstrate the conceptual understanding of biostatistical tools and various types of data.	X					X		X			X				
	CLO 3: Apply biostatistical techniques and principles to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Advance Statistical Inference-II (STAT701)	**CLO 1:** Relate the various statistical inference techniques with the statistical problems under study.	X		X					X		X		X			

	CLO 2: Demonstrate the conceptual understanding of different inferential techniques.	X					X		X			X				
	CLO 3: Apply inferential techniques to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis of the		X	X		X			X							

	problems effectively.															
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Stochastic Processes and Applications (STAT711)	**CLO 1:** Relate the various stochastic processes and its tools to summarize data sets.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understandi ng of various	X					X		X			X				

	stochastic processes and their applications.															
	CLO 3: Apply tools of sotchastic processes to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							

	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Statistical Quality Control (STAT714)	**CLO 1:** Relate the methods used to summarize data sets including common graphical tools such as mean-chart, c-chart, p-chart, etc.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of quality	X					X		X			X				

	control techniques.															
	CLO 3: Apply tools of descriptive Statistics and basic probability principles to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							

	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Statistical Lab- III (STAT702)	**CLO 1:** Relate the programmin g techniques of R to analyze different type of data sets.	X		X					X		X		X			
	CLO 2: Demonstrate the graphics in R.	X					X		X			X				
	CLO 3: Apply tools of R to industrial, field based and real-life problems.	X	X		X				X		X					

	CLO 4: Analyze industrial, field based and real-life problems with R.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis by different techniques of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Multivariate Analysis (STAT705)	**CLO 1:** Relate the methods	X		X					X		X		X			

	used to summarize multivariate data sets.															
	CLO 2: Demonstrate the conceptual understanding of multivariate data.	X					X		X			X				
	CLO 3: Apply tools of multivariate analysis to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Survival Analysis (STAT715)	**CLO 1:** Relate the methods used to analyze the survival of human and industrial systems.	X		X					X		X		X			

	CLO 2: Demonstrate the conceptual understanding of survival analysis of different types of objects.	X					X		X			X				
	CLO 3: Apply tools of survival analysis and basic probability principles to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Modelling and Simulation (STAT722)	**CLO 1:** Relate the methods of modelling and simulation to analyze the problem under study.	X		X					X		X		X			

	CLO 2: Demonstrate the conceptual understanding of statistical modelling and simulation of different types of data.	X					X		X			X				
	CLO 3: Apply tools of modelling and simulation to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze and simulate the outputs of industrial, field based and real-life problems.	X	X	X	X	X			X					X		

	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Design and Analysis of Experiments (STAT741)	**CLO 1:** Relate the basic principles of design of analysis.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understandi	X					X		X			X				

	ng of design of experiment tools to different types of data.															
	CLO 3: Apply tools of design of experiments to agricultural, industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze agricultural, industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO5: Evaluate the results obtained from analysis of the		X	X		X			X							

	problems effectively.															
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	
Data Analysis using PYTHON (STAT742)	**CLO 1:** Relate the programming techniques of Python to analyze different type of data sets.	X		X					X		X		X			
	CLO 2: Demonstrate the graphics in Python.	X					X		X			X				

	CLO 3: Apply tools of Python to industrial, field based and real-life problems.	X	X		X				X		X					
	CLO 4: Analyze industrial, field based and real-life problems with Python.	X	X	X	X	X			X					X		
	CLO 5: Evaluate the results obtained from analysis by different techniques of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the		X	X				X	X						X	

	industrial, field based and real-life problems.															
Theory of Econometrics (ECON735)	**CLO 1:** Relate the methods used to summarize statistical and economic data sets.	X		X					X		X		X			
	CLO 2: Demonstrate the conceptual understanding of econometrics to different types of data.	X					X		X			X				
	CLO 3: Apply basic principles and tools of econometrics to industrial,	X	X		X				X		X					

	field based and real-life problems.															
	CLO 4: Analyze industrial, field based and real-life problems.	X	X	X	X	X			X					X		
	CLO5: Evaluate the results obtained from analysis of the problems effectively.		X	X		X			X							
	CLO 6: Predict the required suitable results related to the industrial, field based and real-life problems.		X	X				X	X						X	

5.2 MASTER'S-Level Programme : M.Sc Applied Physics

5.2.1Mission Statement

Programme Mission
To provide education at all levels in Physical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.2.2 Programme Educational Objectives (PEOs)

S.No	Educational Objectives
1	Become educated citizens who, as physicist contribute by applying, ethically, their specialized knowledge to the educational, Scientific, cultural, social, technological and economic development of their societies.
2	Demonstrate a combination of analytical, computational, and experimental knowledge and skills to make them competitive within the science domain.
3	To apply the theoretical scientific concepts and knowledge to the development of new and innovative techniques in various areas of research.
4	To communicate effectively the knowledge gained with originality and presentation skills and develops a practical hand in laboratory work.
5	Demonstrate communication skills in English and Foreign language that enable them to effectively participate and contribute in both linguistic environments.

6	Value the importance of lifelong learning as demonstrated by pursuing postgraduate studies, being involved in higher studies, research organizations, professional societies, or pursuing scientific advancement and success.
7	value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach, and scientific advancement to get success and employability according to industry 4.0.

5.2.3. Programme Operational Objectives (OG)

S.No	Operational Objectives
1	Create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students.
2	Provide professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research.
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs.
8	Create opportunities for international exposure for its students and faculty.

5.2.4 Programme Learning Outcomes (PEOs):

S.No	Learning Outcomes
1	Develop knowledge and skills to integrate principles of Physical Sciences to achieve academic excellence.
2	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to physical Sciences.
3	Demonstrate scientific enquiry and research aptitude through conduct of innovative research in thrust areas of Physical Sciences which will benefit the society and enhance the intellectual capital of the Domain of Science & Technology.
4	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0.
5	Formulate critical thinking, interpret and comprehend research-based knowledge to provide solutions to scientific problems in Physical Sciences.
6	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Combine scientific creativity and reflective thinking to develop innovative ideas in Physical Sciences for developing processes and products relevant to societal educational needs.
8	Compare, contrast and analyze data in order to take appropriate and effective decisions.
9	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.
10	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Practice ethical behavior and demonstrate professional integrity in their conduct.
12	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available.
15	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.2.5 Programme Operational Outcomes (POOs) :

S.No	Operational Outcomes
1	Department of Physics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2	Department of Physics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	Department of Physics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Department of Physics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Department of Physics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	Department of Physics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Department of Physics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Department of Physics will create opportunities for international exposure for its students and faculty.

5.2.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
M.Sc Applied Physics							
PLO 1	X	X	X	X	X	X	
PLO 2				X		X	
PLO 3	X			X		X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 4			X				
PLO 5				X			X
PLO 6	X						
PLO 7		X					
PLO 8				X			X
PLO 9	X						
PLO 10		X					
PLO 11	X						
PLO 12		X					
PLO 13	X			X	X	X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 14	X						
PLO 15	X						

5.2.10 Assessment of Program Learning Outcomes through Comprehensive Examination

Semester-I	Course Learning outcomes	Course Competency	Indicators	Assessment Based on Bloom Taxonomy	GA1 / PLO1	GA2 / PLO2	GA3 / PLO3	-	-	-	GA15 / PLO15

Semester Course Title				**Rememberin**	**Understandi**	**Applying**	**Analyzing**	**Evaluating**	**Creating**							
Course Title -1 : Calculus and Matrices	CLO1:	**1.1**..Demonstrate the ability to solve real world problem using Calculus.	**1.1.1** Perform operation with various form of complex number to solve indica1tors **1.1.2**													
		1.2	**1.2.1**													
	CLO2															
	CLOn															
Course Title -2	CLO1															
	CLOn															
Course Title -n																

5.2 MASTER'S-Level Programme : M.Sc Applied Mathematics

5.2.1Mission Statement

Programme Mission
To provide education at postgraduate levels in Mathematical Sciences & Technology and in the futuristic and emerging frontier areas of knowledge , learning and research and to develop the overall personality of students by making them not only excellent professionals but also good individuals, with understanding and regards for human values, pride in their heritage and culture , a sense of right and wrong and yearning for perfection and imbibe attributes of courage of conviction and action.

5.2.2 Programme Educational Objectives (PEOs)

S.No	Educational Objectives
1	acquire a combination of theoretical, conceptual, analytical, computational, and experimental knowledge and skills in the field of mathematical sciences aligned with industry 4.0.
2	demonstrate the scientific concepts and knowledge to the development of new and innovative techniques in mathematical sciences.
3	use appropriate information and digital literacy to demonstrate the understanding of scientific principles.
4	develop and apply understanding to analyze and formulate scientific approach for solving the real life problems and contribute to the society.
5	demonstrate professional attitudes, effective communication and behavioral skills and demonstrate professional ethics and academic integrity as an individual/team member/leader in diverse teams.
6	develop and demonstrate the understanding of mathematical sciences in context of global environment and will be able to relate scientific issues to the broader social, economic, legal, cultural and environmental aspects.

7	value the importance of life-long learning as demonstrated by pursuing higher studies, multidisciplinary approach and scientific advancement to get success and employability.

5.2.3. Programme Operational Objectives (OG)

S.No	Operational Objectives
1	Create appropriate teaching learning resources, infrastructure, and conducive environment for excellence in teaching, learning, research, and professional development of students
2	Provide professional development Programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research
3	Demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Continuously strive to build strong industry interaction, alumni networks, and empanelment of expertise from industry.
5	Continually improve the quality of facilities, services, resources, and processes with an aim to attain national and international accreditation and institutional ranking.
6	Arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Create opportunities for international exposure for its students and faculty.

5.2.4 Programme Learning Outcomes (PEOs):

S.No	Learning Outcomes

1	Develop knowledge and skills to integrate principles of mathematical sciences to achieve academic excellence.
2	Choose self–directed and active learning through strong intellectual engagement in independent work relevant to mathematical sciences.
3	Demonstrate scientific enquiry and research aptitude in Mathematical sciences.
4	Efficiently use and apply information and communication technologies and participate in collaborative networks for developing requisite skills of Industry 4.0.
5	Formulate critical thinking, interpret, and comprehend research-based knowledge to design and synthesize solutions to scientific problems in mathematical sciences
6	Employ effective listening and communication skills to enhance interpersonal relationship.
7	Combine scientific creativity and reflective thinking to develop innovative ideas in mathematical sciences for developing processes and products relevant to societal educational needs.
8	Compare, contrast and analyze data to take appropriate and effective decisions.
9	Attain leadership skills and perform responsibly as an individual as well as in a team while being accountable and result oriented.
10	Demonstrate competence in a cross-cultural environment and evolve as a responsible global citizen.
11	Practice ethical behavior and demonstrate professional integrity in their conduct.
12	Acquire social and emotional skills to work effectively with diverse and inclusive group of people in multi-cultural environment and situations.
13	Define their career aspirations and work towards achieving the same by engaging in developing appropriate skills and competencies in their chosen profession (corporate career, student start up, family business, higher education etc.).
14	Gain knowledge and learn skills throughout life focusing on self-directed learning using a range of sources and tools available
15	Analyze and implement the initiative to conserve natural resources and use sustainable technologies by using knowledge and experience of their discipline.

5.2.5 Programme Operational Outcomes (POOs) :

S.No	Operational Outcomes
1	Department of Mathematics will create appropriate teaching learning resources, infrastructure and conducive environment for excellence in teaching, learning, research and professional development of students as per the requirement of industry 4.0.
2	Department of Mathematics will provide Professional development programmes/opportunities to the faculty and staff to regularly upgrade their knowledge and skills and bring excellence in teaching, learning and research to meet the requirement of industry 4.0
3	Department of Mathematics will demonstrate sensitivity to the diverse needs of students and accordingly develop facilities and services.
4	Department of Mathematics will continuously strive to build strong industry interaction, alumni networks and empanelment of expertise from industry.
5	Department of Mathematics will continually improve the quality of facilities, services, resources and processes with an aim to attain national and international accreditations and institutional ranking.
6	Department of Mathematics will arrange all necessary support system for the students to facilitate campus recruitment, higher education or starting their own ventures.
7	Department of Mathematics will act ethically to ensure transparency and good governance while discharging various responsibilities to its stakeholders and execution of policies and programs
8	Department of Mathematics will create opportunities for international exposure for its students and faculty.

5.2.6 Mapping of Programme Learning Outcomes to Programme Educational Objectives (PEOs):

Note:

- ✓ **in a given cell of the table indicates the intended learning outcome in that row is associated with the learning goal in that column**):

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
BACHELOR'S/ MASTER'S LEVEL PROGRAMS							
M.Sc Applied Mathematics							
PLO 1	X	X	X				X
PLO 2	X	X	X				X
PLO 3				X	X		
PLO 4	X	X	X			X	

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 5				X		X	
PLO 6					X	X	
PLO 7					X	X	
PLO 8							
PLO 9				X	X		
PLO 10							
PLO 11			X		X		
PLO 12			X			X	
PLO 13	X	X					
PLO 14	X	X		X			

Programme Educational Objectives(PEOs) / Programme Learning Outcomes (PLOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6	PEO7
PLO 15	X					X	X

5.2.11 Assessment of Program Learning Outcomes through Comprehensive Examination

Amity Institute of Applied Sciences ,Department of Mathematics

Outcome Assessment Plan – 2021-22

Course Coherance Matrix ,M.Sc(AM)															
Course Title	**PLO**	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PLO13**	**PLO14**	**PLO15**
Special Functions [MATH704]	**CLO 1**: Relate basic knowledge of mathematics with applied aspects for developing quantitative skills.	√				√									√	
	CLO 2: Understand to use various special functions like Legendre, Bessel, Hermite and Laguerre in the context of PDE's.	√	√												√	
	CLO 3: Demonstrate problem solving skills for solving various types of differential equation of special functions using different methods.			√	√						√					

	CLO 4: Analyze and evaluate new results using various techniques.	√	√			√		√	√							√
	CLO 5: Apply the concepts in the other branches of Mathematics such as Quantum Mechanics, Electro-Static problems, Structure of Hydrogen atom, Nuclear Physics, etc		√	√		√								√		
Partial Differential Equations & Boundary Value Problems [MATH634]	**CLO 1:** Implement the techniques for solving partial differential equations.	√				√									√	
	CLO 2: Understand existence, uniqueness and other properties of solution of partial differential equations	√	√					√	√						√	

	CLO 3: Make use of geometrical interpretation of differential equation and apply techniques of differential equations to solve real life problems			√	√						√					
	CLO 4: Learn the methods to calculate, compare and interpret the results obtained in other disciplines and determine whether the solutions are reasonable.	√	√			√		√	√							√

	CLO 5: Design and develop various opportunities for correlating the solutions of partial differential equations to different physical problems.		√	√		√			√					√		

SECTION VI:
DOMAIN OPERATIONAL OUTCOMES & OPERATIONAL ASSESSMENT PLAN

6. Operational Assessment

6.1 Operational Outcomes

S. No.	Operational Outcomes
1.	DST will encourage faculty to use appropriate methodology and pedagogical tools for teaching, learning and development of students.
2.	The curriculum is contemporary, developed in collaborative consultation with all the stakeholders, benchmarked with global standards and relevant to the industry requirements.
3.	The students of DST will graduate in timely manner.
4.	DST shall maintain appropriate academic facilities and technological Resources for teaching and learning.
5.	The students of DST will participate in Co Curricular and Extra Curricular activities.
6.	Faculty will be engaged in scholarly and professional activities in order to enhance their competencies and to contribute to the existing Body of Knowledge.
7.	The DST will integrate ethics and values in teaching, theory and practice, develop and retain excellent students, faculty and staff.
8.	DST will facilitate joint research collaborations; invite international delegates and speakers for seminars and conferences and various other opportunities for global exposure.

9.	DST will be continuously engaged in developing/ reviewing processes, policies and systems to achieve prestigious accreditations from various national, international bodies and ranking bodies.
10.	DST will develop and maintain strong relationship with corporate and support all the students for quality placements or join family business or start their own venture.

6.2 Operational Outcome Assessment Plan

S. No.	**Operational Objectives**	**Operational Outcomes**	**Assessment Measures/Methods for Operational Outcomes**	**Performance Objectives (Targets/Criteria)**
1	DST intends to facilitate academically conducive environment and infrastructure to achieve excellence in teaching, learning and research.	• DST will encourage faculty to use appropriate methodology and pedagogical tools for teaching, learning and development of students. • The students of DST will graduate in timely manner.	• Student feedback of course faculty. • Faculty qualification and experience files. • Graduation rate in convocation report. - on completion of Registration period (N) during extended period	• All faculty shall have a minimum criteria of greater than 70% overall score in student feedback. • All faculty to be either M.Tech/PhD or shall have industry experience.

			(N+1+1 for PG and N+2+1 for UG)	• At least 80% students shall graduate on completion of Registration period (N) • 80% of remaining students shall pass during extended period (N+1+1 for PG and N+2+1 for UG)
2	DST will provide ample opportunities to its students to participate in curricular, co-	• The students of DST will participate in Co-Curricular and Extra Curricular activities	• Functional and area specific club, Committees, Sports Events, co-curricular and extracurricular activities and	• Every student shall be a part of at least one Club or Committee or

SECTION VII:

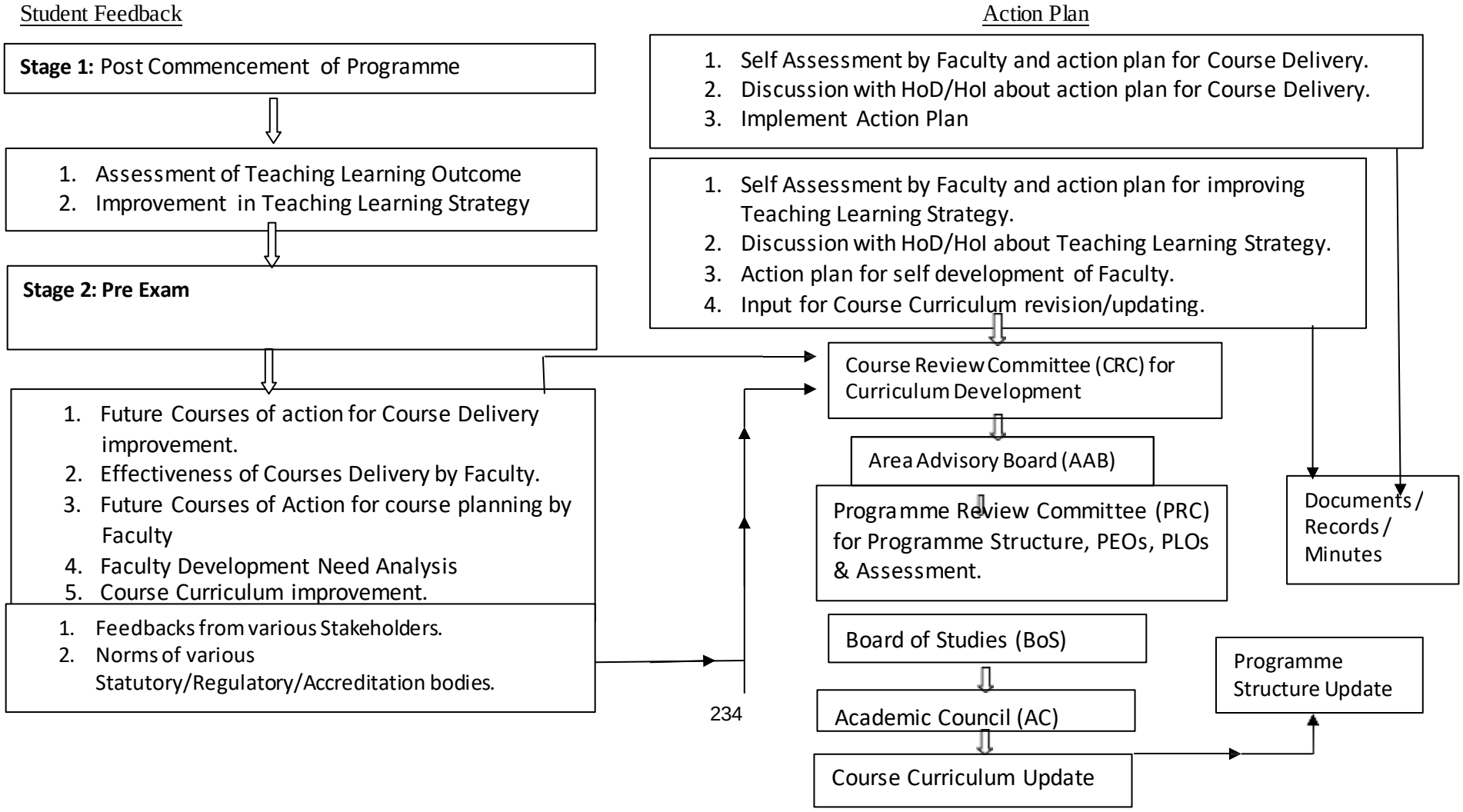
7.1 Linkage of Outcomes Assessment with Strategic Planning

Provide a narrative that describes the ways in which the results from implementing your outcomes assessment plan (i.e., changes and improvements needed) are linked to the strategic planning processes of the academic business unit and the institution.

Faculty of Science And Technology

- Objectives set by University Planning Committee
- Objectives with high priority in strategic planning for desired outcomes

STRATEGIC PROCESS OF CONTINUOUS IMPROVEMENTS



8.1 Format of Assesment Tools:

8.1.1 Rubrics for Behavioural Science (UG – 3 Year Programme)

Assessment Tool-UG/PLO6/BS/ BEHAVIOURAL SCIENCE

AMITY UNIVERSITY
UTTAR PRADESH

Faculty ofScience &Technology

GUIDELINE FOR RUBRICS FOR ASSESMENT OF LEARNING OUTCOMES OF BEHAVIOURAL SCIENCE COURSE FOR 3 YEAR B.Sc. PROGRAMMES

Assessment Parameters:

- *Leadership skills*
- *Interpersonal skills*
- *Team spirit*
- *Impression Management*
- *Good Character and Value based Behavior*
- *Learning for Excellence*
- *Stress Management*
- *Conflict management*
- *Lifelong learning*

SCORING:

- If the student's performance is **unsatisfactory** on a criteria, he scores 0
- If the student's performance is **needs improvement** on a criteria, he scores 1
- If the student's performance is **satisfactory** on a criteria, he scores 2
- If the student's performance is **proficient** on a criteria, he scores 3
- If the student's performance is **distinguished** on a criteria, he scores 4

TOOLS USED FOR ASSESSMENT:

- Social Awareness Programme
- Journal of Success (JOS)
- Participation and Interaction in the class
- Psychometric assessment
- Participation in various extra-curricular & co-curricular activities

COMPOSITION OF ASSESSMENT BOARD

- Behavioral Science Faculty
- Program Leader/ Program Co-coordinator
- One Core Faculty

SCORE SHEET: INDIVIDUAL

If the student scores between	Outcome Attainment Levels
<28	Needs improvement
28-37	Satisfactory
38-46	Partly Achieved
47-56	Fully Achieved

SCORE SHEET :PROGRAMME/ BATCH

Outcome Attainment Levels	Percentage of Students
Needs improvement	
Satisfactory	
Partly Achieved	
Fully Achieved	

Behavioral Science – UG

Name:_____ **Enrolment No.:**_____

Programme:_____

S.NO	**Description of Rubrics**	**UNSATISFACTORY (0)**	**NEEDS IMPROVEMENT (1)**	**SATISFACTORY (2)**	**PROFICIENT (3)**	**DISTINGUISHED (4)**	**Score**
1	Able to Understand Self with reference to strength and Weakness	The JOS Does not reflect the conceptual understanding	The JOS slightly reflects the conceptual understanding	The JOS moderately reflects the conceptual understanding	The JOS mostly reflects the conceptual understanding	The JOS completely reflect the conceptual understanding	
2	Able to display and demonstrate Self Confidence	The individual's JOS did not cover relevant information of the application based learning	The individual's JOS slightly covered relevant information of the application based learning	The individual's JOS somewhat covered relevant information of the application based learning	The individual's JOS mostly covered relevant information of the application based learning	The individual's JOS completely covered relevant information of the application based learning	
3	Able to apply the techniques of Impression management	The individual did not demonstrate critical thinking and analytical ability in reference techniques of Impression management	The individual did not demonstrate critical thinking and analytical ability in reference to techniques of Impression management	The individual somewhat demonstrated critical thinking and analytical ability in reference to techniques of Impression management	The individual mostly demonstrated critical thinking and analytical ability in reference to techniques of Impression management	The individual completely demonstrated critical thinking and analytical ability in reference to techniques of Impression management	
4	Able to recognize and manage Individual Differences	The individual did not demonstrate critical thinking and analytical ability in managing Individual Differences	The individual did not demonstrate critical thinking and analytical ability in managing Individual Differences	The individual somewhat demonstrated critical thinking and analytical ability in managing Individual Differences	The individual mostly demonstrated critical thinking and analytical ability in managing Individual Differences	The individual completely demonstrated critical thinking and analytical ability in managing Individual Differences	

5	Able to Learn and Play in Groups	The individual did not initiate and exhibit the clarity in terms of Group Dynamics	The individual slightly initiated and did exhibit the clarity in terms of better than low Group Dynamics	The individual initiated and did exhibit average on the clarity in terms Group Dynamics	The individual initiated and did exhibit moderately on demonstration of Group Dynamics	The individual effectively initiated and did exhibit average high on demonstration Group Dynamics	
6	Able to apply creative thinking in Various situations of Problem Solving	The individual was not able to apply creative thinking in various Problem solving situation	The individual tried to apply creative thinking in various problem solving situation	The individual could somewhat apply creative thinking in various problem solving situation	The individual could moderately apply creative thinking in various problem solving situation	The individual could completely apply creative thinking in various problem solving situation	
7	Able to demonstrate good character and value based behavior in various situations.	The individual could not demonstrate good character and value based behavior in various situations.	The individual initiated to demonstrate good character and value based behavior in various situations.	The individual could somewhat demonstrate good character and value based behavior in various situations.	The individual could moderately demonstrate good character and value based behavior in various situations.	The individual completely demonstrated good character and value based behavior in various situations.	
	Able to apply positive emotions for creating healthy climate.	The individual could not apply positive emotions for creating healthy climate.	The individual could slightly apply positive emotions for creating healthy climate.	The individual could somewhat apply positive emotions for creating healthy climate.	The individual could moderately apply positive emotions for creating healthy climate.	The individual could completely apply positive emotions for creating healthy climate.	
9	Able to demonstrate the learning of excellence	The individual could not demonstrate the learning of excellence	The individual could slightly demonstrate the learning of excellence	The individual could somewhat demonstrate the learning of excellence	The individual could moderately demonstrate the learning of excellence	The individual could completely demonstrate the learning of excellence	

10	Able to learn and practice their personal success strategies.	The individual scored low in demonstration of practicing their personal success strategies.	The individual slightly scored relatively better than low in demonstration of practicing their personal success strategies.	The individual scored average on demonstration of practicing their personal success strategies.	The individual initiated and scored moderately on demonstration of practicing their personal success strategies.	The individual effectively initiated and scored high on demonstration of practicing their personal success strategies.	
11	Able to apply behavioral communication for effective leadership.	The individual could not apply behavioral communication for effective leadership.	The individual could initiate the application of behavioral communication for effective leadership.	The individual could slightly apply behavioral communication for effective leadership.	The individual could moderately apply behavioral communication for effective leadership.	The individual could fully apply behavioral communication for effective leadership.	
12	Able to demonstrate value based insights to deal effectively in personal and professional life	The individual was not able to demonstrate value based insights to deal effectively in personal and professional life.	The individual could initiate the demonstration of value based insights to deal effectively in personal and professional life.	The individual could slightly demonstrate value based insights to deal effectively in personal and professional life.	The individual could moderately demonstrate value based insights to deal effectively in personal and professional life.	The individual could fully demonstrate value based insights to deal effectively in personal and professional life.	
13	Able to manage their stress in healthy manner	The individual was not able to manage their stress in healthy manner	The individual could initiate the management of stress in a healthy manner.	The individual could slightly manage the stress in healthy manner.	The individual could moderately manage stress in a healthy manner.	The individual could completely manage stress in a healthy manner.	

If the student scores between	Outcome Attainment Levels
<=25	Needs improvement
26-34	Satisfactory
35-43	Partly Achieved
44-52	Fully Achieved

Signature of BS Faculty Leader | Signature of Core Course Faculty | Signature of Programme

8.1.2 Assesment Tool & Rubrics For Business Communication –UG 3 Year Programme

Assessment Tool-UG/PLO 05/BS/ BUSINESS COMMUNICATION

Amity University, Uttar Pradesh
Amity Institute of English Studies and Research

RUBRICS FOR BUSINESS COMMUNICATION- UG

THE THREE ASPECTS OF BUSINESS COMMUNICATION-VERBAL COMMUNICATION INCLUDING ORAL AND WRITTEN COMMUNICATION AND NON-VERBAL COMMUNICATION HAS BEEN DEALT WITH IN THE RUBRICS.

OBJECTIVES: The objective is to enable receivers to

(i) develop information and understanding,
(ii) discourage misinformation, ambiguity,
(iii) encourage social relations and
(iv) develop proficiency in varied forms of communication.

Components	Unsatisfactory	Intermediate	Satisfactory	Proficient	Distinguished
Content (Collection & Organisation)	• Learner fails to adhere to guidelines • Inability of students and improper usage of poorly selected resources	• Learner collects and organizes content as per instructions • Ability of students to select resources and derive content as per the subject	• Learner collects and organizes content as per instructions and improves on it. • Increased ability of students to select resources and derive content as per the subject	• Collection and organisation of content is innovatively done as per the given time frame/ duration • Efficiency of students in identifying and acknowledging resources is evident	• Perfect and unique collection and organization of content • Proficiency of students in identifying and acknowledging resources
	• Incapabilit	• Adequate	• Increased	• Impressive	• Capability

Presentation & Delivery	y of learner to initiate • Halting and mumbling delivery with forced pauses and weak conclusions	initiation of presentation by the learner • Improved presentation with adequate conclusion	ability of learner to coherently initiate the presentation • Fluent presentation with satisfactory conclusion	opening of the argument by the learner • Efficient oratory with confident rhetoric and apt conclusion	of a confident and suave initiation • Fluent oratory with persuasive rhetoric and apt conclusion
Linguistic Accuracy (Pronunciation, Articulation, Intonation, Diction)	• Improper usage of scientific terms and inappropriate grammar and accent • Intonation is not always correct	• Comparatively better usage of scientific terms and better grammar and accent, with some exceptions • Intonation is more or less correct	• Usage of appropriate grammar and accent, with some exceptions • Intonation is correct	• Usage of appropriate accent & grammar • The intonation is accurately used	• Perfection in usage of grammar, accent and diction. • Intonation is capable of delivering the desired meaning.
Extemporaneity	• Inability of learner to fathom audience reaction • Ineffective handling of barriers/communication aids	• Student falls short of managing the audience perfectly • Inappropriate control of barriers/communication aids	• Perfect management of audience by the learner • Appropriate control of barriers/communication aids	• Switching the presentation style according to the audience response • Effective handling of barriers/communication aids	• Perfection in presentation style and adept handling of audience response • Adequate and efficient handling of barriers/communication aids
Non-Verbal Communication (KOPPACT)	• Student demonstrates inappropriate body language • Erratic eye contact discomforts the audience	• Student delivers increasingly appropriate postures, gestures and facial expressi	• Student delivers appropriate postures, gestures and facial expressions	• Student carries near perfect postures, gestures &facial-expressions • Empathetic eye contact with the listeners is	• Student carries perfect body language • Sensible and empathetic eye contact with the listeners is maintained. • Tone, pitch

	• Paralinguistic aspects are not compatible with the spoken word • Inadequate understanding of visual codes	ons • Eye contact is often with disruptions • Enhanced compatible delivery of spoken words and unspoken signals • Increased proficiency in comprehension of visual codes	• Eye contact is often with seldom disruptions • Compatible delivery of spoken words and unspoken signals • Developing proficiency in comprehension of visual codes	maintained, as required • Tone of voice, pitch and tempo are complementary • Developed proficiency in understanding and comprehension of visual codes.	and tempo complement the message • Proficiency in understanding and comprehension of visual codes
Rapport with the receiver	• Responsiveness to audience is inadequate • Disinterestedness is articulated in words and manners	• Generally responsive • Interest is articulated in words and manners	• Increasingly responsive • Enhanced identification with the audience in words and manners	• Learner maintains responsiveness towards the audience • Empathy is articulated in words and manners	• Perfection in responsiveness towards the audience • Increased empathy is articulated in words and manners
Content of Written Communication	• Inability to understand simple texts • Unorganized content with unclear beginning and inappropriate ending.	• Skillful enough to comprehend simple texts • Developing simple content with relevant minor and major supporting details	• Skilled to comprehend complex texts • Developing structurally complex and apt content	• Developed acumen in immediacy and economic feasibility in writing • Proficiency in developing content	• Expertise in comprehension and feasibility in all aspects of writing • Efficiency, flexibility and accuracy in developing content

Grammar	• Incorrect usage of the basic grammar items like tense, voice change and narration etc. • Incoherent short paragraphs	• Developed and increasingly correct usage of simple grammatical items • Framing simple sentences accurately	• Increasingly correct usage of complex grammatical items • Framing complex and compound sentences accurately	• Structurally correct in business writing • Relevant use of technical terms and efficiency in using functional grammar	• Semantically and structurally correct in business writing • Coherent and relevant use of jargons and plain English in functional grammar
Expression: Syntactic, Semantic and Lexical	• Incapability to frame semantically correct sentences and paragraphs. • Inaccurate sentence structures with lexical ambiguity	• Ability to form accurate and semantically relevant sentences and paragraphs. • Less clarity in thought and expression	• Ability to form syntactically accurate and semantically relevant sentences and paragraphs. • Clarity in thought and expression	• Accurate style, form and originality in writing paragraphs • Writing effective e-mails, reports, articles and drafting Policies	• Appropriate and perfect style and creativity in writing • Effective and efficient writing of all technical documents
Critical Thinking	• Inability to identify arguments • Very little knowledge of evaluating them.	• Ability of argument identification • Analyzing and evaluating texts	• Enhanced ability of identification of arguments • Assessing and evaluating texts	• Persuasive writing • Expository writing	• Proficiency of persuasive writing with confidence • Analyzing and assessin texts

					y and logicall y
Creativity	• Lack of sense of achieving delight and understan ding literature. • Lack of respect and admiration for creative skills.	• Developi ng a creative bent of mind • General interest and admirati on for creative skills	• Incorpo ration of creativit y in writings • Aspirin g to be creative in all works	• Writin g short stories with compl ex plots, develo ping cases, Featur e writing • Writin g a busine ss plan, screen writing , writing telescri pts etc.	• Creatin g and evaluati ng original literary works, • Framin g original literary content and ability to write accordi ng to the situatio n, i.e. fiction writing and emotive writing
Contextua l Writing	• Inability to identify the context of writing • No skill to describe the theme with precision.	• Identific ation of formal and informal context • Developi ng impactfu l content	• Increase d identific ation of formal and informa l context • Develo ped content which is original	• Case based writing , Abstra ct and Synop sis writing , Thesis writing • Origin ality and impact ful creatio n of conten t	• Analysi s and constru ctive criticis m of works • Use of good rhetoric , genre and design in differen t professi onal writing

8.1.3 Rubrics for Foreign Business Language – UG

Assessment Tool-UG/PLO 07/D/FBL

FACULTY OF SCIENCE & TECHNOLOGY

RUBRICS FOR ASSESMENT OF FOREIGN BUSINESS LANGUAGE FOR UNDER GRADUATE PROGRAMME

Assessment Parameters:

- *Language*
- *Culture*
- *Pronunciation*
- *Vocabulary*

SCORING:

- If the student's performance is **unsatisfactory** on a criteria then he scores 0
- If the student's performance is **needs improvement** on a criteria then he scores 1
- If the student's performance is **satisfactory** on a criteria then he scores 2
- If the student's performance is **proficient** on a criteria then he scores 3
- If the student's performance is **distinguished** on a criteria then he scores 4

TOOLS USED FOR ASSESSMENT:

- Role play
- Exercises in class
- Class performance
- Assignments

COMPOSITION OF ASSESSMENT BOARD

- Foreign Business Language Faculty
- Program coordinator
- Senior Core Course Faculty

SCORE SHEET: INDIVIDUAL

If the student scores between	Outcome Attainment Levels
<12	Needs improvement
12-16	Satisfactory
17-20	Partly Achieved
21-24	Fully Achieved

SCORE SHEET: PROGRAMME/ BATCH

Outcome Attainment Levels	Percentage of Students
Needs improvement	
Satisfactory	
Partly Achieved	
Fully Achieved	

	Foreign Business Language – UG **Name:**_____ **Enrolment No.:**_____ **Programme:**						
S.NO.	**Attributes Marks**	**Unsatisfactory (0)**	**Needs improvement (1)**	**Satisfactory (2)**	**Proficient (3)**	**Distinguished (4)**	**Score**
1.	**Initiation/ Introduction**	Students hardly understand the concepts.	Student rarely takes initiative & asks questions.	Student is able to understand and utilize relevant study material.	Student willingly participates in class. Asks questions and speaks extemporaneously.	Student shows great curiosity in class activities & immediately responds with the precise answer.	
2.	**Grammatical structure**	Makes sentences which are so brief that there is little evidence of structure & comprehension.	Makes errors which may interfere with comprehensibility.	Makes a few errors which do not affect the overall comprehension.	Uses correct word order and article adjectives. Errors do not hinder comprehensibility	Makes error free sentences using correct sentence formations.	
3.	**Vocabulary**	Uses limited vocabulary and mispronunciations hinder comprehensibility.	Relies on basic vocabulary. Speech is comprehensible in spite of mispronunciation.	Utilizes old and new vocabulary. Attempts to use idiomatic expressions according to the	Speaks clearly and uses idiomatic expressions fluently as per the theme.	Uses variety of vocabulary as per the context. Has good command over expression	

				topic.		s.	
4.	**Conversation**	Uses very few approaches to initiate a conversation.	Uses some strategies and needs frequent prompting to further the conversation.	Uses some strategies yet requires occasional prompting.	Clarifies and continues conversation using good strategies like intonation, self-correction, and verbal cues.	Is able to speak on any given topic using expressions. Is also able to comprehend other person clearly.	
5.	**Pronunciation**	Incomprehensible to a native speaker	Nearly incomprehensible to a native speaker	Partially comprehensible to a native speaker	Mostly comprehensible to a native speaker	Completely comprehensible to a native speaker	
6.	**Cultural Appropriateness**	Rarely uses/interprets cultural manifestations.	Sometimes uses/interprets cultural manifestations when appropriate to the task.	Frequently uses/interprets cultural manifestations when appropriate to the task.	Almost always uses /interprets cultural manifestations when appropriate to the task.	Has in-depth knowledge about other countries culture & other perspectives.	
						Total Score	

If the student scores between	**Outcome Attainment Levels**
<12	Needs improvement
12-16	Satisfactory
17-20	Partly Achieved
21-24	Fully Achieved

SIGNATURES:

8.1.4 Rubrics for Foreign Business Language - PG

Assessment Tool-PG/PLO 07/D/FBL

AMITY UNIVERSITY
UTTAR PRADESH

FACULTY OF SCIENCE AND TECHNOLOGY

RUBRICS FOR ASSESMENT OF FOREIGN BUSINESS LANGUAGE FOR MATERS PROGRAMME

Assessment Parameters:

- *Language*
- *Culture*
- *Vocabulary*

SCORING:

- If the student's performance is **unsatisfactory** on a criteria then he scores 0
- If the student's performance is **needs improvement** on a criteria then he scores 1
- If the student's performance is **satisfactory** on a criteria then he scores 2
- If the student's performance is **proficient** on a criteria then he scores 3
- If the student's performance is **distinguished** on a criteria then he scores 4

TOOLS USED FOR ASSESSMENT:

- Role play
- Exercises in class
- Class performance
- Assignments

COMPOSITION OF ASSESSMENT BOARD

- Foreign Business Language Faculty
- Program coordinator
- Senior Core Course Faculty

SCORE SHEET: INDIVIDUAL

If the student scores between	Outcome Attainment Levels
<10	Needs improvement
10-13	Satisfactory
14-16	Partly Achieved
17-20	Fully Achieved

SCORE SHEET: PROGRAMME/ BATCH

Outcome Attainment Levels	Percentage of Students
Needs improvement	
Satisfactory	
Partly Achieved	
Fully Achieved	

	Foreign Business Language - PG Name:_____ Enrolment No.:_____ Programme:_____						
	Attributes	**Unsatisfactory (0)**	**Needs improvement (1)**	**Satisfactory (2)**	**Proficient (3)**	**Distinguished (4)**	**Score**
1.	**Initiation/ Introduction**	Student does not understand the concepts.	Sometimes takes initiative & asks questions.	Is able to comprehend and utilize appropriate study material.	Student eagerly participates in class. Asks questions and speaks spontaneously.	Student shows great interest in class activities & instantly responds with the right answer.	
2.	**Vocabulary**	Uses limited vocabulary and mispronunciations impede comprehensibility.	Relies on basic vocabulary. Speech is comprehensible in spite of mispronunciation.	Utilizes old and new vocabulary. Attempts to use idiomatic expressions according to the topic.	Speaks clearly and uses idiomatic expressions fluently as per the topic.	Uses variety of vocabulary as per the context. Has good command over expressions.	
3.	**Grammatical structure**	Makes sentences which are so brief that there is little evidence of structure & comprehension.	Makes errors which may interfere with comprehensibility.	Makes a few errors which do not affect the overall comprehension.	Uses correct word order and article adjectives. Errors do not hinder comprehensibility.	Makes error free sentences using correct sentence formations.	
4.	**Conversation**	Uses very few approaches to initiate a conversation.	Uses some strategies and needs frequent prompting to further the conversation.	Uses some strategies yet requires occasional prompting.	Clarifies and continues conversation using good strategies like intonation, self-correction, and verbal cues.	Is able to speak on any given topic using expressions. Is also able to comprehend other person clearly.	
5.	**Cultural Appropriateness**	Rarely uses/interprets cultural manifestations.	Sometimes uses/interprets cultural manifestations	Frequently uses/interprets cultural manifestatio	Almost always uses /interprets cultural	Has in-depth knowledge about other	

			when appropriate to the task.	ns when appropriate to the task.	manifestations when appropriate to the task.	countries culture & other perspectives.	
						Total Score	

If the student scores between	Outcome Attainment Levels
<10	Needs improvement
10-13	Satisfactory
14-16	Partly Achieved
17-20	Fully Achieved

SIGNATURES:

8.1.5 : Feedback of Industry Internship Guide:

AMITY UNIVERSITY
UTTAR PRADESH

Domain of Science& Technology

Class of ---------

SUMMER TRAINEE EVALUATION FORM
(Industry Guide Feedback)

Dear Sir / Madam,

Our Student_____Enroll. No._____Class of **M.Sc. (_____) 20** has undergone __weeks summer Internship under your able guidance in your esteemed organization. We would request you to evaluate the student on a number of attributes, which will help us in developing the efficiency of the concerned student as per the industry needs. Further, your valuable feedback would also help us make the necessary improvement in the Program.

The evaluation will be on a scale of 10 points, 10 being highest and 1 being lowest.

10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Outstanding	Excellent	Very Good	Good	Above Avg.	Avg	Below Average	Needs Improvement	Poor	very poor

Project Title: _____

Date of Commencement: _____Date of Completion: _____

Name of Industry Guide: _____

Designation:_____

Company's Name and Address :_____

Project Evaluation

Scale 1 to 10

S.no.	Name of the student	Enrollment Number	Understanding of the Project Objectives		Problem Definition	Planning Ability	Execution Ability	Use of tools and techniques	Presentation ability	Initiative	Resourcefulness	Quality of work	Result Orientation	Creativity and Innovation	Technical knowledge related to the Project	Keeping deadlines	Overall evaluation of Project
			Theoretical Knowledge needed to do the project.	Effort made in applying his/her knowledge	Understanding the scope and limitation of the Project	Ability to plan, research schedules and resources											

Personality Evaluation

Scale 1 to 10

S.no.	Name of the student	Enrollment Number	Intelligence & Comprehension	Diligence & Perseverance	Co-operation (Ability to work with others)	Leadership (Mobilise Support)	Communication	Oral	Written	Integrity and Loyalty	Decorum	Over all Personality

8.1.6 Rubrics for Major Project

Assessment Tool-PG/PLO 02/D/Major Project

AMITY UNIVERSITY
UTTAR PRADESH

DOMAIN OF SCIENCE AND TECHNOLOGY

RUBRICS FOR ASSESMENT OF MAJOR PROJECT M.Sc. PROGRAM

Assessment Parameters:

- *Analyze*
- *Conceptualize*
- *Scientific Concepts Applied*
- *Demonstrate*
- *Innovation*

SCORING:

- If the student's performance is **unsatisfactory** on a criteria, he scores 0
- If the student's performance **needs improvement** on a criteria, he scores 1
- If the student's performance is **satisfactory** on a criteria, he scores 2
- If the student's performance is **proficient** on a criteria, he scores 3
- If the student's performance is **excellent** on a criteria, he scores 4

TOOLS USED FOR ASSESSMENT:

- Hardware / Software
- Report writing
- Analytical results
- Presentations
- Viva-Voce

COMPOSITION OF ASSESSMENT BOARD

- External Expert (Industry/ Academia)
- Dissertation Guide
- Faculty member

SCORE SHEET: INDIVIDUAL

If the student scores between	Outcome Attainment Levels
<35	Needs improvement
35-45	Satisfactory
46—60	Partly Achieved
61-80	Fully Achieved

SCORE SHEET : MSc (AC)/2013-2015

Outcome Attainment Levels		Percentage of Students
14	Needs improvement	
28	Satisfactory	
	Partly Achieved	
	Fully Achieved	

		MAJOR PROJECT M.Sc. PROGRAM									
Name:			**Enrolment No.:**				**Course:**				
S.No	**Trait**	**Deficient**		**Sufficient**	**Competent**		**Exemplary**	**Score**
		(1)		**(2)**	**(3)**		**(4)**	
1.	Identification of the main Scientificproblem /	Student fails to identify the main problem .		Student is Somewhat is able to identify the problem.	Student substantially identifies the main problem		Student comprehensively & Precisely can identify the main scientific problem	
2.	Identification of the key	Student fails to		Student is	Student substantially identified the assumptions and can understand its effect		Student identifies all key assumptions and its effect s precisely and totally understand its effect.	
	assumptions binding the problem and their effect	identify the main assumptions and their effect on the problem		somewhat able to identify the assumptions and their effect.				

	Literature Review										
3.	Critically reviews	Student fails to			Student is		Student			Student identifies	
	literature; contrast and	identify the relevant			somewhat able to		substantially			all the key the	
	compares relevant	literature, and			identify the relevant		identifies the key			relevant literature,	
	debates, concepts and	unable to compare			literature, and		and relevant			and was able to	
	Theories	and contrast the			unable to compare		literature, and was			develop the	
		concepts and			and contrast the		able to compare			concepts and	
		theories.			concepts and		and contrast the			theories,	
					theories.		concepts and			surrounding a	
							theories for the			Scientific	
							scientific			problem.	
							problem.				
4.	Corroborates literature and the dissertation requirements clearly and can link it to the objectives .	Student fails to			Student is		Student			Student identifies and corroborates	
		clearly link			somewhat able to		substantially links			relevant links	
		literature to			clearly link		literature to			through literature	
		objectives;			literature to		objectives;			to objectives;	

Methodology / Methods / Approach						
5.	Incorporation of methodological approach in relation to research analysis ,design of experiments and Objectives.	Student fails to incorporate methodological approach to be followed with respect to objectives and research design.	Student is somewhat able to incorporate methodological approach to be followed with respect to objectives and research design.	Student is able to incorporate methodological approach in relation to research design and objectives.	Student is able to fully incorporate Methodological approach in relation to research design and objectives and identify relevant links through recent literature surrounding a Scientific problem.	
6.	Justifies appropriateness of analytical procedures / instruments /software for research design and justifies rejection of alternative methods	Student fails to Justifies appropriateness of research design; justifies rejection of alternative methods	Student is somewhat able to Justifies appropriateness of research design and data collection methods; presents reliable and valid data; justifies rejection of alternative methods	Student substantially Justifies appropriateness of research design and justifies rejection of alternative methods	Student identifies relevant links Through literature to objectives; Justifies appropriateness of research design and justifies rejection of alternative methods.	
	Dissertation Outcome					
7.	Evaluation of Dissertation /Research Design.	Student Research Design does not meet the objectives.	Student dissertation /Research Design somewhat meets the objectives	Student Dissertation/ Research Design substantially meets the objectives	Student Research Design completely meets the objectives	
8.	Does the Dissertation results /design demonstrate innovation and are of high Quality ?	Student dissertation results /design fails to demonstrate any innovation and good quality.	Student dissertation result / design satisfactorily demonstrates innovation and quality.	Student dissertation results / design demonstrates good innovation and quality		
					Student dissertation result / Design demonstrates high innovation and quality	
17909.	Ability to arrive at valid , supported conclusions	Student provides conclusions that are unsupported by the Data	Student is somewhat able to provide conclusions that may be unsupported or supported by the	Student provides conclusions that are supported by the data	Student provides conclusions that are supported by the data and demonstrate a deep	

			Data		understanding of	
					the issues involved	
10.	Understanding of the	Student ignores	Student is	Student	Student correctly	
	implications of the	implications from	somewhat able to	demonstrates an	generalizes	
	Conclusions	conclusions or	drive implications	understanding of	conclusions to	
		generalizes beyond	from conclusions or	immediate effects	related areas	
		the scope of	generalizes beyond	of the conclusion	affected by the	
		relevance.	the scope of	drawn.	issues	
			relevance.			
	Presentation of Dissertation					
11.	Logical & Progressive approach				logically and progressively	
		Disorganized approach	Somewhat logically /progressively	organized and well	organized	
			organized	Structured.		
12.		Content is	Content is	Content is relevant	Content is relevant	
	Content	irrelevant or with	somewhat relevant	or with supporting	or with supporting	
		no supporting	but lacks sufficient	evidence	evidence and	
		Evidence	supporting evidence		incorporates	
					innovative insights.	
13.		Presentation was	Presentation was	Presentation	Presentation	
	Timing &	too short or too	somewhat	utilizes allotted	provides excellent	

	conclusion	long , Conclusion missing or content does not support Findings	short/long not covering all the points, Conclusion is somewhat insufficient or content does not support findings	time, Conclusion is supported by content and contain review of key points.	coverage of time, conclusion is supported by content and provides review of key points and stimulates further inquiry with closing thoughts.	
	Written report					
14.	Introduction	Opening not appropriate to problem	Opening somewhat appropriate but does to clearly define problem.	Opening appropriate to problem	Opening is clear , concise, and considerate sets the right tone.	
15.	Organization	Disorganized incorrect format , unclear direction	Somewhat organized, with correct format , but unclear direction	Organized , correct format , clarity of main points	Clear considerate and correct formatting and development of main points	
16.	Content	Incorrect , irrelevant,	Somewhat correct, and relevant,	Relevant and correct with evidence	Relevant and correct with evidence with Innovative insights.	
17	Organization of presentation	Presentation not according to the guidelines	Presentation needs improvement	Presentation was according to the guidelines and well organised.	Excellent and self explanatory presentation	
18	Future Prospects	work is not related to the current scenario	Work is good but needs more modification	Work can be adopted with certain modification	Work is very much related to the current scenario	
19	Collection and representation of data	Not properly collected	Collected but not arranged	Data is very much satisfactory but not properly explained	Data is very well Explained	
20.	Conclusion	Missing content or lack of supporting Evidence	Somewhat conclusive content but lack of supporting evidence	Supports content, contains summary statement	Clear , complete, closing with thought Considerations.	

Total Score

If the student scores between	Outcome Attainment Levels
<35	Needs improvement
35-45	Satisfactory
46-60	Partly Achieved
61-80	Fully Achieved

Signatures:

8.1.7 Assesment Tool For Dissertation:

Assessment Tool-PG/PLO 02/D/Dissertation

AMITY UNIVERSITY
UTTAR PRADESH

DOMAIN OF SCIENCE AND TECHNOLOGY

RUBRICS FOR ASSESMENT OF DISSERTATION M.Sc. PROGRAM

Assessment Parameters:

- *Analyze*
- *Conceptualize*
- *Scientific Concepts Applied*
- *Demonstrate*
- *Innovation*

SCORING:

- If the student's performance is **unsatisfactory** on a criteria, he scores 0
- If the student's performance **needs improvement** on a criteria, he scores 1
- If the student's performance is **satisfactory** on a criteria, he scores 2
- If the student's performance is **proficient** on a criteria, he scores 3
- If the student's performance is **excellent** on a criteria, he scores 4

TOOLS USED FOR ASSESSMENT:

- Hardware / Software
- Report writing
- Analytical results
- Presentations
- Viva-Voce

COMPOSITION OF ASSESSMENT BOARD

- External Expert (Industry/ Academia)
- Dissertation Guide
- Faculty member

SCORE SHEET: INDIVIDUAL

If the student scores between	Outcome Attainment Levels
<35	Needs improvement
35-45	Satisfactory
46—60	Partly Achieved
61-75	Fully Achieved

SCORE SHEET : PROGRAMME/ BATCH

Outcome Attainment Levels	Percentage of Students
Needs improvement	
Satisfactory	
Partly Achieved	
Fully Achieved	

		DISSERTATION M.Sc. PROGRAM				
Name:		**Enrolment No.:**			**Course:**	
S.No	**Trait**	**Deficient**	**Sufficient**	**Competent**	**Exemplary**	**Score**
		(1)	**(2)**	**(3)**	**(4)**	
1.	Identification of the main Scientificproblem /	Student fails to identify the main problem .	Student is Somewhat is able to identify the problem.	Student substantially identifies the main problem	Student comprehensively & Precisely can identify the main scientific problem	
2.	Identification of the key	Student fails to	Student is	Student substantially identified the assumptions and can understand its effect	Student identifies all key assumptions and its effect s precisely and totally understand its effect.	
	assumptions binding the problem and their effect	identify the main assumptions and their effect on the problem	somewhat able to identify the assumptions and their effect.			
	Literature Review					
3.	Critically reviews	Student fails to	Student is	Student	Student identifies	
	literature; contrast and	identify the relevant	somewhat able to	substantially	all the key the	
	compares relevant	literature, and	identify the relevant	identifies the key	relevant literature,	
	debates, concepts and	unable to compare	literature, and	and relevant	and was able to	
	theories	and contrast the	unable to compare	literature, and was	develop the	
		concepts and	and contrast the	able to compare	concepts and	
		theories.	concepts and	and contrast the	theories,	
			theories.	concepts and	surrounding a	
				theories for the	Scientific	
				scientific	problem.	
				problem.		
4.	Corroborates literature	Student fails to	Student is	Student	Student identifies	

	and the dissertation requirements clearly and can link it to the objectives .					and corroborates	
		clearly link		somewhat able to	substantially links	relevant links	
		literature to		clearly link	literature to	through literature	
		objectives;		literature to	objectives;	to objectives;	

Methodology / Methods / Approach

5.	Incorporation of methodological	Student fails to	Student is	Student is able to	Student is able to
	approach in relation to	incorporate	somewhat able to incorporate	incorporate	fully incorporate
	research analysis ,design of experiments and	methodological		methodological	Methodological
	Objectives.	approach to be	methodological	approach in	approach in
		followed with	approach to be	relation to	relation to research
		respect to	followed with	research	design and
		objectives and	respect to	design and	objectives and
		research design.	objectives and	objectives.	identify relevant
			research design.		links through
					recent literature
					surrounding a
					Scientific
					problem.
6.	Justifies appropriateness of analytical procedures / instruments /software for research design and justifies rejection of alternative methods	Student fails to Justifies appropriateness of research design; justifies rejection of alternative methods	Student is somewhat able to Justifies appropriateness of research design and data collection methods; presents reliable and valid data; justifies rejection of alternative methods	Student substantially Justifies appropriateness of research design and justifies rejection of alternative methods	Student identifies relevant links Through literature to objectives; Justifies appropriateness of research design and justifies rejection of alternative methods.
	Dissertation Outcome				
7.	Evaluation of Dissertation /Research Design.	Student Research Design does not meet the objectives.	Student dissertation /Research Design somewhat meets the objectives	Student Dissertation/ Research Design substantially meets the objectives	Student Research Design completely meets the objectives

		Student dissertation	Student dissertation result / design	Student dissertation	
8.	Does the Dissertation results /design demonstrate innovation and are of high Quality ?	results /design fails to demonstrate any innovation and good quality.	satisfactorily demonstrates innovation and quality.	results / design demonstrates good innovation and quality	
					Student dissertation result / Design demonstrates high innovation and quality
09.	Ability to arrive at valid ,	Student provides	Student is	Student provides	Student provides
	supported conclusions	conclusions that are	somewhat able to	conclusions that	conclusions that
		unsupported by the	provide conclusions	are supported by	are supported by
		Data	that may be	the data	the data and
			unsupported or		demonstrate a
			supported by the		deep
			data		understanding of
					the issues involved
10.	Understanding of the	Student ignores	Student is	Student	Student correctly
	implications of the	implications from	somewhat able to	demonstrates an	generalizes
	conclusions	conclusions or	drive implications	understanding of	conclusions to
		generalizes beyond	from conclusions or	immediate effects	related areas
		the scope of	generalizes beyond	of the conclusion	affected by the
		relevance.	the scope of	drawn.	issues
			relevance.		
	Presentation of Dissertation				
11.	Logical & Progressive Organization of presentation	Presentation is	Presentation is	Presentation is well	Presentation is logically and progressively
		Disorganized	Somewhat logically /progressively	organized and	organized
			organized	Structured.	
12.		Content is	Content is	Content is relevant	Content is relevant
	Content	irrelevant or with	somewhat relevant	or with supporting	or with supporting
		no supporting	but lacks sufficient	evidence	evidence and
		Evidence	supporting evidence		incorporates
					innovative insights.
13.		Presentation was	Presentation was	Presentation	Presentation
	Timing &	too short or too	somewhat	utilizes allotted	provides excellent

		Conclusion	long , Conclusion missing or content does not support Findings	short/long not covering all the points, Conclusion is somewhat insufficient or content does not support findings	time, Conclusion is supported by content and contain review of key points.	coverage of time, conclusion is supported by content and provides review of key points and stimulates further inquiry with closing thoughts.
		Written report				
	14.	Introduction	Opening not appropriate to problem	Opening somewhat appropriate but does to clearly define problem.	Opening appropriate to problem	Opening is clear , concise, and considerate sets the right tone.
	15.	Organization	Disorganized incorrect format , unclear direction	Somewhat organized, with correct format , but unclear direction	Organized , correct format , clarity of main points	Clear considerate and correct formatting and development of main points
	16.	Content	Incorrect , irrelevant,	Somewhat correct, and relevant,	Relevant and correct with evidence	Relevant and correct with evidence with Innovative insights.
	17.	Conclusion	Missing content or lack of supporting Evidence	Somewhat conclusive content but lack of supporting evidence	Supports content, contains summary statement	Clear , complete, closing with thought Considerations.

Total Score

If the student scores between	Outcome Attainment Levels
<35	Needs improvement
35-45	Satisfactory
45-60	Partly Achieved
60-80	Fully Achieved

Signatures:

8.1.8 Rubrics for Club Committee Activities

RubricsforAssessmentofParticipation in Club and Committee Activities

Assessment Parameters:

- Deficient
- Sufficient
- Competent
- Exemplary

SCORING:

- Ifthestudent'sperformanceisDeficientonacriteria, she/hescores0
- Ifthestudent'sperformanceisSufficientona criteria,she/hescores 1
- Ifthestudent'sperformanceisCompetentona criteria, she/hescores2
- Ifthestudent'sperformanceisExemplaryona criteria,she/hescores3

TOOLSUSEDFORASSESSMENT:

- Participation in various events
- Organizing various events

COMPOSITIONOFASSESSMENTBOARD

- Event Coordinator
- Club/Committee Members

SCORESHEET: INDIVIDUAL

If the studentscoresbetween	Outcome AttainmentLevels
<8	Needs improvement
9-11	Satisfactory
12-14	PartlyAchieved
15-18	FullyAchieved

Students scoring 9 or above fall in the passing criteria.

SCORESHEET:PROGRAMME/BATCH

Outcome AttainmentLevels	Percentage of Students
Needs improvement	
Satisfactory	
PartlyAchieved	
FullyAchieved	

Participation in Club and Committee Activities Name: ___ Enrolment No.: ____Course: ____						
S.No	**Indicator**	**Deficient**	**Sufficient**	**Competent**	**Exemplary**	**Score**
1.	Student participate actively in various Club and Committee activities.					
2.	Takes the initiative to plan and drive various creative events.					
3.	Is a member of a Club or Committee and helps organize events in that capacity.					
4.	Demonstrate high level of interpersonal skill.					
5.	Delivers assigned job effectively.					
6.	Is able to inspire peer group.					
					TotalScore	

If the studentscoresbetween	Outcome AttainmentLevels
<8	Needs improvement
9-11	Satisfactory
12-14	PartlyAchieved
15-18	FullyAchieved

Students scoring 9 or above fall in the passing criteria.

Signatures:

8.1.9 Rubrics for Human Values

AMITY UNIVERSITY

RUBRICSFORASSESMENTOFHUMAN VALUES AMONGST STUDENTS

ASSESSMENT PARAMETERS:

- **Rarely**
- **Seldom**
- **Sometimes**
- **Always**

SCORING:

- Ifthestudent rarely getinvolved, He/Shescores0
- Ifthestudent seldom getinvolved,He/Shescores 1
- Ifthestudent sometimes getinvolved, He/Shescores2
- Ifthestudent always getinvolved,He/Shescores3

TOOLSUSEDFORASSESSMENT:

- Participation
- Active involvement in organizing

COMPOSITIONOFASSESSMENTBOARD

- Amity Human Value Coordinator
- Event Faculty coordinator

SCORESHEET: INDIVIDUAL

If the studentscoresbetween	Outcome AttainmentLevels
<10	Needs improvement
10-12	Satisfactory
12-16	PartlyAchieved
16-20	FullyAchieved

Students scoring 9 or above fall in the passing criteria.

SCORESHEET:PROGRAMME/BATCH

Outcome AttainmentLevels	Percentage of Students
Needs improvement	
Satisfactory	
PartlyAchieved	
FullyAchieved	

ASSESMENTOFHUMAN VALUES AMONGST STUDENTS

S.No	Indicators	Rarely (1)	Seldom (2)	Sometimes (3)	Always (4)	Score
1.	The student is aware about various social issues/problems in their					
2.	The Student Substantially identifies the concern that they					
3.	The student involves in organizing various activities.					
4.	The student demonstrates active participation in various					
5.	The student is recognized and appreciated for the work to the community.					
					TotalScore	

If the studentscoresbetween	Outcome AttainmentLevels
<10	Needs improvement
10-12	Satisfactory
12-16	PartlyAchieved
16-20	FullyAchieved

Students scoring 9 or above fall in the passing criteria.

Signatures:

8.2 : Guidelines of Comprehensive Examination :

Domain of Science and Technology

Comprehensive Examination Guidelines for UG and PG Programmes for intended Programme Learning Outcomes

Purpose	To assess attainment of programme goals in the core and specialisation areas of all the programmes in Science and Technology.
Goal(s)	1. To acquire and demonstrate the understanding of theory and concepts of Scienceand Technology. 2. To develop an ability to apply the fundamental concepts of Science and Technology to comprehend, analyze, formulate, design and develop novel products and solutions for real life problems. 3. To inculcate in students professional and ethical attitudes, effective communication skills, behaviour skills, multidisciplinary approach and ability to relate Scientific issues to broader social and environmental contexts. 4 To provide students with an academic environment aware of excellence, leadership, written ethical codes & guidelines, use of modern IT tools and life- long learning needed for successful professional / entrepreneurial career. 5. To develop the ability amongst students to assess societal, health, safety, legal, cultural and environmental issues and relevant scientific responsibilities by applying reasoned contextual knowledge and understand its impact towards sustainable development. 6. To develop industry ready students who can excel in their professional careers or pursue higher studies/ jobs.
Process	
Format	**Comprehensive Examination Framework** • Total Multiple Choice questions to be asked : 200 • Programme Group Questions will be common for all programmes in the programme group and will be entered by Programme Group Coordinator in Amizone. • Programme Questions for each programme will be different and will be entered by the HoIs.

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- Students will be able to see all the 200 questions together.
- The questions must be linked to the PLOs, Institution Graduate Attributes, Domain Graduate Attributes and Finally to University Graduate Attributes.

S.No.		Section / University Graduate Attributes	Sub Section	No of Q
1		Knowledge & Expertise of a discipline	1A	20
			1B	20
			1C	20
2		Research Enquiry	2A	20
			2B	15
3		Information & Digital Literacy	3A	5
			3B	5
4		Global Citizen	4	10
5		Problem Solving	5A	10
			5B	30
6		Ethical, Social and Professional Responsibility	6	10
7		Employability, Enterprise & Entrepreneurship	7A	5
			7B	5
8		Life Long Learning	8	15
9		Any Other	9	10
		Total		200

8.3 Format of Student Exit Survey:

8.3.1 Format of Alumni Survey- Masters Programme

AMITY UNIVERSITY
UTTAR PRADESH

Domain of Science & Technology

Student Alumni Survey-Masters Programmes

Dear Alumni, the objective of this Survey is to seek your candid assessment regarding the various learning aspects of the MBA programme. The information from this survey will be analysed and used to identify the areas of improvement.

Looking back on your time at AMITY, how would you assess each of the following aspects of your at AMITY?

S.No.	Experience	Poor	Fair	Good	Very Good	Excellent
1	Various Courses					
2	Value added courses					
3	Overall academic experience					
4	Non-academic or student life experience					
5	Overall experience					

What was your first position after leaving the Programme:

Employed full-time
Self-employed
Higher studies
Unemployed

Other _____

How satisfied are you with the following aspects of your current or most recent job?

S.No.	Aspects	Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Satisfied	Completely Satisfied
1	Intellectual challenge					
2	Career growth, opportunities					
3	Level of responsibility					
4	Flexibility					
5	Prestige of job/organization					

6	Contribution to					
	field/society					
7	Job security					

8 Salary
9 Working Condition
10 Learning Opportunity

How well do you think your degree program at AMITY has prepared you for your chosen career?

Very well prepared quite well

Adequately

Inadequately

How important is each of the following skills and abilities to your current work?

S.No.	Skill/Ability	Not important	Somewhat important	Important	Very important	Essential
1	Subject Knowledge					
2	Research Skills					
3	Identifying problem and formulating solution					
4	Information & Digital Literacy					
5	Locating and applying information/data					
6	Oral Communication					
7	Written Communication					
8	Thinking critically/problem-solving					
9	Working collaboratively					
10	Interpersonal Skills					
11	Leadership Skill					
12	Ethical Conduct					
13	Professional Conduct					
14	Working with people from diverse backgrounds/Global Outlook					
15	Life Long Learning					
16	Any other (please specify)					

With what aspect(s) of the Master's program and the University were you the most satisfied?

_____

With what aspect(s) of the Master's program and the University were you the least satisfied?

_____

If you could start over again, will you join AMITY?

Yes No

Do you have other comments and/or suggestions that you would like to share?

_____

Thank you for taking the time to complete this survey.

9. Domain Leadership & Assessment Team

Faculty/Domian Name
Leadership Team

Programme Outcome Assessment Committee						
S.No	**Institution Name**	**Head of the Institution**	**Programme Title**	**Programme Leaders**	**Programme Outcome Assessment Committee**	**Role**
1	Amity Institute of Applied Sciences	Prof Sunita Rattan	B Sc (H) Chemistry	Dr Tejendra Kumar Gupta	Dr Christine Jeyaseelan	Chair
					Dr Manoj Raula	Member
					Dr Tejendra Kumar Gupta	Member
					Dr Deepshikha Gupta	Member
					Dr Jaya Pandey	Member
					Dr Shalini Jaiswal	Member
					Mr Sunil Verma	Member
			B Sc (H) Physics	Dr Shivani A Kumar	Dr Ashok Kumar	Chair
					Dr S K Srivastava	Member
					Dr H D Sharma	Member

					Dr A K Shukla	Member
					Dr Gautam Singh	Member
					Dr Surbhi	Member
					Dr S P Singh	Member
					Dr Jyoti Katyal	Member
					Dr Chiranjib Konar	Member
					Dr Ravikant Chaubey	Member
					Dr Devendra Singh	Member
					Dr Rohit Verma	Member
					Dr Gaurav Sharma	Member
					Dr Shefali Kanwar	Member
					Dr Chithra Krishnamoorthy	Member
			B.Sc (H) Mathematics	Dr.Sacheendra Shukla	Dr. Mandeep Mittal	
					Dr H D Arora	
					Dr. Rashmi Singh	
					Dr. Vijay Kumar	
					Dr Surbhi Gupta	
					Dr. Anjali Naithani	Member

					Dr.Ritu Gupta	
					Dr.Shweta Upadhyaya	
					Dr.Sudhir Kumar Chauhan Dr. Alok Agrawal	
					Mr. Sunil Verma	
			Bachelor of Statistics	Dr. Niraj Kumar Singh	Dr. Dheeraj Pawar	Chair
					Dr. Niraj Kumar Singh	Member
					Dr. Reetu	Member
					Dr. Vikash Kumar Rathaur	Member
					Dr. Bavita Singh	Member
					Dr. Gunjan Singh	Member

Programme Outcome Assessment Committee						
S.No	**Institution Name**	**Head of the Institution**	**Programme Title**	**Programme Leaders**	**Programme Outcome Assessment Committee**	**Role**
1	Amity Institute of Applied Sciences	Prof Sunita Rattan	M.Sc. Applied Chemistry	Dr Mousumi Sen	Dr Christine Jeyaseelan	Chair
					Dr Aditi Sangal	Member
					Dr Anita Gupta	Member
					Dr Kumar Rakesh Ranjan	Member

					Dr Maumita Das Mukherjee	Member
					Dr Jaya Pandey	Member
					Dr Shalini Jaiswal	Member
					Mr Sunil Verma	Member
			M Sc (Chemistry) Org/Inorg/Phy)	Dr Mousumi Sen	Dr Christine Jeyaseelan	Chair
					Dr Aditi Sangal	Member
					Dr Anita Gupta	Member
					Dr Kumar Rakesh Ranjan	Member
					Dr Maumita Das Mukherjee	Member
					Dr Jaya Pandey	Member
					Dr Shalini Jaiswal	Member
					Mr Sunil Verma	Member
			Master of Statistics	Dr. Niraj Kumar Singh	Dr. Dheeraj Pawar	Chair
					Dr. Niraj Kumar Singh	Member
					Dr. Reetu	Member
					Dr. Vikash Kumar Rathaur	Member
					Dr. Bavita Singh	Member
					Dr. Gunjan Singh	Member
			M.Sc (H) Physics	Dr. Deepak Tripathi	Dr. Ashok Kumar	Chair
					Dr S K Srivastava	Member

					Dr H D Sharma	Member
					Dr A K Shukla	Member
					Dr Gautam Singh	Member
					Dr Surbhi	Member
					Dr S P Singh	Member
					Dr Jyoti Katyal	Member
					Dr Chiranjib Konar	Member
					Dr Ravikant Chaubey	Member
					Dr Devendra Singh	Member
					Dr Rohit Verma	Member
					Dr Gaurav Sharma	Member
					Dr Shefali Kanwar	Member
					Dr Chithra Krishnamoorthy	Member
			M.Sc Applied Mathematics	Dr. Rupakshi Mishra Panday	Dr. Mandeep Mittal	Chair
					Dr H D Arora	Member
					Dr. Rashmi Singh	Member
					Dr. Vijay Kumar	Member
					Dr Surbhi Gupta	Member
					Dr. Anjali Naithani	Member

					Dr.Ritu Gupta	Member
					Dr.Shweta Upadhyaya	Member
					Dr.Sudhir Kumar Chauhan	Member
					Dr. Alok Agrawal	Member
					Mr. Sunil Verma	Member