DEPARTMENT OF ZOOLOGY

PATNA UNIVERSITY

PATNA- 800005 (INDIA)

Ref. No. 145/ESM/PU/19 Date: 15/7/19

To

The NAAC Coordinator
Patna University, Patna

Sub: Students feedback of M.Sc. Environmental Science & Management Course P.U.

Sir

14 students' feedback forms of IV Sem. [Session 2017-19] and 19 students' feedback forms of Sem 2nd [Session 2018-20] of M. Sc. Environmental Science & Management Course, P.U. are being sent for needful.

Thanking You
Sincerely Yours

15.7.19

[D.K. Paul]
Course Coordinator
Env. Sc. & Mgt.
Dept of Zoology, P.U.

Enclosure: As above

Co-ordinator
Env. Sc. & Management
Patna University

Bapya
11.7.19

M.Sc. Environmental Science & Management Course
Department of Zoology, Patna University, Patna

PROGRAMME OUTCOME

- To impart environmental education in depth by giving professional training to the students.
- To focus and promote more of research activities from post graduate level especially on the topics related with day to day life problems and finding their solutions.
- To promote training in practical and conceptual skills.
- To provide constructive feedback on their progress.
- To promote the attitude of sensitization towards the social values.
- To motivate students to become a good citizens whose approach would always be for sustainable development of the nation and serve humanity.

PROGRAMME SPECIFIC OUTCOME

- To provide quality higher education and provide employability based professional training in the field of Environmental Science, & its Management.
- To train students by modular courses of lectures to find solutions of current environmental problems for sustenance of life.
- To provide knowledge & skill required to find evaluative measures for prevention of future environmental problems.
- To improve the communication skill of students by motivating them to participate in seminars/symposia etc and various co-curricular activities.
- To raise consciousness for protection, promotion and awareness of environmental problems and their solutions.
- To make students become role model & generate environmental awareness for the betterment of society.

10.7.19

M.Sc. Environmental Science & Management Course

Department of Zoology, Patna University, Patna

COURSE OUTCOME

	Course/ Paper Code	Nature of Course/ Paper	Course Outcome
SEMESTER I	MESCC-1	Basics of Environmental Sciences	This paper provides basic knowledge and aspects of Environment.
	MESCC-2	Environmental Geosciences	This paper enables the learners to gain knowledge about disaster management and climate system of India as well as earth system.
	MESCC-3	Statistical Methods & Computer Applications	This paper acquaints students with tools and techniques of biostatistics and applications of computer in environmental management.
	MESCC-4	Practical (Based on MESCC 1, 2 & 3)	This paper linked experimentation and data analysis of water quality and meteorological parameters.
	MESAECC-1	Environmental Sustainability & Swachchha Bharat Abhiyan Activities	This Paper endeavors to direct the students about the sustainable development and importance of cleanliness.
SEMESTER II	MESCC-5 DSE-1 for other Department	Resources, Biodiversity and Wildlife	This paper sensitizes students about the conservation of natural resources and biodiversity
	MESCC-6	Environmental Chemistry	This paper provides fundamental knowledge of environmental chemistry and chemistry and chemical composition of air, water and soil.
	MESCC-7	Environmental Biology	This paper teaches fundamental ecology, ecosystem diversity, microbiology and immunology.
	MESCC-8	Recombinant DNA technology, Environmental Biotechnology, Ethics & Scientific Communications	This paper imparts advanced knowledge of environmental biotechnology and environmental ethics
	MESCC-9	Practical (Based on MESCC 5, 6, 7 & 8)	This paper makes the students familiar with basic working methodology in the field of ecology and microbiology.
	MESAEC-1 /SEC-1	One selected from basket	It will give opportunity to students to explore new program from other department/faculty.

10.7.19

	Course/ Paper Code	Nature of Course/ Paper	Course Outcome
SEMESTER III	MESCC-10	Environmental Monitoring & EIA	This paper provides knowledge about the various management tools to mitigate the environmental impacts of developmental projects or activities.
	MESCC-11	Environmental Management	This paper promotes development of skills for efficient sewage and solid waste
	MESCC-12	Environmental Planning , Policy and Legislations	This paper imparts advanced knowledge about concurrent environmental issues, international treaties, environmental management systems.
	MESCC-13	Environmental Pollution	This paper enables students to acquire deep knowledge of source, effects and control measures of environmental pollution.
	MESCC-14	Practical (Based on MESCC 10, 11, 12 & 13)	Provides basic working methodology in the field of ecology and pollution, linked to the estimation of polluting factors
	MESAECC-2	Human Values & Professional Ethics and Gender sensitization	This paper acquaints students with gender sensitization.
SEMESTER IV	MESEC-1	Subject specific elective Project Work	Providing working experience in research aptitude and attitude through experimental/ survey works. It gives opportunity to the students for the skill development.
	MESEC-2	Subject specific elective Project Work	Providing working experience in research aptitude and attitude through experimental/ survey works. It gives opportunity to the students for the skill development.
	MESDSE-1	Opt a Course from other Department	Students get opportunity to study other subjects of their choice in addition to their Main subject.

18.7.16

Name of the Programme Ph.D. in Statistics

Programme code PHSTA

Course Code

CC-01 Research Methodology

CC-02 Quantitative Techniques & Computer Application

Programme Outcome

1. For teaching assignments in college and universities, Ph.D. qualification is mandatory. A student after completion of this Programme may join teaching as his/her profession.

2. After completion of this Programme one may start, his/her career as independent statistical consultant for researches in behavioral, social and medical sciences.

3. Usually pharmaceuticals companies hire such qualified persons to work on clinical trials. The department of clinical trial is mostly headed by Ph.D holders in statistics.

4. Today is the computer era. A large volume of data is available on various aspects of the society. In order to analyses such data, new methodologies are required. Such challenging task may be taken up by Ph.D holders in statistics and they may establish themselves as an analyst of big data.

SK Singh.
19.07.19

University Professor and Head
Department of Statistics
Patna University
Patna-800 005

M.A/M.Sc (Statistics)

Name of Programme: M.A/M.Sc/M.Com/M.Ed/M.Lib.Sc/LL.M/MBA any other Equivalent Programme.

Programme Outcome

Subject:

Kindly provide information in the 'Programme Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

After successful completion of the programme of M.A/M.Sc in Statistics, students get a plenty of opportunities in different fields. As Statistics is an applied science and is being used in almost all the disciplines such as Engineering, Medical Sciences, Economics, Sociology, Management etc. Students may establish themselves as Consultant or Data Scientist or Consultant Analyst in a stock and big corporation.

→ They may develop their career in the field of research especially in Population Science and in Mathematical Statistics.

→ Employment opportunities for students of this programme are increasing day by day in the organisation Indian Statistical Service, NSSO, CSO, State Bureau of Statistics & Evaluation, State Planning Board, Health Sector, Banks etc.

07.05.18

07.05.18

University Professor and Head
Department of Statistics
Patna University
Patna-800 005

3/7/17

Programme Specific outcome

After Completion of the programme, one Can opt teaching as well as research. There are Some Other opportunities in Corporate Sector who appoint as Special officers a Candidate of MA/M.Se Statistics.

S K Singh.

University Department of Statistics
Patna University
Patna-800 005

MA/M.Sc. (Statistics)

Name of Programme: M.A/M.Sc./M.Com/M.Ed./M.Lib.Sc/LL.M/MBA any other Equivalent Programme

Programme Specific Outcome

Subject:

Kindly provide information in the 'Programme Specific Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

07.05.18

07.05.18

Note: - For any query regarding the format provided the following persons may be contacted

1. [illegible]
2. Prof B. G. Prasad, Head Department of Mathematics, P.U. Convenor, NAAC Cell for Criteria-II
3. Dr. Sruti Prasad, Department of English, P.U., NAAC Cell Member for Criteria-II.

MA/M.Sc (Statistics) NAAC Criteria - II

Name of Programme: M.A/M. Sc./M.Com/M.Ed./M.Lib. Sc/LL.M, M.BBA any other Equivalent Programme.

Course Outcome

Kindly provide information in the 'Course Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

Subject:

Semester- I

Sl. No	Paper/Course	Title	Course Outcome
1	101	Real Analysis & Probability Theory	Deals with basic foundation of modern probability theory which is essential for statistical inferences.
2	102	Linear Algebra	Requirement for, potential studies of stochastic processes, linear models & multivariate analysis.
3	103	Sample Survey & Statistics for National Development	Sampling is science and art of modelling & measuring reliability of useful statistical inferences.
4	104	Practical & Group Discussion	These practicals are based on papers 101, 102 & 103. Students are given a topic of dissertation on which group discussions are held.

SK Singh
07.05.18

07/05/18

University Professor
Department of Statistics
Patna University
Patna-800 005

MA/M.Sc (Statistics)

Name of Programme: M.A/M.Sc/M.Com/M.Ed./M.Lib. Sc/LL.M./MBA any other Equivalent Programme.

Course Outcome

Kindly provide information in the 'Course Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

Subject:
Semester- II

Sl. No	Paper/Course	Title	Course Outcome
5	201	Distribution Theory & Non-parametric tests	Helps in modelling real life problems dealing with uncertainties and drawing valid conclusions.
6	202	Linear models & Regression Analysis	Highly applied in Engineering science and in the field of estimating economic parameters and also in forecasting.
7	203	Statistical Computing	Useful in Statistical Computing especially in case of high dimensional data
8	204	Practical & Field Work	Practicals are based on the papers 201, 202 and 203. Students are required to collect data from the field on the topic of social & economic importance and to write report on the same.

Signature ... Committee

K Lalan 07.05.18

S.K. Singh 07.05.18

M.A/M.Sc (Statistics)

Name of Programme: M.A/M.Sc./M.Com/M.Ed./M.Lib. Sc/LL.M./MBA any other Equivalent Programme.

Course Outcome

Kindly provide information in the 'Course Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

Subject:

Semester- III

Sl. No	Paper/Course	Title	Course Outcome
9	301	Statistical Inference	Deals with drawing optimal conclusions based on samples with the help of appropriate inferential techniques.
10	302	Design & Analysis of Experiment	Deals in designing an experiment in a set of conditions such that the result obtained is beyond any coincidence.
11	303	Reliability	Highly applied in Engineering fields dealing with life time as well as reliability of a system.
12	304	Practical Paper	Practicals are based on the papers 301, 302 and 303 to make students course outcome enriched.

Signature of Head

SK Singh.
07.05.18

Signature of Departmental Committee

07.05.18

M.A/M.Sc (Statistics)

Name of Programme: M.A/M.Sc./M.Com/M.Ed./M.Lib. Sc/LL.M./MBA any other Equivalent Programme.

Course Outcome

Kindly provide information in the 'Course Outcome' Column according to the following parameters:

- Academic
- Research
- Applications- Environmental, Social, Scientific
- Employability

Subject:

Semester- IV

Sl. No	Paper/Course	Title	Course Outcome
13	401	Stochastic Process	Deals with real life characteristics as a function of time and hence applied in almost all the disciplines.
14	402	Multivariate Analysis	Deals with highly dimensional data and related statistical inferences.
15	403	Demography	Deals with birth, death, migration etc. It is applicable in planning, food, housing, health, employment, education etc.
16	404	Practical & Dissertation.	Practicals are based on the papers 101, 102 & 403 and students are required to submit dissertations to make them course outcome oriented.

07.05.18

07.05.18

University Professor and Head
Department of Statistics
Patna University
Patna-800 005

Program Outcome

The recent developments in Physics has been included in the enriched M.Sc. (Physics) Syllabus to meet the present day needs of academic and research institutions and industries. An important objective of the course is to develop an understanding of core physics at deeper levels, each stage revealing new phenomena and greater insight into the behavior of matter and radiation. The various courses in the first two semesters are designed to bridge the gap between college and university level physics and to bring all students to a common point. These courses also aim to consolidate the college level knowledge of physics by providing much more logical and analytical framework which will be essential for the specialization courses in the third and fourth semesters. After the completion o f their M.Sc. students will have:

1. Strong analytical abilities
2. Qualities needed for teaching of science and doing research
3. Knowledge of theoretical as well as experimental areas of Physics
4. Capabilities to generate self-employment
5. Computational Skill and ICT development

Course Outcome

1. **MPHY-101: Classical Mechanics and Electrodynamics**

   Students are able to

   (i) Know the difference between Newtonian Mechanics and Analytic Mechanics.
   (ii) Solve the mechanics problems using Lagrangian formalism, a different method from Newtonian mechanics.
   (iii) Understand the connection between classical mechanics and quantum mechanics from Hamiltonian formalism.
   (iv) Understand the basics concepts of special and general theory of relativity.
   (v) Time-varying electromagnetic fields and the Maxwell equations.

2. **MPHY-102: Computational Methods in Physics**

   At the end of this course, the students are able to

   (i) Learn how to interpret and analyze data visually, both during and after computation.
   (ii) Gain an ability to apply physical principles to real-world problems.
   (iii) Acquire a working knowledge of basic research methodologies, data analysis and interpretation.

3. **MPHY-103: Quantum Mechanics I**

   Students are able

   (i) To have a working knowledge of the foundations, techniques and key results of quantum mechanics.
   (ii) To comprehend basic quantum mechanical applications at the research level.

4. **MPHY-104: Lab I**

   Students are able to understand

   (i) The basic idea about finding solutions using computational methods basics
   (ii) How to interpret and analyze data visually, both during and after computation.
   (iii) Physical principles to real-world problems.
   (iv) A working knowledge of basic research methodologies, data analysis and interpretation.
   (v) Physics in the global/social context.

5. **MPHY-201: Mathematical Physics**

   Students are able to

   (i) Understand the basics elements of complex mathematical analysis.

(ii) Solve differential equations that are common in physical sciences.
(iii) Apply group theory and integral transforms to solve mathematical problems of interest in Physics.
(iv) Understand how to use special functions in various physics problem.

6. **MPHY-202: Quantum Mechanics II**

Students are able
(i) To have a working knowledge of the advanced quantum mechanics techniques.
(ii) To understand different approximation theories like perturbation theory.

7. **MPHY-203: Electronics I**

Students have understanding of:
(i) Fundamental designing concepts of different types of logic gates, minimization techniques etc.
(ii) Designing of different types of the digital circuits, and to give the computational details for digital circuits.
(iii) Characteristics of devices like PNP and NPN junction diode and truth tables of different logic gates.
(iv) Basic elements and to measure their values with multimeter and their characteristic study.

8. **MPHY-204: Lab II**

(i) The students have knowledge of the different experimental techniques.
(ii) The students have understood the basics of physics involved in experiments.
(iii) The students are able to apply the concepts of physics and do the interpretation and acquire the results.

9. **MPHY-301: Atomic and Molecular Physics, Lasers**

Students have understanding of
(i) Atomic spectroscopy of one and two valance electron atoms.
(ii) The change in behavior of atoms in external applied electric and magnetic field.
(iii) Rotational, vibrational, electronic and Raman spectra of molecules.
(iv) Electron spin and nuclear magnetic resonance spectroscopy.
(v) Principle, working and applications of laser.

10. . **MPHY-302: Condensed Matter Physics**

Students have understanding of
(i) Structures in solids and their determination using XRD.
(ii) Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties.

(iii) Electrical, thermal, magnetic and dielectric properties of solids.

11. MPHY-303: Electronics II

Students have understanding of:

(i) Design of basic elements and to measure their values with multimeter and their characteristic study.

(ii) Working of Flip-flops, registers and counters.

(iii) Working of operational amplifiers.

12. MPHY-304: Lab-III

At the end of the course:

(i) The students have knowledge on the different experimental techniques involved in electronics.

(ii) The students are able to independently construct the circuits.

(iii) The students are able to apply the concepts of electronics and do the interpretation and acquire the result.

13. MPHY-401: Thermodynamics and Statistical Mechanics

At the end of this course, the students are able to

(i) Obtain basic knowledge of thermodynamic systems

(ii) Understand the basic idea about statistical distributions

(iii) Impart the knowledge about the phase transitions and potentials

(iv) Understand the applications of statistical laws

14. MPHY-402: Nuclear and Particle Physics

Students are able to understand:

(i) Basic knowledge about nuclear and particle physics

(ii) The nuclear reactions and neutron physics

(iii) The nuclear fission and fusion reactions

(iv) The knowledge about the nuclear forces and elementary particles.

15. Elective Paper-I

A: Advanced Quantum Mechanics

At the end of the course, the students are able to understand:

(i) Importance of relativistic quantum mechanics compared to non-relativistic quantum mechanics.

(ii) Various tools to understand field quantization and related concepts.

(iii) Exposure to quantum field theory and universal interactions.

E: Laser and Photonics

At the end of the course, the students are able to understand:

(i) Knowledge of fundamental physics of photonics.
(ii) Knowledge of sophisticated instrumentation intelligently.

F: Measurement and Instrumentation

At the end of the course, the students are able to understand:

(i) Knowledge on the different experimental techniques.
(ii) Basics of physics involved in experiments.
(iii) The concepts of physics and the interpretation of the results.

J: Plasma Physics

Students are able to understand:

(i) Theoretical method to study the charge particle motion.
(ii) Process to generate plasma in the laboratory.
(iii) Mechanism of plasma production.

16. Elective Paper-II

In this paper, students acquire the capacity to do small research projects and design experiments. The writing of project report and the presentation sharpen up the communication skill of the students.

DEPARTMENT OF MATHEMATICS

PATNA UNIVERSITY

ASHOK RAJPATH, PATNA-800 005 (INDIA)

Mob.: 9709224553

Ref. .....

Date 18/7/19

Ph.D Outcome

After Completion of the research and award of the Ph. D degree, the candidate is fit for selection as an Assistant Professor in Mathematics in any University or Engineering College or Polytechnic. Further during the course of research through his presentation in seminars/ conferences the candidate is exposed to speaking before an audience & thus/he develops the habit of presenting his paper/ talk without any hesitation. Also the candidate gains a lot of confidence and interest in higher research, once his research papers get published in reputed, refereed journals.

(L.N. Rai) 18/07/19

Professor & Head

Professor & Head

Department of Mathematics, P.U.

Patna University, Patna-800005

LEARNING OUTCOMES

Name of the Department: MATHEMATICS

Name of Programme: M.A/ M.Sc MATHEMATICS

Course Outcome

Course Outcomes according to the following parameters:

- **Academic**
- **Research**
- **Application- Environmental, Social, Scientific**
- **Employability**

Semester –I

Sl.No	Paper/Course	Title	Course Outcome
01	MAT CC -01	Abstract Algebra	After the completion of this paper, students will be able to answer basic questions related to mentioned topics. Logical capacity of the students is enhanced to a great extent.
02	MAT CC -02	Real Analysis	Real Analysis is an important part of Pure Mathematics. Stress is laid on development of the analytical abilities of the students.
03	MAT CC -03	Linear Algebra	After the completion of this paper students will be able to use computational techniques and algebraic skills. The students are able to grasp an overall concept of algebraic structures.
04	MAT CC- 04	Discrete Mathematics	Discrete Mathematics finds its applications in digital circuits and computational Mathematics, And develops the idea how pure mathematics can be applied to real life.

Signature of Department Committee

Signature of Head 7/19

Professor & Head
Department of Mathematics
Patna University, Patna-800005

LEARNING OUTCOMES

Name of the Department: MATHEMATICS

Name of Programme: M.A/ M.Sc MATHEMATICS

Course Outcome

Course Outcomes according to the following parameters:

- **Academic**
- **Research**
- **Application- Environmental, Social, Scientific**
- **Employability**

Semester -II

Sl.No	Paper/Course	Title	Course Outcome
01	MAT CC- 05	General Advanced Mathematics	The student is able to grasp the basic ideas about the topics mentioned.
02	MAT CC -06	Complex Analysis	Analytical study of complex analysis along with problem solving techniques is developed.
03	MAT CC -07	Differential and Integral Equation	Differential Equation plays an important role in solving problems in Applied Mathematics. The student is well equipped to solve real life situation problem.
04	MAT CC -08	Measure Theory	Measure Theory is an important part of Pure Mathematics. Stress is laid to inculcate development of analytical skills of students. After the completion of this paper the student is well prepared to analyse problem related to the mentioned topics.
05	MAT CC -09	Topology	A study of this topic paves the way for developing the idea how pure mathematics can be applied and generalized.

Signature of Department Committee

Signature of Head

Professor & Head
Department of Mathematics
Patna University, Patna-800005

LEARNING OUTCOMES

Name of the Department: MATHEMATICS

Name of Programme: M.A/ M.Sc MATHEMATICS

Course Outcome

Course Outcomes according to the following parameters:

- **Academic**
- **Research**
- **Application- Environmental, Social, Scientific**
- **Employability**

Semester -III

Sl.No	Paper/Course	Title	Course Outcome
01	MAT CC- 10	Functional analysis	The students, after the completion of the course is able to develop the concepts needed for further study and research.
02	MAT CC-11	Fluid Dynamics	In analytical dynamics and fluid mechanics the completion of course the student will be able to develop some advanced concepts required for research in applied mathematics.
03	MAT CC-12	Classical Mechanics	The students is able to solve some problem arising in physics using mathematical equations, differential equations etc.
04	MAT CC-13	Optimization Techniques	Optimization is a topic of the day & here students are taught some programming methods and they are able to develop an insight in the subject.
05	MAT CC-14	Differential Geometry	After studying Differential Geometry the student is able to see how differential calculus is applied to geometrical problems.

Signature of Department Committee

Signature of Head
Professor & Head
Department of Mathematics
Patna University, Patna-800005

LEARNING OUTCOMES

Name of the Department: MATHEMATICS

Name of Programme: M.A/ M.Sc MATHEMATICS

Course Outcome

Course Outcomes according to the following parameters:

- **Academic**
- **Research**
- **Application- Environmental, Social, Scientific**
- **Employability**

Semester –IV

Sl.No	Paper/Course	Title	Course Outcome
01	MAT EC-01	Elective Papers	MAT EC-01 & MAT EC 02 are the two electives to be selected out of given ten options. Each option has its own importantain the field where it can be applied. After studying the electives the students will be well prepared in the research field of his choice.
02	MAT EC-02	Elective Papers	

10/2/19

Signature of Department Committee

Signature of Head 10/2/19

Professor & Head
Department of Mathematics
[illegible] University, Pune-411007

Programme Specific outcome

- The course is so designed that after the completion of the course, students will be able to develop basic concepts of the topic taught, which will help them in solving problems related to the topic and uplift their analytical abilities required to pursue higher research in the field of their choice, so that they can achieve higher academic excellence.
- Further the applied part of the course is helpful in applying the concepts to various fields such as Bio-Mathematics, Environmental Science, Mathematical Economics, Population Dynamics, Actuarial Science, Industrial Mathematics, Financial Mathematics, Social Science, Medical Science, etc.
- After the completion of the course the student will find himself well equipped to appear at Public Service Examination and other employment related examinations, such as teaching at the University & College level or even at the school level.

10/7/19
Signature of Department Committee

10/7/19
Signature of Head
Professor & Head
Department of Mathematics
Patna University, Patna-800005

Programme outcome

After completion of the programme the student will be able to

1. Develop his logical capacity to great extent which will lay down a firm foundation of the fundamental concepts.
2. Develop the ability in the applicability of Mathematics to real life problems.
3. Develop the ability to design and carry out research in the concerned and allied fields.
4. Develop skills in problem solving, critical thinking and analytical reasoning.
5. Develop the ability to communicate with clarity the results and the concepts which he/she has learned.

Signature of Department Committee

Signature of Head

10/07/19

Professor & Head
Department of Mathematics
Patna University, Patna-800005

To,
NAAC Co-ordinator,
Patna University,
Patna.

Date: 09.07.2019

Sub: Programme Outcome, Programme Specific Outcome and Course Outcomes

Sir,

In reference to your letter No. NAAC/1463 dated 06.07.2019, please find the Programme Outcome, Programme Specific Outcome and Course Outcomes of M.Sc. (Geology) attached for your kind reference.

Thanking you,

Yours faithfully

9/7/19

(Ramesh Shukla)
Head
Department of Geology
Patna University, Patna

Head of the Department of Geology
Patna University, Patna-800005

Encl.:
1. Programme Outcome, Programme Specific Outcome and Course Outcomes of M.Sc(Geo.).

PROGRAM OUTCOME:

1. *The generation of trained personnel ready to serve in the realms of teaching and research in Earth Science.*
2. *The production of a strong contingent of Earth scientists adequately trained in both theoretical and practical aspects of geology.*
3. *The program shall equip students with the technological tools and skills competent enough to analyze geological data and information for the best utilization in Earth Science studies.*
4. *A significant outcome of the program shall be the production of versatile geologists who understand the significance of sustainable utilization & development of Earth resources*
5. *Prepare students for successful and scientific, technical or management careers in the geosciences and related field.*

PROGRAM SPECIFIC OUTCOMES

- *Students will acquire a solid base of knowledge in the science of geology as a whole as well as earth materials, earth history, magma generation, igneous rock classification sedimentation and stratigraphy, deformational processes and structural features, and geomorphic processes and landforms.*
- *Students will develop proficiency in conveying complex geologic concepts in clear, technically correct writing.*
- *Field Visits to introduce and develop field based geological skills and knowledge*
- *Provides great opportunities in the field of Ground Water Management, Geotechnical studies, Mining, Mineral and Hydrocarbon exploration sectors.*

SEMESTER-I
PAPER CODE: MGELCC-1
STRUCTURAL GEOLOGY & GEOTECTONICS

Course Outcome

1. *Knowledge of behavior of rocks and their geological significance*
2. *Ability to analyse strain ellipses and ellipsoid*
3. *Understand the concept of Mechanics of folding and faulting*
4. *Know the significance of planar and linear fabrics*
5. *Understand the evolution of the contineneis and Ocean basins*

SEMESTER-I
PAPER CODE: MGELCC-2
MINERALOGY, CRYSTALLOGRAPHY, & OPTICAL MINERALOGY

Course Outcome:

1. *Knowledge and Classification of mineral groups.*
2. *Knowledge of Properties of essential minerals*
3. *To comprehend space lattice, space groups, crystal lattice and crystal structure*
4. *Understanding of optical mineralogy*

SEMESTER-I

PAPER CODE: MGELCC-3

IGNEOUS PETROLOGY & GEOCHEMISTRY

Course Outcome :

1. *Knowledge of Magma generation, differentiation*
2. *To comprehend various classification of igneous rocks*
3. *Understanding concept of Phase equilbria*
4. *Learning of various igneous activities of India*
5. *Fundamental Knowledge of Geochemistry*

PAPER CODE: MGELCC-4 (Practical)

Course Outcome:

1. *Interpret various geological structures from the study of geological maps.*
2. *Understand the use of stereographic projections of structural data and mineral data.*
3. *Gain an ability to distinguish different igneous rocks in the field and thin sections.*
4. *Learn to classify optical properties of the minerals.*
5. *Understand the importance of Geological Maps in understanding Geomorphology, Structure etc.*

SEMESTER – II

PAPER CODE: MGELCC-5

GEOMORPHOLOGY AND REMOTE SENSING & GIS

Course Outcome :

1. *Students shall have a comprehensive understanding of landforms*
2. *Knowledge of aerial photography techniques*
3. *Application RS and GIS*
4. *Importance of GPS*

SEMESTER – II

PAPER CODE: MGELCC-6

SEDIMENTOLOGY

Course Outcome

1. *Students will be able to understand the process of formation of sedimentary rocks.*
2. *They will interpret dynamics of depositional environments.*
3. *Enable Students to evaluate the record of tectonic & climatic processes through geological time.*

SEMESTER – II
PAPER CODE: MGELCC-7
METAMORPHIC PETROLOGY

Course Outcome:

1. *Understanding of metamorphism and its products*
2. *Knowledge of relation between plate tectonics and metamorphic facies*
3. *Importance of isograds and metamorphic reactions*
4. *Learning about the metamorphic products*
5. *Knowledge of paired metamorphic belts and metasomatism*

SEMESTER – II
PAPER CODE : MGELCC-8
STRATIGRAPHY AND PALAEONTOLOGY (I)

Course Outcome:

1. *Students shall benefit in their idea of various stratigraphic tools.*
2. *A better understanding of the oldest rocks & their associations.*
3. *A comprehensive idea of Aravalli, Cuddapah & Vindhyan rocks & their significance,*
4. *An understanding of origin & extinction of life forms and the vertebrate & Mammalian life.*

PAPER CODE: MGELCC-9 (PRACTICAL)

Course Outcome:

1. *Identification of the different sedimentary and metamorphic rocks.*
2. *Enable students to use satellite data in interpreting geology of the area.*
3. *Learn latest software and its use in solving geological problems.*
4. *Identify different kind of fossils and their stratigraphic importance.*
5. *Learn the position of India on a Global Map in different geological time.*

SEMESTER – III
PAPER CODE: MGELCC-10
ENVIRONMENTAL GEOLOGY & HYDROGEOLOGY

Course Outcome :

1. *Knowledge of hydrological properties of aquifers*
2. *To study techniques of ground water exploration and water quality*
3. *Understanding of Hydrosphere, Lithosphere and Biosphere*
4. *Knowledge of EIA and Environmental legislations*
5. *Study of Environmental Issues*

SEMESTER – III
PAPER CODE: MGELCC-11
ENGINEERING GEOLOGY & GEO-EXPLORATION

Course Outcome :

1. *Understanding of role of geologists in the construction of civil structures*
2. *To investigate Rock Mass characterization and classification*
3. *To understand different types of engineering structures and techniques*
4. *To know different types of Exploration methods.*
5. *Students shall have a solid understanding of techniques of investigations for engineering projects.*

SEMESTER – III
PAPER CODE: MGELCC-12
ECONOMIC GEOLOGY

Course Outcome :

1. *Students will have understanding of classification of Mineral deposits and processes of formation.*
2. *To have a knowledge of Mineral Economics and related Legislations*
3. *A comprehensive idea about genesis and distribution of major ore minerals and associated host rocks.*
4. *A basic understanding of occurrence and origin of fuel deposits with reference to India.*

SEMESTER – III
PAPER CODE: MGELCC-13
STRATIGRAPHY AND PALAEONTOLOGY (II)

Course Outcome:

1. *Evidence for changes in the form of oceans and continents*
2. *Global and local climate and environment in which different forms of life evolved*
3. *To unravel the events of the past*
4. *To determine the order in which the rocks were formed*
5. *To understand morphology and evolutionary trends of fauna and flora*

PAPER CODE: MGELCC-14 (Practical)

Course Outcome:

1. *Identify the Economic Minerals based on their distinguishing properties*
2. *A comprehensive idea of the Rock Mass Classification*
3. *Identify the different kinds of Fossils – vertebrate, invertebrate, plants.*
4. *To develop an idea of Determination of the hydrological properties of rock.*
5. *An understanding of the location of ground water provinces of India.*

SEMESTER – IV
PAPER CODE: MGELEC-1
ADV. HYDROGEOLOGY (Elective paper)

Course Outcome:

1. *Knowledge of water distribution and types*
2. *Understanding the significance of various Hydrostratigraphic units and theory of ground water flow*
3. *Hydrogeomorphic mapping for potential zones*
4. *Knowledge of Well hydraulics*
5. *Analysis of Ground water quality and concept of ground water management*

SEMESTER – IV
PAPER CODE: MGELEC-1
FUEL GEOLOGY (Elective Paper)

Course Outcome:

1. *Students shall benefit to have basic ideas about formations, nomenclature in constitution of coal*
2. *Development of comprehensive knowledge of utilization of coals*
3. *A working detail of distribution of coals and coal industry in India*
4. *Sufficient idea of formation and entrapment of oil and gas*
5. *Elaborate understanding of oil exploration techniques and petroliferous basins of India*

SEMESTER – IV
PAPER CODE: MGELEC-1
ADVANCED SEDIMENTOLOGY (Elective Paper)

Course Outcome:

1. *Students will be able to understand the process of formation of sedimentary rocks.*
2. *Students shall be able to interpret the dynamics of depositional environments.*
3. *Students will be able to critically evaluate the record of tectonic and climatic processes through geological time.*

SEMESTER – IV
PAPER CODE: MGELEC-1
GEOCHEMISTRY (Elective Paper)

Course Outcome:

1) *Students shall benefit to have basic ideas about the Universe and the Earth.*
2) *Development of comprehensive knowledge of the application of geochemistry.*
3) *Understanding about the petrology and the chemistry behind it.*
4) *Enhancement of knowledge regarding the Earth & its different spheres.*
5) *Knowledge of geochemistry for industrial purpose.*

PAPER CODE: MGELEC-2
FIELD TRAINING AND LAB WORK

Course Outcome:

1. *Understand the application of Principles of Geology in the field to reveal geology of the area.*
2. *Experience the process of collection of rock samples, toposheet & GPS location and field diary entry of all the relevant field geological data.*
3. *Framing up of the Field Report based on scientific analysis leading to a professional presentation of the geological data.*

Name of the Programme
M.Sc in Chemistry

COURSE OUT COMES (CO)

PROGRAM OUT COMES (PO)

AND

PROGRAM SPECIFIC OUT COMES (PSO)

03-07-15
Head of the Department of Chemistry
Patna University, Patna

HoD's name :
Mob :
email id :

Program Outcomes

After completion of the programme student

- To develop a firm foundation in the **fundamentals and application of current chemical and scientific theories of the different branches of Chemistry.**

- To develop the **ability to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.**

- To develop skill in problem solving ,critical thinking and analytical reasoning as applied to scientific problems.

- To develop the **ability to clearly communicate the results of scientific** work.

- To develop the **ability to explore new area of research in both** Chemistry and allied fields.

09.07.19

Head of the Department of Chemistry
Patna University, Patna

Program Specific Outcomes

The learners of the two years M.Sc. degree course

* Must gain the complete knowledge about all fundamental aspects of Chemistry.
* Must understand the background of organic reaction mechanism, complex chemical structures, instrumental method of chemical analysis ,molecular rearrangements and separation techniques.
* Must appreciate the importance of the various elements present in periodic table ,Coordination compounds - theories and structures
* Must gather attention about the physical aspects of atomic structure ,reaction pathway with respect to time ,various energy conversions as well as significance of Electrochemistry , symmetry conditions including group theory.
* Must carry out the experiments in the area of Organic , Inorganic and Physical Chemistry.

09.07.19
Head of the Department of Chemistry
Patna University, Patna

COURSES OUTCOMES

In the CBCS curriculum the course outcomes are experessed semester wise as well as topic wise.

Semester -1

Course code - CHECC-1
Subject :- Inorganic Chemistry

* Various ideas of bonding in complex compounds.
* Informs the concepts of magneto-chemistry
* Ideas of the stability constant of complexes.
* Informs the reaction mechanism of the complexes.
* Elementary idea of isopoly and hetropoly acids.

Course code - CHECC- 2
Subject - Physical Chemistry

* Informs about polymers , mechanism and kinetics of polymerization
* Idea of electrode potential in terms chemical potential and theories of strong electrolytes.
* Developed ideas of dynamics of chemical reactions.
* Gives various concepts of 2nd law of thermodynamics.
* Gains various concepts of statistical thermodynamics.

Course Code - CHECC-3
Subject - Organic Chemistry

* Basic concepts of bonding as well as structures of organic compounds.
* Detailed concepts of stereochemistry and stereo-chemical reactions.
* Discuss the various methods for the study of reaction mechanism.
* Detailed concepts of nucleophillic substitution in aliphatic compounds.
* Idea of aliphatic electrophillic substitution and elimination reactions.

Course Code - CHECC - 4
Subject : Practical Physical Chemistry

* Practical idea for the water equivalent and heat of solution measurements.
* Experimental determination of rate constants various reactions and measurements of distribution coefficient of organic compounds.
* Trains in the determination of specific and molar rotation through polarimeter.
* Handling of the apparatus related with the calculation of dissociation constants of weak acids and the solubility product experiments

M.Sc Semester- 2

Course Code - CHECC- 5
Subject : Advances in Chemistry

* Basic idea of nuclear chemistry and isotopic applications of various problems
* Concepts of nano materials and their synthesis.
* Basic idea of conductors , semiconductors and their applications.
* Idea of the industrial application with respect to cement , paper , pulp and petroleum .
* Various waste management methods.

Course Code - CHECC- 6
Subject - Inorganic Chemistry

* Idea about electronic spectra of transition metal complexes.
* Detailed information of various type of symmetry elements.
* Complete foundation of the group theory
* Basic concepts of pi - bonding in metal complexes.
* Detailed idea of metal clusters.

Course Code - CHECC- 7
Subject - Physical Chemistry

* Provides sound knowledge of Quantum mechanics.
* Concepts of linear harmonic oscillator and polynomial equations.
* Idea of approximate method.
* A sound knowledge of Huckel MO theory.
* Detailed idea of LACO-MO theory of bonding.

Course Code- CHECC-8
Subject - Organic Chemistry

* Concepts of addition reactions with respect to carbon-carbon multiple bonds and carbon heteroatom multiple bonds .Also gives the concepts of various free radical reactions.
* Concepts of photochemical reactions with the special reference to carbonyl and unsaturated compounds.
* A perfect idea of various Pericyclic reactions.
* Study of the derivatives of mono saccharide derivatives and some disaccharides
* Provides a sound knowledge of amino acid and protein Chemistry.

Course Code - CHECC- 9
Subject- Practical Organic Chemistry

* Gives the practical training for the separation of binary organic mixture by chemical methods and identification of organic compounds including derivative preparation.
* Training for one step /two steps organic preparations.

Semester -3

Course Code :- MSCCHECC-X
Subject : Applications of Spectroscopy

* Detailed concepts of rotators , rotational energy and rotational spectra
* Concepts of vibrational spectra which includes IR /Raman spectra and photoelectron spectroscopy.
* Detailed idea of Nuclear magnetic resonance spectroscopy.
* Concepts of mass spectroscopy.
* Sound concepts of various other spectroscopy.

Course Code :- MSCCHECC- XI
Subject :- Bio -Inorganic Chemistry

* Sound knowledge of the presence of metal ions in biological system.
* Gives idea of Bioenergetics and ATP cycle.
* Concept of storage and transport of di-oxygen in the biological system.
* Idea of electron transfer in the biological system.
* Detailed idea of the use of metals in medicines.

Course Code - MSCCHECC- XII
Subject :- Environmental Chemistry and Green Chemistry

* Idea of the composition of atmosphere ,bio-distribution of elements and biochemical cycles.
* Idea of chemical composition of water bodies ,water quality parameters and their measurements.
* Concepts related with composition ,reactions and pollution levels in the atmosphere .
* Sound concept of the principles of green Chemistry.
* Idea related with the applications of Green Chemistry.

Course Code- MSCCHECC-XIII
Subject : Bio-organic Chemistry

* Gives the basic concepts of Enzymes.
* A sound concept of the mechanism of the Enzymatic action.
* Brief idea of the reactions controlled by the enzymatic actions.
* A sound knowledge of Co-enzyme chemistry.
* Gives idea of the biotechnological applications of enzymes

Course Code:-MSCCHECC-IVX
Subject : Practical Inorganic Chemistry

* Provides practical training of the Quantitative analysis of the transition metals.
* Trains /expertise in the preparation of complexes including their spectral analysis.
* Trains practically the analysis of the inorganic mixtures containing six radicals including interfering radicals.

4th semester

Course Code :- MSCCHEEC -1a
Subject -Inorganic Chemistry special

* Basic idea of the type, stability , synthesis and the reactivity of the organo-metallic compounds.
* Concepts of transition metal pi-complexes.
* A detailed idea of the homogeneous catalysis.
* Concepts related with supra-molecular chemistry and photochemistry of transition metals.
* A brief concept of the molecular rearrangement in octahedral complexes.

Course Code :- MSCCHEEC-1b
Subject :- Physical Chemistry special

* Idea of Hastree Fock theory& semi -empirical theory
* Concepts related with catalysis and oscillatory behavior of materials.
* Idea of the condensed phase reactions and the study fast reactions.
* Detailed idea of the kinetics of the electrode reactions.
* Concepts related with corrosion and thermodynamics of solids.

Course Code :- MSCCHEEC -1c
Subject -Organic Chemistry Special

* Basic concepts of terpenoid chemistry and structures of some compounds.
* Concepts related with Alkaloids.
* Concepts of drug design.
* Informations related to various type of drugs.
* Basic idea related with heterocycles which includes five and six membered rings.

Course Code -MSCCHEEC-2a
Subject - Practical Inorganic Chemistry special.

* Qualitative inorganic analysis of the mixture mixture containing six radicals including Mo, V, W , Cr.etc.
* Practical training of the analysis of two metals in some alloys& minerals including spectro-photometric analysis of some elements.

Course Code -MSCCHEEC-2b
Subject - Practical Physical Chemistry special

* gives practical training of conducto-metric titration ,potentio-metric experiments and the experiments related with partition coefficients.

Course Code - MSCCHEEC -2c
Subject -Practical organic special

* Trains in the separation of organic mixture through chemical methods containing atleast three compounds, Multiple step organic preparations and estimation of organic compounds by UV -Visible spectro-photometric method.

09-07-19
Head of the Department of Chemistry
Patna University, Patna
(Signature)

Program Specific Outcomes

The learners of the two years M.Sc. degree course

* Must gain the complete knowledge about all fundamental aspects of Chemistry.

* Must understand the background of organic reaction mechanism, complex chemical structures, instrumental method of chemical analysis ,molecular rearrangements and separation techniques.

* Must appreciate the importance of the various elements present in periodic table ,Coordination compounds - theories and structures

* Must gather attention about the physical aspects of atomic structure ,reaction pathway with respect to time ,various energy conversions as well as significance of Electrochemistry , symmetry conditions including group theory.

* Must carry out the experiments in the area of Organic , Inorganic and Physical Chemistry.

Repetation

09-07-19

Head of the Department of Chemistry
Patna University, Patna

DEPARTMENT OF BIOCHEMISTRY

PATNA UNIVERSITY, PATNA-800005

Ref. 2764

Date 16.7.19

Programme Outcome

Programme outcome of M.Sc Biochemistry is to produce competent biochemist that can employ and implement their knowledge base in premium processes and applications which will profoundly influence and be utilized for existing paradigm of agriculture, industry, healthcare, Path laboratory and restoration of degraded environment to provide sustainable competitive edge to present society. Students will exhibit contemporary knowledge of Biochemistry and will be eligible for doing jobs in various sectors of pharmaceutical and biotechnological industry.

Programme Specific Outcome

Biochemistry as a subject is the base of all the subjects of Life Sciences such as Botany, Zoology, Biotechnology, Microbiology etc. It is also included as basic course in Medical Science, Veterinary Science, Dental Science, Agriculture Science etc. Hence M.Sc. Biochemistry Degree Holders have a large number of opportunities for teaching positions at various levels, such as Assistant Professor, Tutor, and Demonstrator etc.

In the present era no research can be done in the field of Life Science without Biochemistry. Hence Biochemistry holds the key of research in the field of Life Science as well as Medical Science, Veterinary Science, Dental Science and Agriculture Science. So a huge number of Scientific positions are available for the Biochemistry Degree Holders.

Beside these, other opportunities area as follows:

- Students will be able design, conduct experiments, analyze and interpret data for investigating problems in Biochemistry and allied fields.
- Higher studies (M.Phil, Ph.D) can be pursued in order to attain research positions. Various examinations such as CSIR-NET, GATE, ICMR and many other opens channels for promising career in research.

- Students can become Research associate, Junior Production Officer and Technical Assistant in Biochemistry, biotechnology, pharmaceutical Companies, bio fertilizer industry, aquaculture industries, environmental units, crop production units, food processing industries, national bio-resource development firms, banking and KPO.
- Entrepreneurship ventures such as consultancy, pathos-laboratory and training centers can be perused.
- Some of the major pharmaceutical and drug companies' hiring biochemist professionals include Accenture, Dabur, Ranbaxy, Hindustan Lever and Dr Reddy's Labs, food processing industries, beverage industry, chemical industry and textile industry as well. Besides this, industries also employ biochemist professionals in their marketing divisions to boostup business in sectors where their products would be required.
- Students will be able to understand the potential impact of biochemical innovations on environment and their implementation in finding sustainable solution to issues pertaining to environment, health sector, agriculture, etc.
- Several career opportunities are available abroad for students with biochemistry background, especially in countries like Germany, Australia, Canada, USA and many more where biochemistry is a rapidly developing field.

Course Outcome

Following Courses of M.Sc. Biochemistry Programme provides opportunities in the following sectors:

Semester	Course Code	Title	Outcome
I	CC-1	**Organic And Biophysical Chemistry**	Drug Industry, Paint Industry
	CC-2	Cell and Molecular Biology	Research
	CC-3	Biophysical and Biochemical Techniques, Biostatistics, Basic Computer skill and Research Methodology	**Biomedical Industry, Bioinformatics Based industry, Data Analysis and Interpretation**
	CC-4	**Practical General Biochemistry**	Quality control in Industries
	AECC-1	**Environmental Sustainability and Swachchha Bharat Abhiyan**	**Awareness for cleanliness and environmental protection**
II	CC-5	Nutritional Biochemistry	**Dietician, Food Processing industries**
	CC-6	Bioenergetics and Biomolecules	Research
	CC-7	Enzymology	Drug and enzyme based industries

	CC-8		Plant Biochemistry	Plant based industries
	CC-9		**Practical Enzymology and Analytical Biochemistry**	Drug synthesis, enzyme based industries and Quality control
	AEC-1		Solid Waste Management	Municipal corporations, Environment protection
			Mushroom Culture	Food Processing Industry
			Bio-fertilizer Production	Agro Based Industries
III	CC-10		Dissertation/ Project	Research or Patho Laboratories
	CC-11		Human Physiology	**Medical based industry, Drug Research and Development (R&D)**
	CC-12		**Immunology and Immunochemistry**	**Vaccine Production, Antidote production**
	CC-13		Biotechnology and Bioinformatics	Genetically modified organisms production, Agriculture research
	CC-14		**Practical- Haematology, Immunochemistry and Biotechnology**	**Blood Bank, Blood testing, Pathological labs**
	AECC-2		**Human Values, Professional Ethics and Gender Sensitization**	**Development of ethos towards profession and society**
IV	EC-1	Theory	Microbial Biochemistry	**Microbes based industries, Dairy, Beverage, Food processing industries**
			Clinical Biochemistry	Pathological lab, Biochemist
	EC-2	**Practical**	Microbial Biochemistry	Enzyme based industries, Bio fertilizer based industry, Biotechnology Based Industries
			Clinical Biochemistry	Hospitals, Labs setup, Medical and Paramedical colleges
	DEC			

15/07/2019

Head

Head Dept. of Bio-Chemistry
Patna University

(Vivekanand Mishra)

DEPARTMENT OF BOTANY

PATNA UNIVERSITY, PATNA-800005

Ref. No: Both G/ 694 Date: 8.7.19

To

The NAAC Co-ordinator
Patna University, Patna

Sub.:- Regarding:-

i. Programme outcome, Programme specific outcome & Course outcomes
ii. Students Feedback

Ref.:- P.U. letter no.-NAAC/1463 dated 06.07.2019

Sir,

With reference to P.U. letter no.-NAAC/1463 dated 06.07.2019 we have to state the following Facts for information and necessary action.

1. The soft copies of Programme outcome, Programme specific outcome & Course outcomes pertaining to the Department of Botany & M.Sc. Course in Biotechnology had already been sent through mail to Ms. Stuti of NAAC office on following dates:-

   i. Department of Botany:- 07.02.2019
   ii. M.Sc. Course in Biotechnology:- 09.02.2019

   As reported by Prof. Birendra Prasad the hard copies had also been signed by me and sent to the University office.

   However, a copy of the aforesaid reports sent earlier is again being attached for necessary action.

2. The students feedback had also been sent to your office in sealed envelopes on 06.07.2019 vide letter no. Bot./G/69[illegible].

8.7.19

(S. R. Padmadeo)
Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany **Name of Programme: M.Sc. Botany**

Programme Specific Outcome

- **Academic:** Better understanding of the subjects of plant diversity, cell biology ,microbiology, genetics, biochemistry , taxonomy etc for economic use.
- **Research** : Development of ideas and concepts from the acquired knowledge for crop improvement, sustainable development, conservation and preservation of endangered species and also bioprospecting.
- **Application – Environment , social, Scientific ;**Understand application of bacteria, cyanobacteria , fungi, plant and plant metabolites for human, social and economic welfare.
- **Employability:** Research and teaching and preparation for various competitions like UPSC, BPSC and forest service.

Signature of Head

Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany **Name of Programme: M.Sc. Botany**

Subject: M.Sc. Botany
Semester: I

Sl.No.	Paper /Course	Title	Course outcome
1.	MBOTCC-I	Phycology, Mycology and Bryology	Exposure to different kinds of algal, fungal and bryophyte diversity and their economic implication.
2.	MBOTCC-2	Microbiology and Plant Pathology	Applied aspects e of microbial diversity in various fields eg: pharmaceuticals, dairy agriculture etc. Understand the ways and means of combating plant diseases so as to minimise economics loss.
3.	MBOTCC-3	Pteridophyta, Gymnosperms and Paleobotany	Study of plant diversity and understanding of evolutionary trends through study of paleobotany.
4.	MBOTCC-4	Practical	Perform procedures for understanding the above mentioned topics in their forms anatomy and microbial diversity Isolation from various sources.

2.7.19

Signature of Head

Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany **Name of Programme: M.Sc. Botany**

Subject: M.Sc. Botany
Semester:II

Sl.No.	Paper /Course	Title	Course outcome
1.	MBOTCC-5	Biofertilizer Technology	Applied aspects for the enhancement of soil fertility and crop productivity and ideal way for sustainable development.
2.	MBOTCC-6	Taxonomy, Anatomy & Embryology	Understanding classifications and interaction between Taxonomy, Anatomy & Embryology
3.	MBOTCC-7	Physiology & Biochemistry	Understanding the mechanism of water realtions , metabolism, growth and morphogenesis .Along with the vast array of primary and secondary metabolites
4.	MBOTCC-8	Plant tissue culture, Ethnobotany , Biodiversity And Biometry	Ways of conservation and propogation of economically important and endangered plants . Study of diversity , its importance .Measurement of variability and test of significance of Data
5.	MBOTCC-9	Practical	Hands on training on conservation by tissue culture .observation of various metabolic pathways and water relations .

Signature of Head

Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany **Name of Programme: M.Sc. Botany**

Subject: M.Sc. Botany
Semester: III

Sl.No.	Paper /Course	Title	Course outcome
1.	MBOTCC-10	Cell biology & Cytogenetics	Study of cellular& karyotypic details of plants and ideogram preparation
2.	MBOTCC-11	Molecular Biology	Understanding the structure and function of protein and nucleic acid essential to life. Also the molecular basis of biological activity and interrelationship between in various system of cell.
3.	MBOTCC-12	Recombinant DNA technology	Joining and manipulating DNA molecules to produce genetic combinations which are of value to Science, medicine & various industry
4.	MBOTCC-13	Plant ecology and environmental biology	Understanding of the environment, pollution its problems and ways for sustainable and healthy ecosystem
5.	MBOTCC-14	Practical	Study of karyotype. Hands on training for basic recombinant DNA technology. Knowledge of different instruments/techniques eg Electrophoresis, spectroscopy, centrifugation, isolation of microorganisms etc. Practical based on environmental biology

Signature of Head

Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany Name of Programme: M.Sc. Botany

Subject: M.Sc. Botany
Semester: IV

Sl.No.	Paper /Course	Title	Course outcome
1.	MBOTEC-1	Cytogenetics and Crop improvement	Understanding of the karyotypic details and knowing the traditional and modern methods of crop improvement
2.	MBOTEC-2	Practical	Hands on training for the preparation of study of various cytological stages of plants
3.	MBOTEC-1	Applied microbiology and Plant Pathology	Equipping students for industrial application of microbial diversity .Study of causal organism of plant pathogens and their control.
4.	MBOTEC-2	Practical	Practical training on isolation, purification and identification of important microbes. Study and collection of Plant pathogens and herbaria preparation.

8-7-19
Signature of Head
Head
Department of Botany
Patna University

NAAC Criteria-II

Name of the Department- Botany **Name of Programme:** M.Sc. Biotechnology

Programme Specific Outcome

M.Sc. Biotechnology is a two-year postgraduate programme initiated with an impetus to impart advanced knowledge on modern biology. Other than providing students with the indispensable knowledge, the programme curriculum fosters problem-solving and critical thinking skills that prepare students to take on any challenges.

Under this programme the students gain insights on the key research areas of Advances in Microbial, Plant and Environmental Biotechnology. The programme encompasses a balance of both theoretical and practical sessions which enables the students to apply their learning and develop end results.

The programme focuses on career-oriented subjects like Microbial Biotechnology, Genetic Engineering, Plant tissue culture, Animal Biotechnology, Enzyme Technology and Bioinformatics.

8/7/19

Co-ordinator
M. Sc. Degree Course in Biotechnology
Patna University

8.7.19

Head
Department of Botany
Patna University

Course Outcome

Subject: Biotechnology
Semester- I

Sl. No	Paper/Course	Title	Course Outcome
1	MSBTCCC-1	Cell & Molecular Biology and Genetics	On successful completion of this course, student will be able to know about the -Diversity of cell, Cell signaling, Organelle biogenesis, Apoptosis -Process of replication of DNA, transcription, post-transcriptional modifications and translation in both prokaryotes and eukaryotes; Regulation of gene; Genetic recombination in prokaryotes -Principles of genetics **The course has importance in the areas of academic and research. The students will get in-depth knowledge of biological processes through the investigation of the underlying molecular mechanisms.**
2	MSBTCCC-2	Microbiology	Students able to – - Acquire and demonstrate competency in laboratory safety and skills applicable to microbiological research - Identify the major categories of microorganisms and analyze their classification, diversity and structure. - Identify and demonstrate how to control microbial growth. -Demonstrate and evaluate the interactions between microbes and hosts and environment. **The course has importance in the areas of academic, research and employability.**
3	MSBTCCC-3	Biomolecule and Basic Enzymology	Students should be able to - Gain fundamental knowledge in biochemistry - Understand the molecular basis of various pathological conditions from the perspective of biochemical reactions. - The course provides a thorough understanding of Enzymology principles.

5/7/2019
Co-ordinator
M. Sc. Degree Course in Biotechnology
Patna University

Head 19
Department of Botany
Patna University

			fundamental properties of enzymes, catalytic mechanisms and enzyme kinetics. The course also provides an overview of enzyme purification, localization of enzymes, enzyme immobilization and applications of enzymes in various industries. Current course provide a thorough theoretical knowledge and an understanding related to structure classification and functions of carbohydrates, lipids, amino acids and their derivatives. The course further sheds light on principle of enzyme catalysis. **The course has importance in the areas of academic, research and pharmaceutical industries.**
4	MSBTCCC-4	Practical	Students able to - - To elaborate concepts of biochemistry with easy to run experiments. - To make students learn the estimation of carbohydrates, lipids, proteins and nucleic acids. The students also learn various techniques such as various types of chromatography used for separation of amino acids and plant secondary metabolites. - To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry. - To isolate, characterize and identify common bacteria and fungi. - To determine bacterial load in different samples. - Perform antimicrobial sensitivity test. - Preserve microbial cultures. **The course has importance in the areas of research and employability.**

8/7/19

Signature of Coordinator

Co-ordinator
M. Sc. Degree Course in Biotechnology
Patna University

Signature of Head

8.7.19

Head
Department of Botany
Patna University

Course Outcome

Subject: Biotechnology
Semester- II

Sl. No	Paper/Course	Title	Course Outcome
1	MSBTCCC-5	Biofertilizer and Mushroom Technology	Application of microbial inoculants, like, *Rhizobium*, *Azotobacter*, *Azospirillum*, Phosphate Solubilizing Microorganisms and Arbuscular Mycorrhizal Fungi, is an integral part of Integrated Nutrient Management (INM). Therefore, students able to acquire the detailed knowledge of production of different types of Biofertilizers. - also determine the most important species of cultivated mushrooms and knows the basic way of their cultivation. **The course has importance in the areas of skill development and entrepreneurship.**
2	MSBTCCC-6	Biophysics and Instrumentation	Students able to -Learn the history, theoretical basis and basic understanding of some of the latest technologies in the area of biotechnology. - Learn about theory and applications of various instruments used in modern biology. - Design an experiment with step-by-step instructions to address a research problem. **The course has importance in the areas of academic, research and employability.**
3	MSBTCCC-7	Biology of Immune System	Students able to – - Apply their knowledge in designing immunological experiments to demonstrate innate, humoral or cytotoxic T lymphocyte responses and figure out the kind of immune responses in the setting of infections (viral or bacterial). - Evaluate the usefulness of immunology in different pharmaceutical companies. **The course has importance in the areas of academic, research and employability.**

6/7/2019
Co-ordinator
M. Sc. Degree Course in Biotechnology
Patna University

8.7.19
Head
Department of Botany
Patna University

4	MSBTCCC-8	Bioprocess Technology	Students able to – - Appreciate relevance of microorganisms from industrial context. - Give an account of design and operations of various fermentors. - Present unit operations together with the fundamental principles for basic methods in production technique for bio-based products. - Critically analyze any bioprocess from an economics/market point of view. - Give an account of important microbial/enzymatic industrial processes in food and fuel industry. **The course has importance in the areas of academic, research and employability.**
5	MSBTCCC-9	Practical	This course will provide an overview of different instrumentation systems used in biotechnological lab. The students will come to know about principle and working of different instruments and their applications in biological research. The students will also be able to comprehend techniques such as different types of spectroscopy, Centrifugation, Chromatography, Electrophoresis etc. Students should also be able to – - Evaluate the usefulness of immunology in different pharmaceutical companies. - Gain ability to investigate, design and conduct experiments, analyze and interpret data, and apply the laboratory skills to solve complex bioprocess techniques. **This experience would enable them to begin a career in industry that engages in modern biology as well as in research laboratories conducting fundamental research. Students can develop relevant skill set which can aid their employment.**

8/7/2019

Signature of Coordinator

Co-ordinator
M Sc. Degree Course in Biotechnology
Patna University

Signature of Head

Head
Department of Botany
Patna University

Course Outcome

Subject: Biotechnology
Semester- III

Sl. No	Paper/Course	Title	Course Outcome
1	MSBTCCC-10	Biostatistics and Bioinformatics	-Biostatistics is essential to understand the interpretation and analysis of scientific data. This course covers the basic tools that can be used for the collection analysis and presentation of data specifically in research experiments. The course enables the students to understand the importance of setting up experiments and how to process research data to reach significant conclusions. -Bioinformatics has now become an indispensable tool in biological research. This course provides a comprehensive knowledge of bioinformatics tools and their wide applications in various fields of biotechnology. The course is designed to develop desired skill set in bioinformatics which is beneficial for both future research and employment of students. **The course has importance in the areas of research and employability.**
2	MSBTCCC-11	Recombinant DNA Technology	Given the impact of recombinant DNA technology in modern society, the students should be endowed with strong theoretical knowledge of this technology. In conjunction with the practicals in molecular biology & genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry. Students also able to – -understand different types of intellectual property rights in general and protection of products derived from biotechnology research and issues related to application and obtaining patents. -gain knowledge of biosafety and risk assessment of products derived from recombinant DNA research and environment release of genetically modified organisms, national and international regulations.

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			-Understand ethical aspects related to biological, biomedical, health care and biotechnology research. **The course has importance in the areas of academic, research and employability.**
3	MSBTCCC-12	Plant and Animal Biotechnology	Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications. **The course has importance in the areas of academic, research and employability.**
4	MSBTCCC-13	Environmental Biotechnology	On completion of course, students will be able to understand -use of basic microbiological, molecular and analytical methods, which are extensively used in environmental biotechnology. -and address complex environmental issues from a problem oriented, interdisciplinary perspective. -various unconventional uses of microorganisms in various industries and environmental benefits of use of the microorganisms. **The course has importance in the areas of academic, research and employability.**
5	MSBTCCC-14	Practical	The lab course is designed as to give students a hands-on experience on plant tissue culture and associated techniques. During the lab course students get exposure to laboratory set up for plant tissue culture media preparation and sterilization for plant growth modulation of plant growth factors callus culture micropropagation etc. **On completion of course, students should be able to gain basic skills** -in animal biotechnology. -in gene cloning, protein expression. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research. -in most important bioinformatics databases. -predicting secondary and tertiary structures of protein sequences. The students are also exposed to cutting edge technologies to achieve a solution and learn to process scientific data using biostatistics. **The course has importance in the areas of academic, research and employability.**

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Course Outcome

Subject: Biotechnology
Semester- IV

Sl. No	Paper/Course	Title	Course Outcome
1	MSBTCEC-1	Project dissertation/Internship	Students should be able to learn how to select and defend a topic of their research, how to effectively plan, execute, evaluate and discuss their experiments. Students should be able to demonstrate considerable improvement in the following areas – - In-depth knowledge of the chosen area of research. - Capability to critically and systematically integrate knowledge to identify the issues that must be addressed within the framework of the specific thesis. - Competence in research design and planning. - Capability to create, analyse and critically evaluate different technical solutions. - Ability to conduct research independently. - Ability to perform analytical techniques/experimental methods. - Project management skills. - Report writing skills. - Problem solving skills. - Communication and interpersonal skills.
2	MSBTCEC-2	Project dissertation/Internship	-Do-

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