

Master of Science in Science Education (M.Sc.Ed)

1. Introduction

The Faculty of Science, Eastern University, Sri Lanka (EUSL), has made a commitment to embark on a program to offer courses to students wishing to earn MSc in Science Education. In this scientific and technological age, an extremely high level of scientific literacy becomes necessary. The knowledge, skills, and resourcefulness of people in Science Education play vital and major role in the development of a country in general, the society in which he/she lives, in particular. As such, in line with the National Policy on education, the importance of science in schools is very vividly emphasized and has been made an essential component in the school curriculum. Science graduate teachers, educators, administrators, and curriculum specialists should have a broad knowledge of the ever increasing complexities of science and technology and need to be well equipped to instill an interest in science by way of excellent teaching and integrate scientific knowledge in a deep and meaningful way among students.

The MSc in Science Education is a full-time program. It is designed primarily for science teachers and educators who wish to enhance their skills and knowledge in teaching of science and Professionally develop themselves in Science Education. The duration of the program is two semesters by coursework. This includes a general component and a special component, that may be one of the following four subject areas: Biology Education, Chemistry Education, Mathematics Education, Physics Education additionally, practicals, a research project and a seminar are also included in the special component.

Medium of instruction of the program will be in English.

2. Justification

As a result of the advancement in science and technology, Information and Communication Technology (ICT) coupled with the effects of globalization there have been rapid changes that are introduced in education. As such, in view of responding to these changes, the University Grants Commission (UGC) has initiated implementation of much needed university reforms in our universities in keeping with the national needs and global trends in the field of university education. These university reforms are expected to bring about changes in existing courses and curriculum and the creations of new degree programs for which there are very high demands. Accordingly, the Faculty of Science, EUSL, has identified the great need in improving the Science Education within the region and the nation at large, has come forward to offer a new postgraduate degree program, MSc in Science Education. It should also be noted that at present only one of the Universities in Sri Lanka, namely, University of Peradeniya offers MSc in Science Education and a very small number of the science graduate teachers enroll in that study program from the North and East of the country. Therefore, there is a high demand commencing such a postgraduate degree program at the EUSL which will give an opportunity for a large number of science graduate teachers from the North and East to potentially benefit from this program.

3. Aims and objectives of the program

Aims

- To increase the skills and capacity of teaching of science in the community at large
- To give opportunity for further professional development for science teachers, educators and educational administrators.
- To promote research in Science Education.
- To improve the performance of the students in science at schools.

Objectives

- To provide higher learning in science to teachers and educators
- To increase the skills of teaching of science among teachers and educators
- To facilitate higher learning of science and education in the community

4. Selection procedure

Eligibility

Those possessing the following educational and professional qualifications are eligible to apply for the M. Sc in Science Education program:

- (a) Bachelor's Degree in Science (Biological and Physical Science) with Postgraduate Diploma in Education

OR

- (b) Bachelor's Degree in Science (Biological and Physical Science) with class

OR

- (c) Bachelor's Degree in Science (Biological and Physical Science) with passed in SLTS/SLPS/SLTES/SLEAS etc.

OR

- (d) Bachelor's Degree in Science (Biological and Physical Science) with Three years teaching experience in Science stream.

OR

- (e) Bachelor's Degree in Education (B. Ed) with an Advanced Level background in Biology/Chemistry/Physics/Mathematics, acceptable by the Senate, EUSL.

Admission Criteria

Eligible candidates would be selected by the selection test and interview conducted by the Faculty of Science.

5. Course structure and duration of the proposed program

The program shall be conducted on a CREDIT system assigned to COURSES. The programme would be **full time** and of **12 month duration**. The course shall comprise of coursework, seminar, assignment, practical, research and field visits. The programme will consist of a General education component and Special education component of the candidates choice and qualification (Biology, Chemistry, Mathematics or Physics).

The Medium of instruction will be English.

Coursework Component

The general and special coursework component consists of core courses which are compulsory and optional courses. Each course is comprised of a theory and/or practical component. ONE CREDIT is equivalent to **15 hours of lectures** in the theory component or **30 hours of activity** (laboratory work of field study) in the practical component.

The optional courses would be offered on demand subject to availability of staff.

Research Component

Students are required to carry out a research project for a duration equivalent to 3 full months which may vary from 3-6 months in reality, subject to the methodology. This may be carried out at the university or at an Institution of their choice which has the necessary facilities for the research in question. The component has a **score of 6 credits**. The title of the research, place of research and the supervisor for the research will have to be approved by the Faculty Board before the commencement of the project.

Seminar

Students will have to present a seminar on an assigned topic under the special component of the programme. This would have a rating of **1.0 credit**.

Duration

The course would be a full time course of 12 months duration. Coursework will be conducted in two semesters of 15-weeks duration and the research project will be 3-6 months duration. The courses would be conducted on FRIDAYS and WEEKENDS throughout the year.

6. Examinations and Evaluation Procedures

The award of the degree/Diploma would be based on the schemes of assessments and evaluations presented under this section.

Evaluation Scheme

Evaluation of Course Work

Attendance:

A minimum of 80% attendance is required for the completion of any course. Those who do not adhere to this requirement may not be allowed to appear for the examinations.

Evaluation of a Course

Each course would have a mark of 100.

The evaluation of each course shall be based on TWO components:

- 1) Within course evaluations (may include continuous assessments, tutorials, assignments, field reports etc, as appropriate). The evaluation would be the average of the best **2/3rd performance** in the series of assessments.
- 2) end of course examinations (theory or practical)

The evaluations would have the following marks:

End of course examination	50 %
Within course evaluations	50 %

The minimum grade a student should achieve to pass a course is ‘C’.

Grade Points and Grade Point Average (GPA)

The Grade Point Average (GPA) will be computed using the grades assigned for core courses and optional courses, taken together for general and special components of the programme. Marks and Grade points for each Grade is tabulated below.

Mark	Grade	Grade Point
75 and above	A	4.0
65 – 74	A ⁻	3.7
60 – 64	B ⁺	3.3
55 – 59	B	3.0
50 – 54	B ⁻	2.7
45 – 49	C ⁺	2.3
40 – 44	C	2.0
00 – 39	F	0.0

The Grade Point Average (GPA) will be computed using the formula:

$$GPA = \frac{\sum c_i g_i}{\sum c_i}$$

Where c_i = number of credits units for the i^{th} course, and
 g_i = grade point for the i^{th} course

Repeating Courses

If the student fails a course or wishes to improve his/her grade in a course, he/she shall repeat the course at the next available opportunity.

The maximum grade, he/she could obtain for computation from a repeat examination is that of **Grade C**. However students who were unable to appear for examination at the first opportunity for medical or other valid reasons approved by the Faculty of Science and Senate EUSL would be assigned the grade they obtain at the examination, for computation.

Candidates are allowed to repeat a course **ONLY TWICE**, on two subsequent occasions. However, if there's no possibility of a subsequent examination in the near future, a special examination may be conducted, on the recommendation of the Faculty Board and the Senate, EUSL.

Evaluation of Research Project

Research project will be evaluated on the basis of a written report (M.ScEd project report) and oral presentation. The Report would be evaluated by two members and the oral presentation by three member panel appointed by the Faculty of Science.

The report would score 80% of marks and the oral presentation would make 20%

All reports have to be submitted within **ONE MONTH** (date would be announced) from the last day of the last end of year theory examination of the programme.

Effective Date of the Degree

The effective date of the degree shall be announced *the date for the final submission* of the research projects.

7. Award of Degree

Masters in Science Education

A student would be eligible for the award of Masters in Science Education degree if he/she;

- a) **completes all 30 credits** within the stipulated time period at the earliest opportunity and
- b) obtains **at least a 'C' Grade in all courses offered** and
- c) obtains an **overall GPA of at least 2.7.**

Award of Post graduate Diploma in Science Education

A student would be eligible for a award of Post graduate diploma in Science

education if he/she;

- a) successfully **completes all 24 credits (except research project)** and
- b) obtains **at least Grade C in all courses(except research)** offered and
- c) obtains and **overall GPA of at least 2.5** in those 24 credit courses

Such candidates may be considered for the award of the Post Graduate Diploma in Education if he/she successfully completes research project subsequently within the two consecutive years and obtains a overall GPA of at least 2.7.

8. General Regulation

General regulations and conduct stipulated for Post graduate degree at EUSL would apply when specifically not mentioned in this document.

PROGRAM SUMMARY

The program of study consists of 30 credits with 14 credits under the General Component of Science Education and 16 credits under selected Special component of Science education in the general component - Science Education.

The duration of the course would be 12 months and the Medium of instruction would be English.

Programme	Credits	Credits
General Component Course work	14	14
Special Component Course work	09	16
Seminar	01	
Research	06	
TOTAL		30

The compulsory courses would be marked with an asterisk in the document and the optional courses would be on demand subject to availability of staff. 80% attendance is mandatory for all courses.

General Component - Science Education

Course Code	Course	Lecture Hrs.	Practical Hrs.	No.of Credits
*MSED 2501	Pedagogical psychology	30		2
MSED 2502	Theoretical basis of education	30		2
*MSED 2503	Critical history of Science education	30		2
MSED 2504	Research methods in science education	30		2
MSED 2505	Approach to science teaching and learning	30		2
MSED 2506	Measurement of learning outcomes	30		2
*MSED 2507	Exceptional pedagogy	30		2
*MSED 2508	Educational technology	30		2
*MSED 2509	Career guidance and counseling	30		2
*MSED 2510	Education Management	30		2
*MSED 2511	Issues in education	30		2
MSED 2551	Teaching Practices and technology		60	2

* Elective courses - will be conducted depending on the availability of the staff

Special Component

The students are expected to select **one** of the following special subjects:

- (i) **Biology Education**
- (ii) **Chemistry Education**
- (iii) **Mathematics Education**
- (iv) **Physics Education**

Research Project

Every student should undertake a research project on a topic related to teaching/ learning of the special subject. The students may seek guidance from their supervisors at the beginning of the academic year. The results of the project should be presented at a seminar and submitted in the form of a written report.

SPECIAL COMPONENT - BIOLOGY EDUCATION

Course Code	Course	Lecture Hrs.	Practical Hrs.	No.of Credits
MSED 2516	Biology Education	15	-	1
MSED 2517	Methods of Teaching Biology	15	-	1
MSED 2518	Plants and Animals: Their Evolution and Interactions	15		1
MSED 2519	Natural resources and sustainable management	15		1
MSED 2520	Functional Biology	15		1
MSED 2521	Teaching advanced laboratory technology		60	2
*MSED 2522	Interactive genetics	15		1
*MSED 2523	Applied Biology	15		1
*MSED 2572	Laboratory Techniques		30	1
MSED 2597	Seminar			1.0
MSED 2599	Research Project (3 months)			6.0

* Elective courses - will be conducted depending on the availability of the staff

SPECIAL COMPONENT - CHEMISTRY EDUCATION

Course Code	Course	Lecture Hrs.	Practical Hrs.	No. of Credits
MSED 2526	History of Chemistry	15		1
MSED 2527	Teaching and learning of Chemistry	15		1
MSED 2528	Chemistry of the Environment	15		1
*MSED 2529	Laboratory Management	15		1
MSED 2530	Teaching of modern Organic Chemistry	15		1
MSED 2531	Teaching of Modern Physical Chemistry	15		1
MSED 2532	Application of Chemistry	15		1
*MSED 2533	Chemicals in Society	15		1
*MSED 2534	Calculations in Chemistry	15		1
*MSED 2535	Demonstrations in Chemistry	15		1
MSED 2573	Chemistry Laboratory		30	1
MSED 2597	Seminar	-	-	1
MSED 2599	Research Project (3 months)			6

***Elective courses - will be conducted depending on the availability of the staff**

SPECIAL COMPONENT - MATHEMATICAL EDUCATION

Course Code	Course	Lecture Hrs.	Practical Hrs.	No.of Credits
*MSED 2536	Foundation of Mathematics Education in Sri Lanka	15	-	1
*MSED 2537	Teaching and Learning practices in Mathematics	15	-	1
*MSED 2538	Basic Concepts in Mathematics	15	-	1
MSED 2539	Foundations of analysis I	15	-	1
MSED 2540	Foundations of Analysis II	15	-	1
*MSED 2541	Advanced Mathematical Modeling	15	-	1
MSED 2542	Linear Algebra and matrix theory	15	-	1
MSED 2543	Advanced calculus	15	-	1
*MSED 2544	Introduction to measure and integration	15	-	1
*MSED 2545	Symmetry method for differential equation	15	-	1
MSED 2546	Probability and mathematical statistics	15	-	1
MSED 2547	Numerical analysis with application	15	-	1
*MSED 2548	Mathematics for computing	15	-	1
*MSED 2574	Laboratory & Field Work	-	30	1
MSED 2597	Seminar	-	-	1.0
MSED 2599	Research Project (3 months)			6

*** Elective courses - will be conducted depending on the availability of the staff**

SPECIAL COMPONENT - PHYSICS EDUCATION

Course Code	Course	Lecture Hrs.	Practical Hrs.	No.of Credits
MSED 2556	Physics Pedagogy	15	-	1
MSED 2557	Teaching basic concepts in Physics	15	-	1
MSED 2558	Teaching Classical Physics	15	-	1
MSED 2559	Teaching Modern Physics	15	-	1
MSED 2560	Electronics	15	-	1
*MSED 2561	Astrophysics	15	-	1
MSED 2562	Introduction to nanotechnology	15	-	1
MSED 2563	Physics research	15	-	1
*MSED 2564	Nuclear Physics	15	-	1
MSED 2575	Physics Laboratory	-	30	1
MSED 2597	Seminar			1
MSED 2599	Research Project (3 months)			6

* will be conducted depending on the availability of the staff

PROGRAM CONTENTS

GENERAL COMPONENT:

MSED 2501 Pedagogical Psychology (2 Credits)

Nature of cognitive, affective and psycho-motor learning, Developmental factors and learning, Cognitive and Humanistic approaches to learning concepts of Constructivism and Meta cognition, Reasoning and problem solving, Motivation and learning, Transfer of learning, Encoding storage and retrieval of memory, Developing creativity, Multiple intelligence, Emotional intelligence and Artificial intelligence- promoting development through appropriate teaching strategies.

MSED 2502 Theoretical Basis of Education (2 Credits)

Educational implications of idealism. Naturalism, realism, Pragmatism and Humanism, Marcist and Neo-Marcist interpretations. The Oriented approaches to Education, Post –colonialism and Education, Post modernist thoughts on Education, Globalization and the changing concept of Education, Recent trends in education – National integration, Multi culturalism, Conflict resolution Education and Human resource development.

MSED 2503 Critical History of Science Education (2 Credits)

Ancient history of Science- Europe, Middle East and Asia. Medieval Science history, Development of modern thoughts, Significance of Renaissance, Scientific thoughts and methods of Galileo Galilee, Isaac Newton, Francis Bacon, Rene Descartes Newton, Maxwell, Dalton, Darwin and Einstein – Contemporary thoughts on Science, Development of scientific thoughts in relation to religion, society and culture, Impact of scientific thoughts on the quality of human life.

MSED 2504 Research Methods in Science Education (2 Credits)

Development of research methods in Education- Qualitative and Quantitative methods, Essential qualities of research, Role of review of literature in research, Types of research Historical, Philosophical, Comparative, Developmental, Descriptive, Inductive, Statistical, Survey and Scientific Role of action, Research in Science teaching, Tools of data collection, Sampling techniques, Experimental designs, Report writing-Objectives, Justification, Research problems, Review of literature, Methodology, Research process and results.

MSED 2505 Approach to Science Teaching and Learning (2Credits)

Aim of objectives of teaching science Lesson planning techniques. Developing attention and perception. Providing motivation. Organising appropriate environment and climate, Selecting appropriate method in relation to the content and maturity of the learners with diverse background. Selecting appropriate teaching and learning aids. Role of teacher as reflection practitioner and facilitator. Developing guided problem solving and guided discovery. Using stimulation in science teaching. Developing 5E model, Evaluation and feed back.

MSED 2506 Measurement of Learning Out comes (2 Credits)

Theoretical Foundation of evaluation and measurement. Taxonomy of educational objectives different type of test, developing objectives different type of tests, Developing objectives approaches in the construction of tests. Concept of reliability, Validity and practicability, Types of assessment, formal, informal, continuous, summative, aspects of school fused assessment and national assessments, using measurement as tools for developing student abilities and remedial teaching. Using statistical methods in science teaching.

MSED 2507 Exceptional Pedagogy (2 Credits)

Conceptual foundation of Exceptional Education, Issues and Innovations of Exceptional Education, Policies and Programmes, Organization of teaching for:- Educable mentally retarded, Trainable mentally retarded, Visually handicapped, hearing handicapped, Multiple handicapped, Speech and language handicapped, Developing alternate talents and skills, educations for learners and socially disadvantaged children, organizing education for gifted children, Developing curricular and Co- curricular activities for exceptional children.

MSED 2508 Educational Technology (2 Credits)

Need for nondirectional technology, Developing two way process, Promoting learning to learn writes actions, strategies for individualized instruction, small group of instructions and large group of instructions. Effective use of text books and course guides strategies to develop lecture method, Demonstration method and work shop method. Use of two dimensional aids and three dimensional aids, Use of multimedia, developing improvisations, on line education and virtual classes

MSED 2509 Career Guidance and Counseling (2 Credits)

Concept and need for career guidance and counseling, Education and job market, Producing marketable school leavers and graduates, job selection and Job satisfaction, career guidance techniques, Counseling in schools and Universities, Empowering students, Positive adjustment techniques and stress management, emotional development curriculum, Integrating counseling with the educational process, Sri Lankan traditional counseling techniques and methods.

MSED 2510 Educational Management (2 Credits)

Concept of Educational Management, an over view, Educational Management as a profession; Five functions of a manager, planning, decision making, organizing, directing, and controlling. Leadership in Educational Management; Legal basis for Public Education in Sri Lanka. Organization and Management of the ministry of Education with special focus on Provincial levels; Recent Education Reforms and restructure (Policy and Programme of Action

MSED 2511 Issues in Education (2 Credits)

Educational planning for economic development and human resource development, Problem related to equality and equity in education, Problems and challenges related to medium of instruction, Youth unrest, Youth unemployment etc, Education and gender equality, Decentralization and devolution in education, Internationalization of education, Role of media in education, Effect of economic depression on education, Education and ecology, Sustainable development and education.

MSED 2551 Teaching Practice and Technology (2 Credits)

Use of text books, guides, notes, computers, charts, actions, models in communication of ideas. Teaching to different categories of students and to smaller and larger classes. Preparation of lesson material, group activities and planning of field visits. Conducting of discussion classes tutorials.

SPECIAL COMPONENTS

BIOLOGY

MSED 2516 Biology Education (2 Credits)

Background of Biology education, Aims and objective of learning biology, Problems in biology teaching at schools and at universities, curriculum development in biology education in Sri Lanka. Assessment in evaluation of biology theoretical part and practical chronological development with years. The development of culture with lesser practical knowledge base for current biology students with the aim of conservation of animals and plants together with animal welfare acts.

MSED 2517 Methods of Teaching Biology (2 Credits)

Scientific methods in hypothesis testing, hypothesis testing and use of statistics, physics in biology and environment, mathematics in biology and environment, modeling biology, preparation of audio visual aids, study packages games and debates, dialogues in biology, drama based on biological principles and environment.

MSED 2518 Plants and Animals: Their Evolution and Interactions (1 Credit)

The evolutionary history of biological diversity, plants and animals similarities and differences, plant animal interactions, Practical to study various animal and plant groups then a person get to know to identify the plants and animals where is can be found etc to be known.

MSED 2519 Natural Resources and Sustainable Management (1 Credit)

Resources of Sri Lanka, Different Environments in Sri Lanka, Man made and Developmental process Environmental problems, how to mitigate each problems, conservation and management of natural resources in Sri Lanka with other experiences or learnt lessons in related aspects globally, garbage management in a municipal council, reuse, reduce, recycle principle applications, practical and field trips.

MSED 2520 Functional Biology (1 Credit)

Important biochemical pathways in photosynthesis, respiration, excretion, Biotechnology, plant and animal hormones and its actions, homeostasis/ osmosis, water balance, growth and development, Adaptation to desert life in plants and animals

MSED 2521 Teaching Advanced Laboratory Technology (1 Credit)

Staining principles in plants and animal tissues or cells, Histological sections of plants and animals, How to conduct practical in class room with less facilities, Nanotechnology in laboratories, Terrarium, herbarium, aquarium development and technology involved in it, skeletal preparation of animals, preservation techniques for plants and animals, Maintenance of green house and ornamental fish ponds.

MSED 2522 Interactive Genetics (1 Credit)

Gene, inheritance, gene expression and organization in prokaryotes and eukaryotes, Mendelian principles, speciation, cloning, biotechnology, population genetics, genetically modified organisms (plants, animal examples), genetically linked diseases, fungal, bacterial, fly genetics, mutations natural; induced,

MSED 2523 Applied Biology (1 Credit)

Microbiology in applicatory sciences, Post harvest technology (plants and animals), plants and animals as raw material for industry, diseases in plants and animals, Microbiology in industry and environmental preservation, beer, wine production, fish sausage, and other fish products production, field visits and practical for identification of suitable organisms used in industry harmful organisms, pests in agriculture, beneficial insects honey bee and silk moth.

MSED 2597 Seminar (1 Credit)

MSED 2599 Research Project (6 Credits)

CHEMISTRY

MSED 2526: Historical of Chemistry (1 Credit)

The roots of chemistry: The transformation from pseudo-science to science; the law of conservation of mass; Dalton and the atomic theory -The development of quantitative relationships in chemistry; Periodic Table; and the development of laboratory techniques; the concepts of structure and dissociation; chemical bonds; the electronic theory of organic reactions; the development of chemical education; the rise of the chemical industry in the 19th century; the revolutionary influence of modern analytical techniques.

MSED 2527 : Teaching and learning (1 Credit)

Instructional design: meaningful learning, advance organization of learning, , problem-based learning, constructive learning design, various teaching methods, using audio visuals, units and lesson planning, class management, computer assisted learning (CAL); Evaluation of achievement: formative evaluation, summative evaluation, assessing cognitive skills, assessing practical skills, assessing attitudes, ; Laboratory maintenance: organization and maintenance of laboratories, administration of laboratory, science and co-curricular activities in school.

MSED 2528 : Chemistry of the Environment (1 Credit)

Green chemistry and sustainable development, designing hands-on chemistry practicals for school children with emphasis on environmental protection, cleaner productions with the emphasis on reuse of the waste, solid waste management, water purification process, soil remediation, alternative fuels and emission control strategies.

MSED 2529 Laboratory Management (1 Credit)

Good laboratory management: management commitment, search for required specifications, ordering chemicals, glassware, other consumables and instruments, inventory maintenance, labeling, laboratory safety, laboratory waste handling.

MSED 2530: Teaching of Modern Organic Chemistry (1 credit)

Mechanistic & stereochemical approach to organic reactions: reactions of organic compounds as acids and bases, reaction pathways, conformational analysis, overview of stereochemistry, nucleophilic substitution and elimination reactions, , electrophilic substitution of aromatic compounds, heterocyclic chemistry :nomenclature, aromatic heterocyclic compounds, reactions of heterocyclic compounds, synthesis of heterocyclic compounds, substitution reactions of heterocyclic compounds, pyrimidines, purines and pyridines of biological significance, five membered heterocyclic compounds of biological significance; concerted reactions: overview of concerted reactions, cycloaddition reactions of carbons compounds, electrocyclic reactions, 1,3-dipolar additions, sigmatropic rearrangements, natural products chemistry: carbohydrates, alkaloids, steroids, terpenoids, other biologically active natural products.

MSED 2531 : Teaching of Modern Physical Chemistry (1 Credit)

Electro-analytical techniques: electro-deposition, electrolysis, electrochemical cells, electrolytes, corrosion and corrosion prevention, analytical application of electrochemistry, molecular modeling: molecular mechanical and quantum mechanical methods, energy minimization, molecular geometry, orbital shapes, electron density, energetics, introduction to equilibrium, acid-base equilibria, electrochemical equilibria, complexation equilibria, electrochemical equilibria, ion-exchange equilibria, phase equilibria, partition coefficient, dissociation of acids and bases, industrial applications, nanotechnology.

MSED 2532 : Applications of Chemistry (1 Credit)

Applications of Chemistry in Industry: cement, ceramic, glass, paper, textile, rubber and food & beverage industry; chemical manufacturing industries: sulphuric acid, ammonia, sodium hydroxide, sodium carbonate, metal extraction, alloys; water quality & treatment.

MSED 2533 : Chemicals in Society (1 Credit)

The place of chemistry in science and technology – Chemical sources of energy; water; pharmaceuticals and healthcare products; pesticides and agrochemicals; nutrition; plastics and polymers; the chemistry of common household items – detergents, shampoos, cosmetics, and cleaners; toxic and dangerous chemicals; advanced materials and high-tech chemistry.

MSED 2534 : Calculations in Chemistry (01 Credit)

Review of basic mathematics for Chemistry; use of significant figures, error theory and basic statistics; calculations based on stoichiometry; calculations based on equilibria: acid-base, buffers, solubility etc.; redox reactions: electrochemistry, thermodynamics; use of graphs; use of spreadsheets in Chemistry; Probability theory; probability distribution

MSED 2535 : Demonstrations in Chemistry (01Credit)

Lecture demonstrations; demonstrations to reinforce classroom material vs. demonstrations to entertain; thermochemistry; chemiluminescence; polymers; coloured metal ion complexes; gases; solutions and colloids; electrochemistry; organic reactions; clock reactions and oscillating reactions; use of everyday objects in chemical demonstrations.

MSED 2573 : Chemistry Laboratory (01 Credit)

Selected experiments covering areas of Inorganic, Organic, Physical, Analytical, Biochemistry and Molecular Biology, training in the use of analytical equipment.

MSED 2597 : Seminar (1 Credit)

Current topics in chemistry are given for literature survey and self learning. Evaluation is based on a presentation on gathered information, a written report and a viva.

MSED 2599 : Research (06 Credits)

A research project of 3-6 months duration in chemistry/chemistry education. Evaluation is based on the dissertation and a viva

MATHEMATICS :

MSED 2536 : Foundations of Mathematics Education in Sri Lanka (1 Credit)

Analysis of teaching and learning mathematics in our education system: schools, colleges of education and universities. Critical reflection of the mathematics curriculum development at the secondary schools and universities. Critical understanding of evaluation and assessment, and on the impact on mathematics education. Career prospects for mathematics graduates and understanding of research practices in mathematics education examining the contemporary research literature.

MSED 2537 : Teaching and learning practices in mathematics (1 Credit)

Teaching and learning modes: classroom interaction and management, self directed learning, problem solving and home work assignments, and the use of digital technology and, mathematical educational software, and the pedagogical issues in mathematics education.

MSED 2538 : Basic Concept in Mathematics (1 Credit)

Reviewing the fundamental areas of algebra, geometry and analysis.

MSED 2539 : Foundations of Analysis I (1 Credit)

Axiomatic and historical development of real number system, sequence and series of real numbers and related theorems, completeness property of real numbers. Axiomatic foundation of complex number system, different representations of complex numbers, sequence and series of real numbers and related theorems

MSED 2540 : Foundations of Analysis II (1 Credit)

Limit, continuity and differentiability of real valued functions of real variable. Intermediate and Extreme value theorems. Rolle's theorem, mean value theorem and Taylor's theorem.

MSED 2541 : Advanced Mathematical Modeling (1 Credit)

Classifications and stages of modeling process, system environment, state variables, relationships, closed and open systems, making assumptions, flow diagrams, dimensional form, asymptotic behavior and sensitivity analysis, testing and using the output of the model, mathematical modeling of problems in economics, finance and management and industries. Linear programming, transshipment problem and networking.

MSED 2542 : Linear Algebra and Matrix Theory (1 Credit)

Vector spaces, independence, linear transformations, algebra of matrices, rank, inverses, quadratic forms, Eigen values, system of linear equations and inner product spaces.

MSED 2543 : Advanced Calculus (1 Credit)

Elementary topology of Euclidean spaces, vector valued functions, functions of several variables, mapping and differentials, multiple integrals and introduction to differential forms.

MSED 2544 : Introduction to Measure and Integration (1 Credit)

Measurable sets, Lesbesgue measure, measurable functions, Lesbesgue integral and L_p spaces.

MSED 2545 - Symmetry Methods for Differential Equations (1 Credit)

ODE - Introduction to symmetry, transformations of coordinates and points, continuous one-parameter group of transformations in R^2 , group generators, Lie's theorems, Lie algebra, ideals and examples of integration of ODEs.

PDE - Continues one-parameter group of transformation in R^n , group generators and examples of similarity solutions for PDEs.

MSED 2546 : Probability and mathematical statistics (1 Credit)

Properties of probability, conditional probability, random variables, distributions and densities, expectation, moment generating functions, limit theorems, estimation theory and hypothesis testing theory, analysis of variance and least squares.

MSED 2547 : Numerical Analysis with Applications (1 Credit)

Equation solvability, system of non linear equations, iterative methods, contraction mapping theorem, New-Raphson method, secant method, Lagrange's interpolation, numerical differentiation and integration, Jacobi and Gauss-seidel methods.

Numerical solution of ordinary differential equations, introduction to Euler methods and Runge-Kutta methods.

MSED 2548 : Mathematics for Computing (1 Credit)

Counting principles, number systems, computer codes, logic, graphs and trees, Boolean algebra, number bases and their properties.

MSED 2574 : Laboratory and Field Work (1 Credit)

Focus is on exploring a range of teaching styles and strategies for the effective mathematics teaching at the G.C.E. (O/L) and G.C.E. (A/L). Analysis of instructional design theory and practice.

MSED 2597 : Seminar (1 Credit)

A presentation is required by each student based on the undertaken research project.

MSED 2599 : Research project (6 Credits)

An independent research project writing is required on a selected topic in mathematics education under the guidance of a supervisor.

PHYSICS

MSED 2556 : Physics Pedagogy (1 Credit)

Importance of Physics, Principles of Teaching and Learning Physics and methods of teaching Physics, Designing and developing Physics curricula for various educational levels in Sri Lanka, Assessment and evaluation process in Physics.

MSED 2557 : Teaching Basic Concepts in Physics (1 Credit)

Teaching General Physics: Units and Measurement, Fluid Mechanics, Heat and Sound, Mechanics: Classical Mechanics, Newtonian mechanics, energy and collision, Teaching Thermodynamics: the laws of Thermodynamics and their applications and Teaching statistical Physics: statistical concepts in understanding the macroscopic systems.

MSED 2558 :Teaching Classical Physics (1 Credit)

Teaching Waves and Vibrations: Simple Harmonic Oscillations and their application, Teaching Optics: Nature of Light and the Laws of Geometrical Optics and Physical Optics and Teaching Electromagnetic Theory: concepts of Electric charge, Electric and Magnetic fields and flux.

MSED 2559 : Teaching Modern Physics (1 Credit)

Modern Ideas about Physics, Relativity: Relativity principle, Invariance of Newton's equations under a Galilean transformation, Time dilation, space time diagrams and the Lorentz transformation.

Quantum Physics: Failure of classical physics to explain atomic spectra and black body radiation, Einstein's quantum explanation, Photoelectric effect, Compton effect, particle nature of light and De-Broglie relation. Heisenberg's uncertainty principle, Schrödinger's equation, Time-independent Schrödinger's equation and solutions.

MSED 2560 : Electronics (1 Credit)

Analogue Electronics: Basic idea about semiconductor devices and their application, diodes, Transistors, Integrated Circuits, Operational Amplifier and Feedback Amplifiers.

Digital Electronics: Number systems, Binary number, Truth table, Logic gates, Laws of Boolean algebra, and De Morgan's Theorems.

MSED 2561 : Astrophysics (1 Credit)

Nature of the Universe, Solar system, Stars, Galaxies and Cosmology.

MSED 2562 : Introduction to Nanotechnology (1 Credit)

Introduction, Synthesis and characterization of nanomaterials, Nanodevices and their applications, Societal Health and Environmental Impacts.

MSED 2563 : Physics Research (1 Credit)

Foundation and development of Physics Research, Types of Educational Research - Fundamental, Applied and Action Research, Qualitative and Quantitative Research, Research proposals, Research tools, techniques and data analysis.

Some small projects: How things work-Mechanism behind some selected mechanical objects and electrical objects.

MSED 2564 : Nuclear Physics (1 Credit)

Basics of atoms and nucleus and their Classification, Binding energy and stability of the Nuclei, Nuclear models, Semi-empirical mass formula, The decay process, the Nuclear reaction, Nuclear fission and fusion.

MSED 2575 : Physics Laboratory (1 Credit)

Organization and demonstration of physics practical, Error and graphical analysis, Selected experiments in Physics, computer applications in Physics practical.

MSED 2597 : Seminar (1Credit)

Each student is required to present the report based on his/her research project as a seminar.

MSED 2599 : Research project (6 Credits)

Each student is required to carry out an independent research project on a suitable topic in Physics under the guidance of a supervisor and write a project report and present for oral examination.