POSTGRADUATE INSTITUTE OF SCIENCE
UNIVERSITY OF PERADENIYA

Master of Science Education Degree Programme
(SLQF Level 9)

Master of Science (M.Sc.) in Science Education Degree Programme
(SLQF Level 10)

1. INTRODUCTION

The postgraduate programme of study in Science Education seeks to provide an opportunity to students to achieve a perspective of science and science education. An understanding and a suitable adaptation to the future which is becoming more and more complex daily is what science education must strive at. The advancements in science and technology have changed the life style patterns of humans and, the nature of society. Science has come to be viewed as an aspect of human culture and, hence as an essential component in the school curriculum. Science plays a significant role in all human activities and therefore knowledge and the ability of its application would lead to greater effectiveness and fulfillment in our personal and social lives. Science educators should be competent to guide themselves, their colleagues and, above all their students to cope with the rapidly changing world. This programme will take into consideration the nature of the learner, the processes of learning and teaching and, the characteristics of the domain-Science. It will further stress the importance of orientation towards the future.

The programme leading to the Degree of Master of Science Education and Degree of M.Sc. in Science Education is a full-time programme. It is designed especially for the science teachers, educationists and those who could contribute to the development of science education in Sri Lanka. The programme consists of two semesters of coursework (lectures and practicals), which include the professional general component of **Science Education,** and a special component which could be one of the five subject areas - **Biology Education**, **Chemistry Education, Mathematics Education Physics Education and ICT Education**. An independent study is included in the Masters degree (SLQF Level 9) programme and a research project in the M.Sc. degree (SLQF Level 10) programme.

2. AIMS AND OBJECTIVES OF THE PROGRAMME

The programme is designed to provide students an opportunity to develop their teaching competency, to explore disciplines providing a theoretical framework for professional work and to extend individual interests, skills, talents, and career opportunities. The special component provides guidance and common experiences, which are flexible enough to meet the individual student's needs and career goals.
The students who follow the programme will be able to:

* develop competencies to "Learn to Learn" along with the other competencies
* develop concern for the betterment of oneself and of others
* engage in scientific activities deriving joy and satisfaction

* inculcate a "Habit of Mind" continuously to be sensitive, alert and curious
* develop intellectual attitudes such as open mindedness, whole heartedness and social responsibility
* develop personal and professional confidence of "Knowing about Knowing" to meet the challenges in the 21st century.

3. PROGRAMME ELIGIBILITY

The candidates possessing the following educational and professional qualifications are eligible to apply for the Master of Science programme in Science Education:

I. (a) Bachelor's Degree in Science (B.Sc.)

and

II. (a) Postgraduate Diploma in Science Education/Education or

(b) Any other equivalent qualifications/experience acceptable to the Postgraduate Institute of Science

Candidates who meet eligibility requirements and successful at the selection test (aptitude, English and subject component) will be called for an interview. Employed candidates who are eligible for admission should produce evidence of leave granted to follow the programme and a letter of release from the relevant Heads of the Department/Institution.

4. PROGRAMME FEE

Category	**Programme Fee**	
	Master of Science Education Degree Programme	**M.Sc. in Science Education Degree Programme**
Local candidates	Rs. 300,000/- (1 year)	Rs. 375,000/- (2 years)
Foreign candidates	USD 2,000/- (1 year)	USD 2,500/- (2 years)

Students registered for the Master of Science Education degree programme shall pay the Programme fee in full or in two *(1/2 at the registration and the balance at the end of the first semester)* or three *(1/3rd at the registration, another 1/3rd after 4 months from the date of registration and the balance after 8 months from the date of registration)* installments. Other payments including registration fee, medical fee, library subscription, examination fee and deposits (science and library) should be paid according to the procedure stipulated by the PGIS. (N.B. The Programme fees given above may be revised as per recommendation of the Board of Management of the PGIS.)

5. THE PROGRAMME STRUCTURE AND DURATION

5.1 Masters Degree by Course Work (SLQF Level 9)

The Master of Science Education degree can be obtained by completing only the course work component. Course work, comprising of theory courses, laboratory and/or fieldwork and an independent study, shall be conducted over a period of two semesters. The total duration of the degree, including examinations, shall be about 12 months. Satisfactory completion of a minimum of 30 credits of course work with a GPA of not less than 3.00 is required for the successful completion of the degree (Students who do not satisfy the above criteria but obtain a GPA in the range 2.75 to 2.99 for course work of 25 credits are eligible for the Postgraduate Diploma in Science Education, and those who obtain a GPA in the range 2.75 to 2.99 for course work of 20 credits are eligible for PostgraduateCertificate).

5.2 Masters Degree (SLQF Level 10)

Completion of 30 credits of Course work as stated in 5.1 with a GPA of not less than 3.00 is a prerequisite for the Masters Degree by Course work and Research. The research project for the degree should be conducted on full-time basis, and completed during the second year. The research component is allocated 30 credits, totaling 60 credits for the entire programme. Therefore, duration of the entire programme shall be 24 months. After successful completion of the research project, the student shall be eligible for the award of the M.Sc. in Science Education degree - SLQF Level 10 (Students who do not complete the research project within the stipulated time period shall be awarded the Master of Science Education degree - SLQF Level 9).

5.3 Extension of the programme for M.Phil. or Ph.D.

After conducting research for a period of six months in the M.Sc. degree programme under 5.2, students who have demonstrated exceptional progress may apply for upgrading the degree status to M.Phil. The student should continue the research project and any additional research work/assignments recommended by the PGIS for a total of two years (60 credits of research) to qualify for the award of the M.Phil. degree.

During the second year of research, students who have demonstrated exceptional and continuous progress may apply for upgrading the degree status from M.Phil. to Ph.D. The student should continue the research project and any additional research work/assignments recommended by the PGIS for another year on full-time basis (to complete 90 credits of research in total) to qualify for the award of the Ph.D. degree.

PROGRAMME SUMMARY

The programme of study consists of 16 credits in the general component and 14 credits in the special component for the M.Sc. Degree in Science Education with course work. The course units of the General Component are presented below followed by the course units of Special (subject) Components.

GENERAL COMPONENT - SCIENCE EDUCATION (MINOR REVISION)

Course Code	Course	Lecture hrs.	Practical hrs.	No. of Credits
SE 501	Science in the Past, Present and Future *	15	-	1
SE 502	Science Teaching and Learning *	45	-	3
SE 503	Qualitative Research Methods in Science Education*	45	-	3
SE 504	Quantitative Research Methods in Science Education*	30	-	2
SE 505	Science Curriculum	30	-	2
SE 506	Science and Society	30	-	2
SE 507	Science and Information Technology *	15	30	2
SE 508	Measurement and Evaluation	30	-	2
SE 509	Philosophical Foundations of Education	15	-	1
SE 510	Psychological Foundations of Education	15	-	1
SE 511	Educational Management	15	-	1
SE 512	Action Research	15	-	1
SE 513	Energy and Environment	15	-	1
SE 514	School, university and industry relationships	15	-	1

** Compulsory courses*

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
(v) ICT Education

BIOLOGY EDUCATION

Course Code	Course	Lecture hrs.	Practical hrs.	No. of Credits
SE 516	Biology Education*[1]	30	-	2
SE 517	Methods of Teaching Biology*[1]	30	-	2
SE 518	Plants and Animals: Their evolution and Interactions*	15	15	1.5
SE 519	Environmental Science*	15	15	1.5
SE 520	Molecular Biology and its applications*	15	15	1.5
SE 521	Histology and Hormones in living organisms*	15	15	1.5
SE 522	Plant Systematics and Breeding*	15	15	1.5
SE 523	Microbiology and its applications*	15	15	1.5
SE 524	Food Science*	15	15	1.5
SE 535	Functioning Plant*	15	15	1.5
SE 599	Independent Study*[1]	500 notional hrs.		5
SE 699	Research Project**	3000 notional hrs. (one year duration)		30

*[1] *Compulsory for Master of Science Education Degree (SLQF Level 9)*
** *Compulsory for M.Sc. in Science Education Degree (SLQF Level10)*
* *Optional Courses - Students are required to obtain 5 credits from 8 courses*

CHEMISTRY EDUCATION

Course Code	Course	Lecture hrs	Practical hrs	No. of Credits
SE 531	Curriculum Development and Chemistry Education in Sri Lanka*[1]	15	-	1
SE 532	Problems of Chemistry Teaching in Schools and Possible Remedial Measures*[1]	15	-	1
SE 533	Methods of Teaching Chemistry I*[1]	15	-	1
SE 534	Methods of Teaching Chemistry – II*[1]	15	-	1
SE 535	Some Important Theoretical Concepts and Special Topics Relevant to Chemistry Teaching I*	15	-	1
SE 536	Some Important Theoretical Concepts and Special Topics Relevant to Chemistry Teaching II*	15	-	1
SE 537	Relevance of Principles of Chemistry in Selected Chemical Industries*	15	-	1
SE 538	Chemistry in Society and Environment*	15	-	1
SE 539	Laboratory Work*[1]	-	60	2
SE 599	Independent Study*[1]	500 notional hrs.		5
SE 699	Research Project**	3000 notional hrs. (one year duration)		30

*[1] *Compulsory for Master of Science Education Degree (SLQF Level 9)*
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**Optional Courses-Students are required to obtain 2 credits from 4 courses*

PHYSICS EDUCATION

Course Code	Course	Lecture hrs	Practical hrs	No. of Credits
SE 561	Physics Education I*[1]	30	..	2
SE 562	Physics Education II*[1]	15	..	1
SE 563	Important concepts and principles in physics*[1]	15	..	1
SE 564	Energy and Environment*	15	..	1
SE 565	Physics of Materials*	15	..	1
SE 566	Astronomy*	15	..	1
SE 567	Electronics and communication*	15	..	1
SE 568	Topics in Applied Physics*	15	..	1
SE 569	Practicals in Physics*[1]	..	60	2
SE 599	Independent Study*[1]	500 notional hrs.		5
SE 699	Research Project**	3000 notional hrs. (one year duration)		30

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**Optional Courses- Students are required to obtain 3 credits from 5 courses*

MATHEMATICS EDUCATION

Course Code	Course	Lecture hrs.	Practical hrs.	No. of Credits
SE 546	Mathematics Education in Sri Lanka*[1]	15		1
SE 547	Methods of Teaching Mathematics*[1]	15	-	1
SE 548	Fundamental Concepts in Mathematics*[1]	15	-	1
SE 549	Laboratory & Field Work*[1]	-	45	1.5
SE 550	History of Mathematics*[1]	15	-	1
SE 551	Complex-variable Theory*	15		1
SE 552	Mathematical Modelling*	15	-	1
SE 553	Metric Spaces and their Applications*	15		1
SE 554	Linear Algebra*	15	-	1
SE 555	Measure Theory*	15		1
SE 556	Differential Equations*	15		1
SE 557	Computer Mathematics*	15		1
SE 558	Probability and Statistics*	15	-	1
SE 559	Numerical Methods*	15		1
SE 599	Independent Study*[1]	500		5
SE 699	Research Project**	3000 notional hrs.		30

*[1] *Compulsory for Master of Science Education Degree (SLQF Level 9)*
** *Compulsory for M.Sc. in Science Education Degree (SLQF Level10)*
**Optional Courses- Students are required to obtain 3.5 credits from 9 courses*

ICT EDUCATION

Course Code	Course	Lecture hrs.	Practical hrs.	No. of Credits
SEI 530	ICT Education in Sri Lankan Schools*	45	-	3
SEI 531	Pedagogies for the use of ICT in Education*	25	10	2
SEI 532	Introduction to Computers*	25	10	2
SEI 533	Programming principles and applications*	15	30	2
SEI 534	Web Programming	20	20	2
SEI 535	Contribution of ICT towards National Development	15	30	2
SEI 536	Communication network	30	-	2
SEI 537	Introduction to database systems	20	20	2
SEI 538	Introduction to Computer Operating Systems	30		2
SEI 539	Software Engineering	24	12	2
SEI 599	Independent study*	500 notional hrs		5
SEI 699	Research Project	3000 notional hrs.		30

** Compulsory Courses*

In addition to the compulsory courses (9 credits), each student must follow an optional course (minimum 2 credits) to meet the requirement of 11 credits

6. PROGRAMME CONTENTS

Course code	SE 599
Course title	Independent Study
Credits	05
Compulsory/optional	Compulsory
Prerequisites	SE 503 and SE 504, which can be taken concurrently
Time allocation	500 notional hrs.
Aims	The overall aim is to familiarize the student with concepts and methods involved in scientific research **Specific aims:** 1. To gain experience on the scientific process in the conduct of research. 2. To develop skills to write a review paper and a scientific research proposal. 3. To develop skills to make a presentation. 4. To master the application of data analyses on quantitative and qualitative scientific data.
Intended learning outcomes	At the end of the successful completion of the course, students will be able to, 1. conduct an independent review of literature on a selected topic in the area of Science Education. 2. write a formal scientific report conforming to the guidelines provided. 3. transfer the knowledge gained through (2) and (3) above in the form of a presentation. 4. complete a research proposal conforming to the guidelines provided. 5. perform analyses of quantitative and qualitative data.
Content	*Review paper*: Review of literature; Development of the review paper in concise and professional manner and logical presentation of results that have been reported, writing an abstract, compilation of the list of references. *Proposal writing*: Interpretation and critical evaluation of results of published research; Formulation of a research problem, Concise literature review, justification, writing research aim/objectives/hypotheses/research questions, describing methodology, time frame, identification of resources, budgeting, etc. *Project*: Collection and analysis of data on a topic associated with the review paper. *Seminar*: Presentation of literature and data collected on a given topic; Preparation of an abstract, preparation of power-point slides.
Recommended texts	1. Backwell, J. and Martin, J. (2011). *A Scientific Approach to Scientific Writing*, Springer. 2. Postgraduate Institute of Science (2016). Guidelines for Writing M.Sc. Project Report/M.Phil. Thesis/Ph.D. Thesis 3. Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd edition), Thousand Oaks, CA: SAGE. 4. Hesse-Biber, S. N. and Leavy, P. (2011). *The practice of qualitative research* (2nd edition), Los Angeles: SAGE.

Assessment Criteria	Review paper (20 %) Proposal writing (10 %) Project (40 %) Seminar (30 %)

Course code	SE 699
Course title	Research Project
Credits	30
Compulsory/optional	Compulsory
Prerequisites	GPA of 3.00 at M.Sc. (Course work)
Time allocation	3000 notional hrs. (One year duration)
Aims	The overall aim is to prepare the student to conduct a research independently. **Specific aims:** 1. To train students to apply scientific method in scientific research. 2. To train students to generate researchable hypotheses. 3. To train students to plan, design and conduct scientific research. 4. To gather reliable scientific data, analyse, and interpret. 5. To develop skills in scientific writing.
Intended learning outcomes	At the end of the successful completion of the course, students will be able to, 1. Apply the scientific method. 2. Design a research project. 3. Complete a research project. 4. Describe ethical issues in scientific research. 5. Explain the patenting process in research. 6. Make presentations at national/international conferences. 7. Produce a thesis conforming to the requirements of the PGIS. 8. Write manuscripts for publication in refereed journals.
Content	The students will conduct sufficient amount of laboratory/field work on a chosen research topic under the guidance provided by an assigned supervisor/s, make a presentation of research findings at a national/international conference, and produce a thesis.
Recommended texts	1. Backwell, J. and Martin, J. (2011). A Scientific Approach to Scientific Writing, Springer. 2. Postgraduate Institute of Science (2016). Guidelines for Writing M.Sc. Project Report/M.Phil. Thesis/Ph.D. Thesis 3. Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd edition), Thousand Oaks, CA: SAGE. 4. Hesse-Biber, S. N. and Leavy, P. (2011). *The practice of qualitative research* (2nd edition), Los Angeles: SAGE.
Assessment Criteria	Continuous Assessments (30 %) Oral examination (20 %) Project report (40 %) Conference presentation (10 %)

PROGRAMME CONTENTS OF OTHER COURSES

SCIENCE EDUCATION: GENERAL COMPONENT

SE 501: Science in the Past, Present and Future *(15h, 1 credit*)

The nature of science; Static and dynamic views; Scientific method; Scientific way of thinking; Scientific inquiry; Developing the "Scientific Mind;" Development of science and scientific thought in relation to the socio-cultural, philosophic, moral and religious thought of various ages from ancient to modern including indigenous and traditional knowledge, roots and growth of science and technology.

SE 502: Science Teaching and Learning *(45 h, 3 credits)*

Use of constructive approach in teaching science for understanding and meaningful learning and to achieve scientific literacy; Science teaching as a scholarship; Criticisms of teacher-centred, subject-centred, child-centred teaching, teaching for conceptual change and changes in the emphasis of science teaching in Sri Lanka and outside referring to Nuffield, BSCS; Collaborative problem solving; Reciprocal teaching; Concept map as a tool in teaching, learning, research and in evaluation; Problem-based learning;Guiding students for self-directed and self-regulated learning.

SE 503: Qualitative Research Methods in Science Education *(45 h, 3 credits)*

Limitations of using scientific method in educational research; Selection of a sample in qualitative research; Selection of a site and early negotiations with the administrators. Rights and duties, Consent forms. Recording observations as an observer and participant observer (Field notes), Transcribing fieldnotes, Methods of conducting interviews, Transcribing interviews, Use of documents as data in qualitative research; Use of field notes, interviews and documents in data analysis; Data coding and indexing; Grounded theory; Content analysis; Triangulation

Writing a research report

SE 504: Quantitative Research Methods in Science Education *(30 h, 2 credits)*

Use of scientific method in educational research; Types of educational research (Case-studies, descriptive, historical and philosophical); Research designs; Need for sampling, techniques of sampling, sampling designs--simple, random, stratified, proportionate, cluster, snow ball; Sampling error, sampling bias, and sampling size; Developing research instruments (Questionnaires, observation and interview schedules, survey instruments); Data coding and recording

Percentages; Regression and correlation; Chi-square; t-tests; z-tests; Univariate, bivariate and multivariate analysis of variance; Use of research findings in policy formulation; Writing a research report

SE 505: Science Curriculum *(30 h, 2 credits)*

Research and changing emphasis in the development of science curriculum national as well as international; Types and definitions of curriculum, Place of science in the school curriculum referring to Nuffield and BSCS programmes; Use of integrated science approach and constructivist approach in the development of a science curriculum; Developing a unit plan for conceptual change, The concept of curriculum and curriculum development in relation to the three modes of operation-practical, quasi-practical and eclectic.

SE 506: Science and Society *(30 h, 2 credits)*

Science in day to day life--learning to live with natural hazards-earthquakes, cyclones, landslides, coastal erosion etc., safety of drinking water-surface and ground water-their quality and pollution aspects; Energy resources and their utilization; The role of Mines and Minerals Act No. 33 of 1992; Effects of mining (sand, minerals and, rocks) on society.

SE 507: Science and Information Technology *(15 h T + 30 h P, 2 credits)*

Contributions of technological revolutions in science learning and teaching; Use of print-based, radio, television, audio and video cassettes as media in science teaching and reaching people; Use of computers in educational research; Satellite communications; Use of internet in receiving information; Concept of "Global Village".

SE 508: Measurement and Evaluation *(30 h, 2 credits)*

Assesssment (continuous, school-based, formative, summative, formal & informal), Scales of measurement; Measures of central tendency, Frequency distributions, Histograms, Stem and leaf plot, Box and whiskers plot, Normal distribution, Skewed distributions

Taxonomy of objectives in the three domains and its application in education; Cognitive and non-cognitive tests, Construction and validation of tests; Criteria for reporting student performance; Qualities of measuring instruments (Validity, reliability and practicability); Formative and summative evaluation; Diagnosis and remediation

SE 509: Philosophical Foundations of Education *(15 h, 1 credit)*

Some knowledge about individual philosophers of science. Popper, falsification, demarcation and critique of induction. Kuhn, normal science, revolutionary science, and paradigmatic change. Positivist view of science. Realist view of science. Pragmatism and idealism. Religious approach. Analytical traditions.

SE 510: Psychological Foundations of Education *(15 h, 1 credit)*

Cognitive and psycho-social development of the child; Language and thought (Piaget, Vygotsky & Chomsky); Metacognition; Cooperative and collaborative learning; The concept of "Learning Community;"Behavioural, cognitive and social learning, children with special needs (slow learners, backward, gifted and maladjusted); The role of computers and artificial intelligence.

SE 511: Educational Management *(15 h, 1 credit)*

Concept of Educational Management, an overview; Educational Management as a profession; Five functions of a manager, planning, decision making, organising, directing, and controlling; Leadership in Educational Management; Supervision in Educational Management; Legal basis for Public Education in Sri Lanka; Organisation and management of the Ministry of Education with special focus on Provincial levels; Recent Education Reforms and restructure (Policy and Programme of Action)

SE 512: Action Research *(15 h, 1 credit)*

Origins of action research, Definitions and models of action research, Classroom teaching and action research, The teacher as a researcher, Action research and reflective practice, Writing an action research report.

SE 513: Energy and Environment *(15 h, 1 credit)*

Energy development and utilization; Fossil fuels (oil, natural gas and coal), environmental effects of producing and using fossil fuels; Alternative energy sources: solar, wind, bio-gas, geothermal and ocean energy (wave and thermal), hydro and nuclear. Environmental effects of using alternative energy sources; Electrochemical power sources: batteries and fuel cells; hydrogen as a fuel (8L)
Air pollution, greenhouse effect, ozone depletion, water pollution, waste management (5L) Noise pollution (2L)

SE 514: School, university and industry relationships ***(15 h, 1 credit)***

Sociology of the school (Relationship between society's goals and those of the school, the socio-political and instructional organization of a school, roles and values of a teacher); Social relations in the classroom, school, community and their interactions, peers and social groups; Socialization process and its impact on education; Sociological theories and relevance to education; Ideology of Science; Social theory as Science. The impact of science and technology on human development; What is university-industry relationship? Technology transfer and commercialization; Models/concepts of innovations; Promotional mechanisms and features in developing countries

SPECIAL COMPONENTS

BIOLOGY EDUCATION

SE 516: Biology Education *(30 h, 2 credits)*

Aims and objectives of learning Biology; Problems of Biology teaching in schools; Curriculum development and Biology education in Sri Lanka; Assessment and evaluation in Biology

SE 517: Methods of Teaching Biology *(30 h, 2 credits)*

Hypothesis testing and use of statistics; Physics in Biology; Mathematics in Biology; Modelling Biology lessons; Use of audio-visual aids, study packages, games etc.

SE 518: Plants and Animals - Their Evolution and Interactions *(15 hours Theory & 15 hours Practicals, 1.5 credits)*

The evolutionary history of biological diversity; Plants and animals-similarities and differences; Plant animal interactions; Practical

SE 519: Envioronmental Science *(15 T & 15 P, 1.5 credits)*

Environment, environmental problems and environmental education; Problem solving in Biology in relation to school projects; Natural resources of Sri lanka; Conservation and management of natural resources; Practical and field trips

SE 520: Molecular Biology and its Applications *(15 T & 15 P, 1.5 credits)*

Molecular biology; Biotechnology; Genetics; Practical

SE 521: Histology and Hormones in Living Organisms *(15 T & 15 P, 1.5 credits)*

Animal hormones in growth and development; Animal Histology Plant hormones in growth and development; Plant histology; Practical

SE 522: Plant Systematics and Breeding *(15 T & 15 P, 1.5 credits)*

Gene expression and organization in Eucaryotes; Speciation and mechanisms of evolution; Wild crops; Breeding and development of new varieties; Plant syatematicsPractical

SE 523: Microbiology and Plant Pathology *(15 T & 15 P, 1.5 credits)*

Microbiology;Diseases in plants and remedies; Practical

SE 524: Food Science *(15 T & 15 P, 1.5 credits)*

Agriculture vs Agroforestry for sustainable development; Food and nutrition; Post-harvest technology; Practical

SE 525: Functioning Plant *(15 T & 15 P, 1.5 credits)*

Plant water relations; Ionic relations (mineral nutrition); Carbon metabolism; Practical

SE 599: Research Project *(3-6 months, 6 credits)*

SE 597: The seminar (based on the Research Project) *(0.5 credit)*

CHEMISTRY EDUCATION

SE 531: Curriculum Development and Chemistry Education in Sri Lanka ***(15h, 1 credit)***

Aims and Objectives of Learning Chemistry; Role of Chemistry in everyday life; Clothing and Sanitary needs, Household items, Transport etc.; Career opportunities involving the application of Chemical knowledge; History of Chemistry Education; Role of Chemistry from ancient times to modern period; Changes in the emphasis of teaching Chemistry in Sri Lankan schools and in the universities (undergraduate and postgraduate study); Curriculum development; Critical evaluation of the Chemistry component of General Certificate of Education (G.C.E.) Ordinary Level (O/L) Science curriculum, present G.C.E. Advanced level (A/L) Chemistry curriculum and present University first year Chemistry curricula; Bridging the gap of chemical knowledge between the different levels of Chemistry teaching as mentioned above

SE 532: Problems of Chemistry Teaching in Schools and Possible Remedial Measures *(15h, 1 credit)*

Evaluation of Obstacles encountered in Chemistry teaching in Sri Lanka; Critical evaluation of the

degree to which the goals set by curriculum are achieved; Factors responsible for inability to reach set targets (syllabus, methods of teaching, textbooks, laboratory facilities etc.); Possible means of overcoming the relevant obstacles; Assessment and evaluation of student achievement; Objectives of assessment and evaluation; Different methods of evaluation and their suitability and drawbacks; Setting up of School Laboratories; Understanding the basic facilities required to carry out practical work in schols; Planning the setting up of a Chemistry laboratory with special emphasis on the facilities available in rural/urban environments; Design of laboratory buildings and furniture; Requirements in chemicals, glassware, burners etc. Low cost equipment for teaching Chemistry

SE 533: Methods of Teaching Chemistry - I *(15h, 1 credit)*

Computer Assisted Learning; Introduction to computers; Software for preparing study packages; Information Technology

SE 534: Methods of Teaching Chemistry - II *(15h, 1 credit)*

Audio-visual techniques; Use of simple demonstrations; Audiovisual aids; Games, study packages; Problem solving in Chemistry; Potential of numerical problem solving as a teaching technique; Techniques of numerical problem solving with special emphasis on stoichiometry; Industrial flow charts; Identification of bottle-necks in various manufacturing processes taking cement industry, tyre industry etc. as examples

SE 535: Some Important Theoretical Concepts and Special Topics Relevant to Chemistry Teaching - I *(15h, 1 credit)*

Structure of matter; Elementary concepts of quantum mechanics and chemical bonding, H-bond; Laws of thermodynamics with special emphasis on its relevance to Chemistry and the understanding of various day to day processes; The role of thermodynamics in industry; Chemical equilibria and their application; Phase equilibria and their application

SE 536: Some Important Theoretical Concepts and Special Topics Relevant to Chemistry Teaching - II *(15h, 1 credit)*

Basic concepts of Organic Chemistry; Isomerism; IUPAC nomenclature; Simple reaction mechanisms; Special topics in Inorganic Chemistry; Economically important minerals in Sri Lanka and their utilization with special emphasis on clays, mineral sands, apatite, iron ore, limestone; Potential future development for chemical industry in Sri Lanka; Gems and their chemistry, heat treatment of gem stones; Chemistry of the transition elements

SE 537: Relevance of Principles of Chemistry in Selected Chemical Industries

(15 h, 1 credit)

Role of Chemistry in Detergent industry, Rubber product industry, Activated Carbon industry, Ceramics industry, Plastic industry, Beverage industry; Industrial gases; Electroplating etc.

SE 538: Chemistry and the Environment *(15h, 1 credit)*

Scientific and technological advances and environmental pollution; Pollution of air, water and soil; Monitoring air and water pollution; Green house effect and global warming; Health and toxicological aspects relating to pollution, their mitigation and control; Depletion of natural resources and the need for sustainable development; Energy crisis and alternate energy sources; Solid state, their accumulation and disposal; Field monitoring of pollutants with special emphasis on suitable student projects

SE 539: Laboratory Work *(60 h, 2 credits)*

Working of simple instruments used in Chemistry teaching (with special emphasis on G.C.E. A/L Chemistry teaching;) Measurement of gas pressure and volume; Handling of glass ware; Simple glass blowing; Data collection and handling; Graph drawing; Evaluation of about 15 selected experiments from G,C,E. A/L curriculum with special emphasis on special usefulness of the experiment, drawbacks, methods of improving the experiment for obtaining better results and investigation of ways of incorporating these improvements in classroom situations

SE 599: Research Project *(3- 6 months, 6 credits)*

Some suggested areas of study:

Development of experiments to illustrate selected principles of Chemistry, Demonstrations to illustrate selected principles of Chemistry; Development of chemical experiments that can be carried out at home using readily available material; Development of evaluation procedures; Preparation of study packs for teaching selected topics; Use of computers for teaching selected topics in Chemistry; New approaches in teaching selected topics in Chemistry

MATHEMATICS EDUCATION

SE 546: Mathematics Education in Sri Lanka *(15 hrs; 1 credit)*

Role of mathematics in everyday life, Teaching mathematics in schools, teacher-training colleges, technical colleges and universities, Critical evaluation of the mathematics syllabi of the G.C.E. (O/L), G.C.E. (A/L) and the first year (G.S.Q.) levels at universities, Bridging the gap of mathematics knowledge between different levels of mathematics teaching as mentioned above, Assessment and evaluation in mathematics, Career opportunities for mathematics graduates, Use of mathematical skills in other disciplines, Postgraduate studies in mathematics, Research and frontier developments in mathematics education.

SE 547: Methods of Teaching Mathematics *(15 hrs; 1 credit)*

Student-centered method, Teaching through problem solving, group discussions and presentations, Teaching through home-work problems, quizzes and traditional examinations, observations and understanding of nature related to mathematical theories, Model - building in mathematics, Mathematics clubs and quiz-competitions, Computer assisted learning and software packages, Audio-visual aids, Use of library facilities, Writing course-texts, Identification of mathematical problems in the industry.

SE 548: Fundamental Concepts in Mathematics *(15 hrs; 1 credits)*

Mathematical logic, Baby set theory, ZF+C Model, Construction of the real number system via Dedekind's cuts, Topics in Geometry, Algebraic structures (groups, rings, modules, fields, vector-spaces), Topology of R^n, Transfinite numbers, Rigid-body dynamics, Validity of Newtonian mechanics, Four-vectors and Tensorial geometry.

SE 549: Laboratory and Field Work *(45 hrs; 1.5 credit)*

Designing and preparation of simple instruments and models related to G.C.E. (A/L) mathematics teaching, Data collecting and methods of representation, Identification of problems in teaching mathematics at school levels, Usage of software packages, Computer-aided teaching.

SE 550: History of Mathematics *(15 hrs; 1 credit)*

Origin of numbers, Role of numbers in the society, Euclidean geometry with original proofs, Cubic and quartic equations, historical approach to calculus, historic period from the eighteenth century covering the work of Brook Taylor, Colin Maclaurin, J.D'alembert, Augustine-Louis Cauchy, E.F. Gauss, J. Jacobi, Riemann, Lebesgue, Karl Weiestrass, J.W.K. Dedekind, George Cantor and Albert Einstein.

The following optional courses (SE 551 - 559) are designed to stimulate and motivate Masters students to the excitement of the subject and to enhance their career opportunities.

SE 551: Complex-Variable Theory *(15 hrs; 1 credit)*

Geometry of complex numbers, Riemann's sphere, Cauchy's Theorems (four), Winding number and homotopy, Rouche's theorem and its applications.

SE 552: Mathematical Modeling *(15 hrs; 1 credit)*

Dimensional analysis, Averaging (mean, median, mode), Curve fitting, Model-testing, Rational models, Optimization via calculus Optimization via linear programming, Income determination models and models related to banking sector.

SE 553: Metric Spaces and their Applications *(15 hrs; 1 credit)*

Distance functions, Diameter of a set, Open and Closed sets, Complete metric spaces, Fixed point theorems and their applications to differential and integral equations.

SE 554: Linear Algebra *(15 hrs; 1 credit)*

Vector spaces and linear transformations, Characteristic values, Functions of matrices, Stochastic matrices, Non-homogeneous linear systems; mechanical systems; Biological systems, Inner-product spaces, Linear functionals and dual spaces.

SE 555: Measure Theory *(15 hrs; 1 credit)*

Measurable sets and Lebesgue measure, Measurable functions, The Lebesgue integrals, Differentiation and integration, Lp - spaces, Probability measures and Random-variables, Stochastic independence.

SE 556: Differential Equations *(15 hrs; 1 credit)*

ODE : Second order differential equations and their practical importance, Autonomous systems, Limit cycles, Non-autonomous systems, Perturbation, theorems, Stability.

PDE :Eigenvalue problems, Hamilton-Jacobi equation, Finite-difference approximations and numerical methods.

SE 557: Computer Mathematics *(15 hrs; 1 credit)*

Binary number system, Computer codes, Algorithms, Flowcharts, Boolean algebra, Combinational analysis, Graphs and multigraphs, Finite state machines, Strings, Finite automata theory.

SE 558: Probability and Statistics *(15hrs; 1 credit)*

Probability spaces, Bayes' Theorem, Random variables, Distribution functions, Regression, Limit theorems, Sampling, Estimations, Testing Hypotheses.

SE 559: Numerical Methods *(15hrs; 1 credit)*

Solving Non linear equations: iteration method, Newton Raphson method, secant method, convergence concept.

Solving simultaneous equations: Gauss elimination method, iterative methods, Jacobi & Gauss sequential method, Diagonal dominant Interpolation.

Approximations: Taylor method, Least square method.

Integration: Solving Differential equations, forward difference method, Euler& Runge Kutta method.

SE 599: Research Project *(3 – 6 months, 6 credits)*

Each student is required to carry out an independent research project on a suitable topic in Mathematics Education under the guidance of a supervisor and write a project report.

PHYSICS EDUCATION

SE 561: Physics Education - I *(30 h, 2 credits)*

History of Physics Education; Aims and objectives of learning Physics; Methods of teaching/learning Physics; (a) Student-centred method of teaching Physics (b) Teaching Physics through problem solving, group discussions and tutorials, (c) Use of demonstration experiments for Physics teaching (d) Interactive Physics teaching through: audio-visual aids, videos, computer software and multimedia packages (e) Physics teaching through observation and undersatnding of nature, real world, and technology (f) Physics teaching by motivating students by their participation in Physical societies, quiz competitions, exhibitions, astronomy clubs, and environment clubs etc.

SE 562: Physics Education - II *(15 h, 1 credit)*

Problems of Physics teaching in schools; Development of Physics curricula at primary, secondary and tertiary levels in Sri Lanka and the relevence of Physics curricula to society; Assesment and evaluation in Physics

SE 563: Important Concepts and Principles in Physics *(15 h, 1 credit)*

Teaching Physics through understanding and appreciating important concepts and principles in Mechanics; Wave motion and optics; Thermal and statistical physics; Electromagnetic phenomena; Atomic and nuclear physics; Quantum Mechanics

The following optional courses (SE 549 -553) are designed to stimulate students and motivate them into Physics and to expose them to the excitement and fascination of the subject and to appreciate its relevance in many areas of nature, universe and modern technology.

SE 564: Energy and Environment *(15 h, 1 credit)*

Energy resources, non-renewable and renewable; Alternative energy resources; Environmental impact of energy utilization

SE 565: Physics of Materials *(15 h, 1 credit)*

Physics of technologically important materials: ceramics, glass, polymers, semiconductors and superconductors; Their synthesis, characterization, physical properties, and technological applications

SE 566: Astronomy *(15 h, 1 credit)*

Early astronomy, Solar system, Interstellar and intergalactic matter, Introduction to cosmology

SE 567: Electronics and communication *(15 h, 1 credit)*

Analogue and Digital electronics, Microprocessors, Data communications

SE 568: Topics in Applied Physics *(15 h, 1 credit)*

Physics in Medicine and Biology (5 h), Geophysics (4h), Atmospheric Physics and Meteorology (6h)

SE 569: Physics Practicals *(60 h, 2 credits)*

Planning and management of a Physics laboratory, Data recording and analysis, graphs, error analysis,; Analysis of some selected experiments in Physics, Demonstration experiments in Physics, Computer interfacing of simple experiments.

SE 599: Research Project *(3- 6 months, 6 credits)*

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

ICT EDUCATION (NEWLY INTRODUCED)

SEI 530: ICT Education in Sri Lankan Schools*

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 530 ICT Education in Sri Lankan Schools 3 Compulsory None
Objectives	To develop students' knowledge about the ICT education in Sri Lanka
Time allocation	45 h (30h *(Theory)*, (Notional Hours-150))
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities/Problem based learning/case studies)
Intended learning outcome	At the end of successful completion of the course students will be able to: • express the importance of introducing ICT education in to school curriculum • critically examine how the ICT curriculums have been developed • assess and evaluate ICT lessons within the school curriculum

	• explore ICT related issues in school curriculum • appreciate the government policy related to the use of ICT • appreciate the role of ICT in development
Course Content	Introduction of ICT Education in Sri Lanka, Aims and objectives of ICT Education, ICT Curriculum development (O/L and A/L) in Sri Lanka, Assessment and evaluation strategies of ICT Education in schools, Problems of ICT Education in schools in Sri Lanka
Recommended Texts:	1) *G.C.E. (O/L) IT Teacher Instructional Manual* , 2007, National Institute of Education 2) *G.C.E. (Advanced Level), Information and Communication Technology Syllabus*, Grade 12, 13, National Institute of Education 3) National policies that connect ICT-based education reform to economic and social development. *Interdisciplinary Journal on Humans in ICT Environments* by Kozma, R.B. (2005). 1 (2), 117-156.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	20
	Written Examinations	20
End Semester Examination		60

SEI 531: Pedagogies for the use of ICT in Education*

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 531 Pedagogies for the use of ICT in Education 2 Compulsory None
Objectives	To develop students' conceptualisation in ICT and pedagogies related to ICT
Time allocation	25h (*Theory)* & 10h *(Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities/Problem based learning/case studies)
Intended learning outcome	At the end of successful completion of the course students will be able to: • describe the concepts of educational technology and ICT in education • explain main theories and models related to ICT and their educational use • demonstrate the competence of planning, implementing and evaluating the use of ICT in lessons within the school • use e-learning tools in teaching and learning • state the problems related to and due to the use of ICT in Education
Course Content	Educational technology, ICT in Education, Pedagogical aspects of ICT in Education (Learning Theories and models), E-learning, and Problems related to and due to the use of ICT in Education.
Recommended Texts:	1) *Pedagogy and ICT Use in Schools around the World: Findings from the IEA SITES 2006 Study* by Law, N., Pelgrum, J. & Plomp, T. (2008). Hong Kong: Springer.http://books.google.lk/books?id=urCHH10HK_0C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false) Pedagogy before Technology: Re-thinking the Relationship between ICT and Teaching by Watson, D. M. (2005). *Journal of Education and Information Technologies*, 6(4), 251–266. 3) *E-learning: an expression of the knowledge economy* by Chada, G. & Kumail, S. M. N. (2003). New Delhi: Tata McGraw-Hill.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	20
	Written Examinations	20
End Semester Examination		60

SEI 532: Introduction to Computers*

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 532 Introduction to Computers 2 Optional None
Objectives	To develop students' comprehension the evolution of computer and their competence in using PCs and networks
Time allocation	25h (*Theory)* & 10h *(Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities/Practical work/Role play)
Intended learning outcome	At the end of successful completion of the course students will be able to: • describe the evolution of computers • acquaint with different parts of a computer and their functions • develop skills and knowledge related to computer networks • explain the basic principles behind the design of modern computer systems • apply them to novel designs that they may come across in the future.
Course Content	History of computers: Evolution of computers, Computer Classification, Basic hardware components: CPU Memory, Graphic Units, I/O devices, their functionalities and assembling a PC, Introduction to computer logic circuits. Computer arithmetic: Binary arithmetic and Boolean Algebra Combinational logic Circuits: Logic gates, Karnaugh maps. Sequential logic circuits: Flip-flops, Memory, CPU design: ALU, Input/output, Instruction sets, addressing modes, Computer networks: Introduction, Advantages over standalone PCs, Network applications such as Internet, email, MSN messenger and web browsing.
Recommended Texts:	1) *Introduction to computers and information processing* (3rd ed) by Long, L. (1991). New Jersy: Prentice Hall. *2) Computer fundamentals: Concepts, systems & applications* by Sinha, P.K. (1992).New Delhi: BPB publications. 3) *Logic and Computer Design Fundamentals* by M. Morris Mano, Charles R. Kime. 4) *Computer Architecture & Logic Design* by Thomas C. Bartee. *5) An Introduction to Assembly Language Programming for 8086 Family* by Thomas P. Skinner.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 533: Programming principles and applications*

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 533 Programming principles and applications 2 Compulsory None
Objectives	To develop students' experience on basic programming concepts
Time allocation	15h (*Theory)* & 30h *(Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods (Interactive lectures/Small group activities, Independent learning activities)
Intended learning outcome	At the end of successful completion of the course students will be able to: • explain the use of data types and variables in program design • use control structures to manage the program execution • design and implement small programs in high level programming languages
Course Content	Basic component of a programming language: syntax and semantics; flowcharts, Introduction to Visual Basics (VB); Designing and Learning Activities using VB. Basic Concepts: The concept of Data types and operations on data types, Basic data structures Arrays and structures. Writing a complete program: Sequential, alternation, and repetition control structure: formatted and unformatted basic input output, Modular structured programme modules in VB, functions. Structured Programme Development: Problem definition and specification, top-down design and development, Coding guidelines & standards in developing commercial application systems. Introduction to Object Oriented Programme Development (Using Java): Implementation of programs with object oriented language constructs: classes, objects, inheritance, aggregation, composition and polymorphism.
Recommended Texts:	1. *Algorithms in C* by Sedgwick, R. (1998). Addison Wesley. 2. *Data Structures in Java* by Standish, T. A. (1998).Addison Wesley. 3. *Data structures, Algorithms& Object-Oriented programming* by Gregory L. Heilemen (1996).McGraw-Hill. 4. *Computer Algorithms - Introduction to Design & Analysis* by Sara Baase & Allen Van Gelder (2000). Addison-Wesley.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	20
	Written Examinations	20
End Semester Examination		60

SEI 534: Web Programming

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 534 Web Programming 2 Optional None
Objectives	To enhance students' comprehension and skills to apply modern technologies in developing web applications
Time allocation	20h (*Theory)* & 20h *(Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods (Interactive lectures/Small group activities/Practical work)
Intended learning outcome	At the end of successful completion of the course students will be able to: • use web technologies and relational databases for designing and implementing web applications • apply the learnt concepts in real life situations.
Course Content	Introduction to Internet Programming: Client/Server model, Browsers-Graphical and Hypertext Access to the Internet, HTTP – Hyper Text Transfer Protocol. Creating Web pages HTML – Hyper Text Markup Language, headers, body, html tags, tables, Text, graphics, sounds, video clips, multi-media, Client side image mapping, web page counters, HTML resources - html converters and tools, HTML forms programming, Building a form, Text fields and value, size, max-length, html buttons: radio, checkboxes, pre-checked, Selection lists. Introduction to CSS scripting, Action and Method - GET and POST, html form interface with cgi scripts, Automating processing such as info forms and email, Graphic User Interface with AWT, AWT calls, Windows, dialog boxes, pop-up menus, Graphics, Using a Layout manager, Manipulating Images, Image animation. Explores the use of scripting languages, such as Java Script, PHP, and Java Applets in web site development. Introduction to web based application development tools and frameworks. Students will use these concepts to develop a web based interactive educational application.
Recommended Texts:	1. *Internet & World Wide Web How to Programme* (Second Edition) by Benoit Marchal (2002). 2. *Java How to Program: Java 2, Introducing Swing* by Harvey M. Deitel & Paul J. Deitel (1999). Prentice Hall Professional Technical Reference. 3. X*ML by Example* (2nd Edition) by Benoit Marchal (2001). Que Publisher Internet.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 535: Contribution of ICT towards national development*

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 535 Contribution of ICT towards national development 2 Compulsory None
Objectives	To develop student' experience of the government policies related to the use of ICT
Time allocation	15h (*Theory)* & 30h *(Practical*), (Notional hours-100)
Intended learning outcome	Student teachers will be able to: • appreciate the government policy related to the use of ICT; • appreciate the role of ICT in development; and • use ICT with due respect to ethical and social norms. • apply knowledge on a selected topic by self-study • demonstrate presentation skills and to be confident in oral defence.
Course Content	Government policy; ICT for Education, Health, Agriculture, E-commerce: E-business, E-Governance. Select a topic relevant to ICT Education, prepare a report after carrying out a literature survey and make a presentation.
Recommended Texts:	1) National policies that connect ICT-based education reform to economic and social development. *Interdisciplinary Journal on Humans in ICT Environments* by Kozma, R.B. (2005). 1 (2), 117-156. 2) *Handbook of Research on E-Planning :ICTs for Urban Development and Monitoring* by Silva, C. N. (2010).New York: Information science reference,

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 536: Communication Network

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 536 Communication network 2 Compulsory None
Objectives	To develop students' conceptualization in communication networks and their applications.
Time allocation	30h (*Theory*) , (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities)
Intended learning outcome	At the end of successful completion of the course students will be able to: • state the concept of networks, importance and types of network and models of networking; • use the knowledge behind Network Operating System, and different types of protocols; • describe the origin of the Internet; • appreciate the services offered by the internet.
Course Content	Network: Definition and importance of network Types of network, OSI communication model. LAN, MAN, WAN: Definition and Their Features, Topologies (Star, Bus & Ring), Connectors & Cabling Systems, HUB, Switch, Router, Modem, Network Interface Card. Transmission Media & Communication Channels, Communication Techniques. Server, Workstation, File Server, Application Server, Network Operating System, Different Types of Protocol-TCP/IP, IPX/SPX, NetBEUI. Internet: Introduction and Origin of Internet, Internet Architecture, Client Server Basics, Bridge, Gateway, IP Protocol & IP Address, Internet Control Protocols, Domain Name System (DNS) & Name Servers, Electronic Mail, Telnet, FTP, Archie, Gopher, Jughead, Veronica, WAIS, WWW, Search Engine, Network threats and security. HTTP, HTML, URLs, VSAT Web Page, Browsing.
Recommended Texts:	1) *Communication networking: an analytical approach* by Kumar, A., Manjunath, D., & Kuri, T. (2005). New Delhi: Elsevier India (Pvt) Ltd.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	20
	Written Examinations	20
End Semester Examination		60

SEI 537: Introduction to database systems

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 537 Introduction to database systems 2 Optional None
Objectives	To develop students' familiarization of the principles, design, implementation, and applications of database management systems.
Time allocation	20 h (*Theory*) & 20 h (*Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Practical work/Problem based learning)
Intended learning outcome	At the end of successful completion of the course students will be able to: • express essential DBMS concepts; • identify the different issues involved in the design and implementation of database system; • study the physical and logical database designs, database modelling, relational, hierarchical, and network models; and • design and build a simple database system using ACCESS and MySQL.
Course Content	Basic Database Concept: Communication with Database System Introduction to Database Management System: Relational Database Model, Structured Query Language, Relational Database Design and Normalization, ER Model: Primary key. Foreign key. RDBMS Programming with ACCESS and MySQL: Introduction to SQL, Benefit of SQL, Running SQL commands, Creating Database and Tables, Adding Data, Deleting Data, Updating Data, Select Statements Altering Tables.
Recommended Texts:	1) *Database systems: models, languages, design, and application programming* by Elmasri,R.,& Navathe, S.B.(2011).Boston: Pearson Education. 2) *Database systems: a practical approach to design, implementation &management* (4th ed.) by Connolly, T. M., & Begg, C.E. (2005). Delhi: Dorling Kindersley (India) Pvt. Ltd.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 538: Introduction to Computer Operating Systems

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 538 Introduction to Computer Operating Systems 2 Optional None
Objectives	To develop students' experience on the operations of operating systems such as process scheduling, memory management, fault tolerance and so forth.
Time allocation	30h (*Theory*) , (*Notional Hours-100*)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities/Presentations/Assignments)
Intended learning outcome	At the end of successful completion of the course students will be able to: • describe functions of operating systems and issues in designing operating systems; • appreciate the value of these operating systems; and • use the experience in real situations.
Course Content	Introduction, Evolution and classification, Distributed OS Techniques; Naming, Inter-process communications and remote procedure calls Data and process migration, transactions, file systems. Parallel OS Techniques; Process management, scheduling, synchronization, Data management, caching, coherency, consistency, file systems, Load balancing. Advanced OS Concerns; Memory management, virtual memory, garbage collection, Fault-tolerance, reliability, replication, Protection, authentication, Performance, benchmarking, and monitoring, Client - Server Model, Paging.
Recommended Texts:	1) *Modern Operating Systems* by Andrew S. Tanenbaum 2) *Operating Systems Design and Implementation* by Andrew S. Tanenbaum & Albert S. Woodhull 3) *Operating System Concepts* (7th edition) by Abraham Silberschatz, Peter Baer Galvin, & Greg Gagne (2005). John Wiley & Sons.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 539: Software Engineering

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 539 Software Engineering 2 Optional None
Objectives	To enhance students' experience on the structured approach in software development, most notably the advantages of software engineering over traditional approaches, development of reusable software to mean today's user requirements.
Time allocation	24 h (*Theory*) , 12h (*Practical*), (Notional Hours-100)
Teaching/Learning Methods	Student-centered teaching and learning methods(Interactive lectures/Small group activities/Projects)
Intended learning outcome	At the end of successful completion of the course students will be able to: • analyse problems in software engineering; • identify document requirements in software development; and • design and implement reusable systems.
Course Content	Overview of software engineering: software process; classic life cycle model, iterative models, incremental model. Project planning; Fundamentals of project and system planning, requirements analysis. SSADM (Structured Systems Analysis & Design Method), SDLC Model. Software design fundamentals; Stepwise refinement, bottom-up approach, modularity, Design techniques; Use of UML and design patterns. Testing: Testing objectives, test case design, and white box vs. black box testing, overview of testing strategies. Maintenance; Overview of maintenance issues and software configuration management.
Recommended Texts:	1) *Software Engineering* (6th edition) by Ian Somerville (1999). Addison-Wesley. 2) *Design Patterns* (1st edition). Addison-Wesley, 1996.

Assessment criteria

		Percentage
Continuous assessment/Mid semester examination	Assignments	40
End Semester Examination	Written Examination	60

SEI 599 Independent Study

Course Code	SE 599
Course Title	Independent Study
Credits	05
Compulsory/optional	Compulsory
Prerequisites	None
Aim	The overall aim is to familiarize the student with concepts and methods involved in scientific research. Specific objectives are to: . Explain the scientific process in the conduct of research; . Develop skills to write a review paper and a scientific research proposal; . Develop skills to make an effective oral presentation; and . Master the application of data analytical methods on scientific data.
Time allocation	500 notional hours-Independent learning
Intended learning outcome	At the end of the successful completion of the course, students will be able to: • Explain the scientific method; • Conduct a review of literature on a selected topic in the area of science education; • Prepare a research proposal conforming to the guidelines provided; • Conduct an independent study on a selected topic; • Write a formal scientific report conforming to the guidelines provided; • Transfer the knowledge gained through the above in the form of an oral presentation;
Course content	*Review a paper*: Review of literature; Development of the review paper in concise and professional manner and logical presentation of results that have been reported, writing an abstract, compilation of the list of references. *Proposal writing*: Interpretation and critical evaluation of results of published research; Formulation of a research problem: Concise literature review, justification, time frame, identification of resources, budgeting, etc. *Project*: Conduct a research study. *Writing a report:* Writing an appropriate project report on the study. *Seminar*: Make an effective presentation on the study conducted.
Recommended Texts	Recommended Texts: 1) *A Scientific Approach to Scientific Writing* by Backwell, J., Martin, J. (2011), Springer. 2) *Guidelines for Writing M.Sc. Project Report/M.Phil. Thesis/Ph.D. Thesis*. Postgraduate Institute of Science (2016). 3) *Action Research: Improving Schools and Empowering Educators* by Mertler, C. A. (2011). USA: SAGE. *1) H. Handbook of Action Research: Concise Paperback Edition* by Reason, P. & Bradbury (2006). London: Sage

Assessment criteria: Continuous Assessment

Component	**% marks**
Review paper	20
Proposal writing	10
Project	40
Seminar	30

SEI 699: Research Project

Course Code Course Title Credits Compulsory/optional Prerequisites	SEI 699 Research Project 30 Compulsory None
Objectives	1. Provide an extensive training to undertake a research project, write reports, and publish outcomes. 2. Foster skills to work in a team. 3. Cultivate skills to monitor research progress, data management, and data analysis. 4. Provide opportunities to attend and present in conferences
Time allocation	One year , (Notional Hours-3000)
Teaching/Learning Methods	Student-centered teaching and learning methods (Independent learning activity)
Intended learning outcome	At the end of successful completion of the course students will be able to: • write a research proposal, plan the research and execute • work in team and manage the project for its success • conduct data collection, data analysis and report the findings
Course Content	Each student is required to plan a research project on an appropriate topic; collect data and analyze them; and write a dissertation to report the literature review, methodology and findings and conclusion/s.
Recommended Texts:	

Assessment criteria

	Percentage
Continuous assessment	50
Evaluating the dissertation	40
Viva Voce examination	10

7. PROGRAMME EVALUATION

Programme evaluation will be as stipulated in the PGIS Hand Book.

8. TEACHING PANEL

	Name, Affiliation, and Qualifications	Area of Specialization
1.	Dr. W. D. Chandrasena Senior Lecturer, Science Education Unit, Faculty of Science, University of Peradeniya, Sri Lanka. *B.Sc. (Perad.),* *Postgraduate Diploma in Education (Colombo),* *M.Sc. (Perad.), M.Phil (Colombo),* *Ph.D.(UWS, Australia)*	Science education with the special emphasis on chemistry education, Educational psychology, Science teaching methods, Mixed methods research in education
2.	Dr. G. Kodituwakku 73A, Senarathgama, Katugastota *B.Ed. (Colombo), M.Phil (Perad.),* *Ph.D. (Colombo)*	Teaching methods, Research methodology
3.	Prof. D. D. Mallikarachchi 118, Kalandurukotuwa Road, Illukkwatta, Pilimathalawa. *B.A., M.A. (Cey.), Ph.D. (Moscow)*	Educational psychology and philosophy
4.	Dr. P. R. K. A. Vitharana Senior Lecturer, Dept. of Education, University of Peradeniya. *B.Sc.(OUSL), Dip. in Ed.,* *M.Sc. (Perad.), Ph.D. (Perad.)*	Science education, Teaching methodology, Qualitative research
5.	Mr. K. S. K. Peiris Lecturer, Pasdunrata College of Education. *B.Sc (Perad.), M.Phil. (Colombo),* *M.Sc. (Perad.)*	Science education, Science curriculum, Educational management
6	Dr. S. Yatigammana Senior Lecturer, Department of Education, University of Peradeniya. *B.Sc. (Perad.) Dip. in Ed,* *M.Sc. (Perad.)* Postgraduate Diploma in IT Education (Perad.), Postgraduate Diploma in Research, Methods *(Bristol),* PhD (*Bristol)*	Science education, ICT education, Research methodology

	Name, Affiliation, and Qualifications	Area of Specialization
7	Prof. S. Karunaratne Gonamulla Junction, Galle. *B.Sc. (Cey.), Postgraduate Diploma (Perad), M.Sc. (Perad), M.Ed. (Bristol), Ph.D. (Michigan State)*	Science education, Teaching Methodology, Qualitative Research Methods
8	Dr. M. U. Sedere Rector, Sri Lanka International Buddhist Academy, Pallekele. *B.Ed. (Cey), M.A. (Iowa), Ph.D. (Iowa)*	Research methodology, Measurement and evaluation
9	Dr. Ashoka Abeykoon Menike, "Madara", Hiriwadunna. *B.Sc. (Kelaniya), Dip. in Ed.(NIE), M.Sc (Perad., Ph.D. (Perad.)*	Science education, Teaching methodology, Qualitative research
10	Prof. K. Dahanayake, Emeritus Professor, Dept. of Geology, University of Peradeniya. *B.Sc. (Cey.), Ph. D. (Nancy)*	Geology, Natural disasters (Landslides, Tsunami etc.)
11	Prof. H. A. Dharmagunawardane Dept. of Geology, University of Peradeniya. *B.Sc., M. Phil. (Perad.), Ph.D. (Copenhagen)*	Geology, Hydro-geology
12.	Dr. W. A. M. Daundasekera Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), Ph.D. (Cranfield, UK)*	Post-Harvest Pathology
13.	Dr. G. A. N. Suranjith, Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. Hon. (Perad.), Ph.D. (Kentucky, USA*)	Food science
14.	Prof. R. G. S. C. Rajapakse Dept. of Molecular Biology and Biotechnology,	Molecular biology

	Name, Affiliation, and Qualifications	Area of Specialization
	Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), M.Phil. (Perad.),* *PhD. (Hokkaido University-Japan)*	
15.	Dr. K. M. G. G. Jayasuriya Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), Ph.D.(Kentucky)*	Biochemistry
16.	Prof. S. D. S. S. Sooriyapathirana Dept. of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya. *B.Sc. Agric.(Perad.), M.Sc. (Perad.),* *Ph.D (Michigan State, USA)*	Molecular biology
17.	Dr. A. M. K. Karunaratne Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), M.S. (Nebraska, USA), Ph.D. (Perad.)*	Food science
18.	Prof. C. L. Abeysekera Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), Ph.D (Perad.)*	Microbiology
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24.	Dr. S.C.K. Rubasinghe Department of Botany, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), M.Phil. (Perad.), Ph.D. (Edinburgh, UK)*	Plant systematics and Phylogeny
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26.	Prof. W.A.I.P. Karunaratne Department of Zoology, Faculty of Science, University of Peradeniya. *B.Sc. (Perad.), Ph.D. (Perad.)*	Entomology
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	Name, Affiliation, and Qualifications	Area of Specialization
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