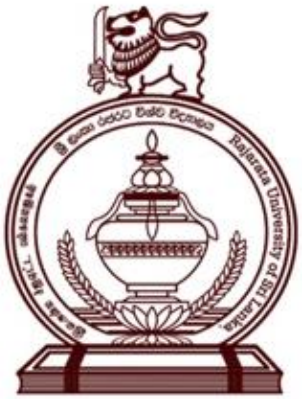
HANDBOOK

FACULTY OF APPLIED SCIENCES

RAJARATA UNIVERSITY OF SRI LANKA

ACADEMIC YEAR 2020/21



STUDENT HANDBOOK
(2020/2021)

FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRI LANKA

❝ Student Handbook provides necessary information for students required for their academic life.

They are expected to read the Handbook thoroughly and understand the content by the commencement of the academic programme and throughout.

Any matter which is not fully understood should be clarified with the consultation of their respective mentors. ❞

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FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRI LANKA

1 INTRODUCTION

1.1 BACKGROUND OF THE FACULTY

The Rajarata University of Sri Lanka (RUSL) was established in November 1995 by the Gazette Notification No: 896/2 of 7th November 1995 in the Administrative District of Anuradhapura. The Central Province Affiliated University College (CPAUC) in Polgolla, located at a distance of 140 km from the main campus at Mihintale was amalgamated to the RUSL as its Faculty of Applied Sciences (FAS). The immediate task of the FAS at that time was to upgrade all the students of the CPAUC who had successfully completed their Diploma requirements, to the Graduate level. On this task the FAS was inaugurated on 10thJanuary, 1997 to commence the third year Degree Programme with a batch of 102 students, who subsequently graduated in 1998. The first batch of students that was directly sent by the UGC to follow the degree programme was enrolled in November 1997. After functioning for nearly 10 years at Polgolla, the Faculty was finally established in the premises of the main campus at Mihintale, on 16th January 2006.

1.2 PRESENT STATUS

The FAS, consists of five departments *viz:* Biological Sciences, Physical Sciences, Health Promotion, Computing and Chemical Sciences. The Department of Biological Sciences offers courses in the fields of study/subjects/disciplines of Botany, Zoology and Biology. The Department of Physical Sciences offers courses in Physics, Pure Mathematics and Applied Mathematics. The Department of Health Promotion offers courses in Health promotion. The Department of Computing offers courses in Computer Science and Information Technology. The Department of Chemical Sciences offers courses in Chemistry. All courses are offered in English medium. As such, the Faculty conducts an intensive course and an ongoing course in English Language, for students to be competent to follow lectures and comprehend the courses taught by the five departments. From its inception, the Faculty follows the course unit system.

It is the intention of the Faculty to ensure that a student entering the Faculty could, in the third and fourth years select a particular field or fields of Applied Sciences of his/her choice. First and second year courses are designed in such a way that a student may select a specific area/s in Applied Sciences in the third year or third and fourth years. The basic plan of the BSc Degree Programmes in Faculty of Applied Sciences is given in the tree diagram in page 122.

1.3 VISION AND MISSION

Vision

The FAS of Rajarata University of Sri Lanka envisions to be a dynamic, innovative and renowned centre of excellence in learning, research, training and consultancy with emphasis on national relevance and international recognition in different disciplines of Applied Sciences.

Mission

To promote learning, research and training among all members of the university, industry and community and to help individuals achieve their full potential through development of the whole person with a view to making significant contributions to the regional, national and global needs.

1.4 UNIVERSITY AND FACULTY WEB SITES

UNIVERSITY WEBSITE: http://www.rjt.ac.lk/

FACULTY WEBSITE: https://aps.rjt.ac.lk/

2 DEPARTMENTS

2.1 BIOLOGICAL SCIENCES

Biology is an exciting and dynamic field which aims to understand biological systems ranging from the molecular biology of individual cells to interactions among entire populations of organisms. At Rajarata University, the department of biological sciences has a recognized research programme and a strong commitment to undergraduate teaching. The objective of the department is not confined to producing graduates capable of securing employment or pursuing higher degrees in the field of biology but also producing individuals capable of fitting into roles outside their area of training. The department pays special emphasis on developing both area specific and transferable skills and hence, provides a diverse array of vibrant and intellectually challenging courses for undergraduates and a number of research opportunities before graduation with hands-on advising. The department also provides flexible learning options in the form of a number of different degree tracks. The department has a highly qualified academic and academic support staff and physical infrastructure to deliver a state-of-the-art curriculum. The department also enjoys a strong sense of community among students and faculty and is also actively involved in community outreach.

2.2 CHEMICAL SCIENCES

The Department of chemical sciences sits at an intellectual and physical nexus of the basic sciences, engineering, and medicine at Rajarata University of Sri Lanka. In addition to conducting of exiting research, the natural synergies with other fields have driven the department into fascinating exchange and collaborative projects across disciplines. The courses offered by the department provide in-depth knowledge of conventional areas of chemistry and application in the relevant field and hence provide structured and tailored service to the industry and other institutions. The Department of chemical sciences is committed to fostering a respectful workplace culture. Currently, the department accommodates numerous undergraduate and graduate students with distinguished permanent academic staff, and a team of skilled technical officers, laboratory staff and administrative staff leading the department to run at its' optimum level.

2.3 COMPUTING

The Faculty of Applied Sciences also responded to the ever-increasing demand for IT professionals by the IT industry by introducing BSc in Information Technology (IT) degree programme. Students enrolling in IT degree programme will obtain a 3-year Bachelor of Science in Information Technology (BSc in IT) or a 4-year Bachelor of Science Honours in Information Technology. Selected students will be eligible for the 4-year degree programme at the end of the 3rd year based on their performance within the degree programme and preference. The IT degree programme is at a stage of its evolution in which it has been able to secure high donor confidence through several industrial projects underway in the faulty since 2009. It has also gained the recognition from the local IT industry with many partners willing to take part in student placement and collaborative research and job placement activities.

2.4 HEALTH PROMOTION

Health promotion is a relatively new discipline, which has begun to spread globally only recently. It deals with practical implementation of a set of core principles and approaches of demonstrated effectiveness in changing behavior to improve the wellbeing of individuals, communities or groups and society at large. Rajarata University is so far the only institute in Sri Lanka (and all of South Asia) that offers a BSc degree programme in health promotion.

The BSc and BSc Honours in Health Promotion degree programmes were introduced to Faculty of Applied Sciences in 2006 under the Department of Biological Sciences and the Department of Health Promotion was established as a separate department in 2018. Approximately two-thirds of the course units of the BSc in Health Promotion degree program consists of theory modules and the remainder is spent on field practical placement. The theoretical components of the health promotion program are interdisciplinary and provide a broad-based understanding of promoting health in real-life settings. For the Honours degree, students additionally engage in an individual health promotion project comprising approximately half of the credit weightage of the fourth year.

2.5 PHYSICAL SCIENCES

The Department of Physical Sciences comprising Physics, Mathematics and Statistics divisions which collectively span the entire academic spectrum in teaching and research. All courses are geared towards the practical aspects of the disciplines and students are immersed in an extremely demanding schedule that emphasizes a multidisciplinary approach to many aspects of scientific global needs. The first two years focus on the fundamentals which provide a sound theoretical background of each discipline and remaining years are dedicated to advanced studies of theory and practice. The modern curriculum is taught by dynamic, flexible, committed faculty members having international recognition in research.

3 STAFF

3.1 OFFICERS OF THE UNIVERSITY

Vice-Chancellor: Prof. (Mrs.) G. A. S. Ginigaddara

Deans of Faculties:	Agriculture:	Dr. G.V.T.V. Weerasooriya
	Applied Sciences:	Prof. E. M. R. K. B. Edirisinghe
	Management Studies:	Prof. P.M.B. Jayathilake
	Medicine & Allied Sciences:	Dr. P. H. G. Janaka Pushpakumara
	Social Sciences & Humanities:	Prof. D. Thusitha Mendis
	Technology:	Dr. T. C. Bhamunuarachchige

Librarian: Mrs. A. S. Siriwardena

Registrar: Mr. A. M. G. B. Abeysinghe

Bursar: Mr. S. S. K. Godakumbura (Acting)

3.2 STAFF OF THE FACULTY

Dean: Prof. E. M. R. K. B. Edirisinghe
BSc (Hons) (SJP), M.Phil. (SJP), PhD (Greenwich, UK), M.I. Chem. C.

3.2.1 ACADEMIC STAFF OF THE FACULTY

Department of Biological Sciences

Head: Prof. Sanath Hettiarachchi,
BSc (Hons) (Kelaniya), MSc, PhD (VUB, Brussels)

Professors: Prof. Sanath Hettiarachchi,
BSc (Hons) (Kelaniya), MSc, PhD (VUB, Brussels)

Prof. (Mrs.) Sriyani Wickramasinghe
BSc (Hons) (Colombo), MSc (Colombo), PhD (AIT, Thailand)

Prof. (Mrs) T. V. Sundarabarathy
BSc (Hons) (SJP), MSc (Perad.), SEDA (UK), PhD (Perad.)

Senior Lecturers: Dr. (Mrs) P. L. Hettiarachchi
BSc (Hons) (Colombo), MSc, PhD (VUB, Brussels), C.Biol. (Sri Lanka), F.I.Biol. (Sri Lanka)

Dr. Rajnish Vandercone
BSc (Hons) (Perad.), PhD (Washu-St Louise, USA)

Dr. (Mrs) P.N. Yapa
BSc(Hons) (Perad.), MSc (Perad.), MSc (Reading, UK), M.Phil. (Perad.)

Dr. K. D. B. Ukuwela
BSc (Hons) (Perad.), PhD (Adelaide, Australia)

Dr. E. Y. Fernando
BSc (Hons) (Westminster, UK), PhD (Westminster, UK)

Dr. Ravindra L. Jayaratne
BSc (Hons) (RUSL), MSc (Perad.), PhD (Colombo)

Dr. (Mrs.) D. K. Hettiarachchi
BSc (Hons) (RUSL), MSc (Perad.), PhD (Lincoln, NZ)

Dr. (Mrs.) Theja Abeyrathna
BSc (Hons) (SJP), M.Phil. (SJP), PhD (Sydney, Australia)
Dr. Dinarzarde Raheem,

BSc Hons (Imperial College, UK), PhD (Cantab, UK)

Lecturers: Dr. Malaka M. Wijayasinghe
BSc (Hons) (Perad.), PhD (Pavia, Italy)

Mr. K. G. D. De A. Abeysinghe - Study leave
BSc (Hons) (RUSL)

Department of Physical Sciences

Head: Dr. (Ms.) Harshani O. Wijewardane
BSc (Hons) (Colombo), PhD (Missouri, USA), C. Phy.

Senior Lecturers: Dr. U. Dahanayake
BSc (Hons) (Perad.), PhD (Perad.), C. Phy.

Dr. (Ms.) Harshani O. Wijewardane
BSc (Hons) (Colombo), PhD (Missouri, USA), C. Phy.

Mr. E. M. U. S. B. Ekanayaka
BSc (Hons) (Perad.), MPhil (Gunma, Japan)

Dr. (Mrs). P. K. Premachandra
BSc (Perad.), MSc & PhD (Missouri, USA)

Mr. W. A. Gunarathna
BSc (Hons) (Perad), M.Phil (Perad.)

Mr. D. M. R. B. N. Dissanayake
BSc (Hons) (RUSL), MSc (Alaska Fairbanks, USA)

Mr. M. K. D. D. Sandaruwan
BSc (Hons) (RUSL), M.Phil. (Perad.)

Lecturers: Mr. M. A. M. Mohammed
BSc (Hons) (Perad.), MSc (India)

Department of Health Promotion

Head: Dr. Manoj Fernando
M.B.B.S. (Hons) (Colombo), M.Phil. (Colombo)

Professors: Honorary Professor Diyanath Samarasinghe
M.B.B.S. (Colombo), DPM (UK), LRCP (UK), MRCS (Eng.), MRCPsy (UK), FRCPsy (UK), D.Sc. (RUSL)

Prof. G. G. N. Duminda
B.A. (Kelaniya), M.S.Sc. (Kelaniya), M.Phil. (Perad.), PhD (Colombo)

Senior Lecturers: Dr. Manoj Fernando
M.B.B.S. (Hons) (Colombo), M.Phil. (Colombo)

Dr. Lalith Senarathna
Grad. I. Chem., M.Med. Sci (Newcastle), PhD (Sydney)

Mrs. H. Parween Reyal
BSc (Hons) (RUSL), MPhil (RUSL)

Mrs. K. G. P. H. Kandegedara
BSc (Hons) (RUSL) MPhil (RUSL)

Lecturers: Mr. C. P. Senevirathne
BSc (Hons) (RUSL), M.Phil. (Colombo)

Mrs. D. R. N. K. K. Dissanayake
BSc (Hons) (RUSL), MPH (Kelaniya)

Department of Computing

Head: Mr. N. S. Weerakoon
BSc (Hons) (Eng.) (Perad.), MSc (Perad.)

Senior Lecturers: Dr. K. A. S. H. Kulathilake
BSc (Hons) (SLIIT), MCS (Colombo), M.Phil. (Moratuwa), PhD (UM, Malyasia), SEDA (UK)

Mrs. T. C. Irugalbandara - Study leave
BSc (Hons) (RUSL), MPhil (RUSL)

Ms. T. M. A. U. Gunathilaka - Study leave
BSc (Hons) (RUSL), MPhil (OUSL)

Lecturers: Mr. N. S. Weerakoon
BSc (Hons) (Eng.) (Perad.), MSc (Perad.)

Mr. P. S. Palliyaguruge
BSc (Hons) (Perad.), MSc (Perad.)

Mr. N. M. A. P. B. Nilwakke
BSc (Hons) (Perad.), MSc (Perad.)

Ms. I. J. Hewarathne
BSc (Hons.) (Perad.)

Mr. Wiraj U. Wickramaarachchi
BSc (Hons) (Sabaragamuwa), M. Eng. (WUT, China)

Department of Chemical Sciences

Head: Prof. Ajith C. Herath
Grad. I. Chem., MSc (Perad.), PhD (Perad.), FRSC., F.I,Chem, C., C.Chem

Professors: Prof. Ajith C. Herath
Grad. I. Chem., MSc (Perad.), PhD (Perad.), FRSC., F.I,Chem, C., C.Chem

Prof. J. L. Ratnasekera - On secondment
MSc (Hons) (Moscow), PhD (Moscow)

Prof. E. M. R. K. B. Edirisinghe
BSc (Hons) (SJP), M.Phil. (SJP), PhD (Greenwich, UK), M.I. Chem. C.

Senior Lecturers: Mr. A. M. Hafil,
BSc (Perad.), MSc (SJP), M.Phil. (Perad.), C.Chem

Dr. Naleen B. Jayaratna
Grad. I. Chem., MSc (SHSU, USA), PhD (UTA, USA)

Dr. Suchithra A. Senevirathne
Grad. I. Chem., MSc (SHSU, USA), PhD (UTD, USA)

Department of English Language Teaching – Applied Sciences Cell

Lecturers: Mr. G. A. S. M. P. L. Abeywardena
B.A. (Hons) (RUSL), M. A. (Kelaniya)

Mr. M. D. S. S. Kumara
B.A. (Hons) (RUSL), M.A. (Kelaniya)

3.2.2 ADMINISTRATIVE STAFF OF THE FACULTY

Assistant Registrar:	Ms.V Kirushnananthy BSc (WUSL), MSc (UoP), MSc (UoB,UK)
Senior Assistant Librarian:	Dr. I. K. Illangarathne (Acting) BA (Hons)(Kelaniya), MSSc (Kelaniya), PhD (China)
Assistant Bursar:	Ms. R. M. S. Rathnayake (Acting) BSc (USJP)

VISITING STAFF

Emeritus Professor Sarath W. Kotagama, University of Colombo
Prof. A. A. I. Perera, University of Peradeniya
Prof. K. G. P. B. Jayathilake, Rajarata University of Sri Lanka
Prof. P.B. Terney Pradeep Kumara, University of Ruhuna
Prof. Rohan Weerasuriya, National Institute of Fundamentals Studies
Prof. W. B. Daundasekera, University of Peradeniya
Dr. (Mrs) Suba Fernando, University of Moratuwa
Dr. (Mrs.) N. S. R. Hewageegana, Former Deputy Director General, Public Health Services, Ministry of Health
Dr. (Ms) L. S. Nawarathne, University of Peradeniya
Dr. A. S. Ambegedara, University of Peradeniya
Dr. A.M.K.R. Bandara, Rajarata University of Sri Lanka
Dr. Ajith Karawita, Consultant Venereologist, Teaching Hospital, Anuradhapura
Dr. Chaminda Egodawatta, Rajarata University of Sri Lanka
Dr. D. M. Samarathunga, University of Ruhuna
Dr. Damitha Chandradasa, Consultant Paediatrician, Teaching Hospital, Anuradhapura
Dr. J.A.A.S. Jayaweera, Rajarata University of Sri Lanka
Dr. L. L. Amila Isuru, Rajarata University of Sri Lanka
Dr. Malik Silva, University of Colombo
Dr. Nuwan Wickramasinghe, Rajarata University of Sri Lanka
Dr. P. G. Manthilaka, Director, Institute of Material Engineering and Technopreneurship
Dr. P. R. Weerathunga, Rajarata University of Sri Lanka
Dr. Rasika Waduge, Deputy Director, Sri Lanka Standard Institution
Dr. S. K. Weragoda, Chief Engineer, National Water Supply & Drainage Board
Dr. S. Sumathipala, University of Moratuwa
Dr. Sameera Hewage, Regional Epidemiologist, Regional Director of Health Services, Kandy
Dr. Sanfica M Young, University of Colombo
Dr. Shantha Fernando, University of Moratuwa
Dr. Sumali N. Dissanayake, Rajarata University of Sri Lanka
Mr. Asoka Dias, Director, MTV Channel (Pvt) Ltd
Mr. Chandana Weerasinghe, DMS Electronics
Mr. J. A. K. N. Jayawardena, Software Engineer
Mr. Kanishka Weeramunda, Director, PayMedia Private Limited
Mr. P. A. C. T. Perera, Manager Ornamental Fish Industry
Mr. P. P. A. M. S. I. Rathnayake, Rajarata University of Sri Lanka
Mr. R. K. K. M. P. Randeniya, Deputy General Manager, Foreign Employment Bureau
Mr. Randika Hapugoda, Softcodeit Solutions (Pvt) Ltd, Battaramulla, Clolombo, Sri Lanka
Mr. Shakya Nanayakkara, General Secretary, Healthy Lanka Alliance for Development
Mr. T. Y. Bandara, Senior Electronics Engineer
Ms. Mano Basnayake, University of Peradeniya
Ms. R.M.S.U. Rathnayake, Graduate School of Information Science and Technology, Hokkaido University, Sapporo, Japan
Ms. W. D. Sehani, Rajarata University of Sri Lanka

5 STUDENT COUNSELLING AND ACADEMIC ADVISING

5.1 STUDENT COUNSELLORS

The student Counsellors of the faculty provide confidential and non-judgmental service to advise students to resolve their social, academic, personal, or emotional concerns. Even though the student counsellors of FAS are not providing professional counselling services as registered counsellors we have trained Advisers/Counsellors (both male and female) appointed to provide the students with appropriate services depending on their needs. They are available at the faculty during the working days and can be contacted over the phone at any time, whenever their services are required.

Senior Student Counsellor

Dr. Kanishka Ukuwela
kanishka@as.rjt.ac.lk
kanishkauku@gmail.com

Student Counsellors

Dr. M. M. Wijayasinghe malakamadhu@gmail.com	Dr. Suchithra Senevirathne ssuchithraa@as.rjt.ac.lk suchithra@yahoo.com	Mr. Anura Gunarathne gunarathna329@gmail.com	Mrs. K.G.P.H. Kandegedara prabuddhika06@gmail.com prabuddhika@as.rjt.ac.lk	Mr. W.A.W.U. Wikramarachchi wirajudara@as.rjt.ac.lk

5.2 MENTORS

Effective student counselling, mentoring and academic advising are some of the key roles played by the academic staff at the Faculty of Applied Sciences. Mentoring can be considered as a trusting and helpful relationship between a lecturer and a student. Every student will be assigned to a mentor group at the commencement of their academic life. Students can consider the academic mentor as their "guardian" throughout the years they spend at the university. Academic mentor is the key person to discuss any matter on academic, social or personal basis.

Note: Mentors are available at the faculty on working days. Moreover, you can contact them over the phone or via email. In addition, students are requested not to hesitate to meet any of the lecturers to discuss any issues they have to cope with. All of them are willing to help you.

5.3 ACADEMIC ADVISORS

The academic advisors of the faculty help the students in the selection of appropriate subject combinations, courses and discuss about the progression of students and any other matters related to degree programmes. Additionally, the students' request committee of FAS can be reached by the students for further assistance regarding academic matters.

Biological Sciences:	Prof. (Mrs.) T. V. Sundarabarathy tvbarathy@as.rjt.ac.lk	Health Promotion:	Mr. C. P. Senevirathne cpchamil@yahoo.com
Computing:	Mr. P. S. Palliyaguruge psp@as.rjt.ac.lk	Chemical Sciences:	Dr. Naleen B. Jayaratna naleenbj@yahoo.com naleen@as.rjt.ac.lk
Physical Sciences:	Mr. Ranjan Dissanayake ranjand@as.rjt.ac.lk		

5.4 STUDENT REQUEST COMMITTEE

The Student Request Committee of the FAS can be reached by students for assistance regarding academic matters. The Student Request Committee is comprised of the Senior Student Counsellor, Heads of the Departments and Academic Advisors of the Departments at FAS. Students' requests on solving academic matters related to the study programmes, examinations, attendance, deferments, extending deadlines etc. are welcome by the Student Request Committee. They are reviewed at the committee meetings chaired by the Senior Student Counsellor and convened by the assistant registrar

of the Faculty. The decisions are tabled at the faculty board for approval. Your request should be sent via an online form which is available in the faculty web site.

FACULTY WEB > STUDENTS > STUDENT'S RQUEST

5.5 CAREER GUIDANCE

Career Guidance services of the Faculty of Applied Sciences mainly focus on counselling students to select the right career paths, coordinating the activities conducted by the University Career Guidance Unit (CGU), finding the industrial training placements, conducting job shadowing, coordinating career development course and implementing career guidance programmes with the aim of facilitating life-long career development of students.

The Faculty coordinator of the CGU is responsible for the activities conducted and these activities are in liaison with the CGU of the University.

Faculty coordinator of CGU
Mrs. Parween Reyal
parweenreyal@as.rjt.ac.lk

6 STUDENT RESPONSIBILITIES, RIGHTS AND DISCIPLINE

A university student has rights and responsibilities, and needs to be disciplined throughout the years spent at the university which is required to establish the university environment safe and scholarly for all and ultimately to produce a disciplined individual to the society. The Student charter prepared by UGC in conjunction with circulars provides the required guideline to meet the requirements. Relevant documents can be found at the faculty website through the given path and it is strongly recommended to read, understand, and abide by these guidelines, rules, and regulations.

FACULTY WEBSITE > STUDENTS > STUDENTS CHARTER & DISCIPLINE

6.1 UNIVERSITY STUDENT CHARTER

University Student Charter serves as a guide for students enrolled in state universities as well as a document that states the conditions of the contract that exist between the university and its students. It also serves as a guide to the academic, administrative and support staff and the public, as it emphasizes the commitment expected from all stakeholders for the smooth functioning of state universities.

University Student Charter,

i. outlines the vision and mission of the national universities and the principles on which universities are governed, and what experience the student can expect from the university once he or she becomes a student.
ii. states the conditions of the partnership that shall exist between the university and its students.
iii. guides the students in their quest for knowledge in a chosen field of study and urges the students to exploit the precious opportunity that they have received by having been admitted to a university.
iv. advises the students to conduct themselves in productive, constructive, responsible and enlightened manner and do nothing to damage the good name of the university and their future.
v. states the consequences of causing, inciting or abetting the breakdown of law and order and discipline of the university.
vi. explains the disciplinary procedures that would be initiated by the University and the punitive action that would be taken by the Police and Courts of Law.
vii. spells out the unethical and unlawful activities that are prohibited in universities, and
viii. spells out the possible punishment that could be imposed by the university on those who engage in or commit any one or more of the unethical and unlawful activities listed.

Therefore, the University Student Charter earnestly urges students to cooperate and contribute towards making it possible for the state universities to play their mandatory role and contribute to preserve and sustain the core values and principles of the institution.

FACULTY WEBSITE > STUDENTS > STUDENT CHARTER & DISCIPLINE> STUDENT CHARTER

6.2 UNETHICAL AND UNLAWFUL ACTIVITIES THAT ARE PROHIBITED IN UNIVERSITIES

Undergraduate students of all state universities are required to refrain from engaging or committing the following Unethical and Unlawful Activities which will result in disciplinary action by the Institution and punitive action by the police and Courts of Law.

The Police has been empowered by the Prohibition of Ragging and Other Forms of Violence in Educational Institutions Act, No. 20 of 1998 to take punitive action against the offenders through the Court of Law. The university administrations have been empowered through the UGC Circular No. 919 of 15th January 2010 which sets strict guidelines to curb the menace of ragging in the Universities/Higher Educational Institutes, to take stern action against those who commit any one of the unethical and unlawful activities listed below. Further, the UGC has given instructions through UGC Circular No. 902 of 1st December 2008 to all universities to make offenders accountable for any damages to the university property and charge the cost of damages from the responsible individuals or, deduct the cost of damages from the allocations made to student societies and councils. Therefore, the punishment that would be imposed by the university may range from recovering damages and/or issuing a warning letter to temporary suspension for a period of time from academic work and/or university residential facilities and expulsion from the university in addition to the punishments imposed by a Court of Law.

6.2.1 Plagiarism and Cheating

Undergraduates are required to maintain high academic standards and commit themselves to academic honesty in their academic work and examinations. Copying, plagiarism or keeping unauthorized material at examinations, copying or reproducing work of others in students' reports or theses or assignments without disclosing the source of information are not allowed. Disciplinary action would be taken against all violators. All students are advised to ensure that any work submitted is one's own work and that use of work of others should appropriately be acknowledged.

6.2.2 Disorderly Conduct, Dissent and Protests

Student conduct violating the contemporary community standards of morality and/or in violation of university norms will not be tolerated. Any type of offensive or vulgar or rude or indecent conduct in campus or at university sponsored events, on or off campus will also not be tolerated. Organizing, sponsoring, implementing or conducting programmes or activities which are disorderly and/or violation of civil laws or university regulations are prohibited and will be subjected to disciplinary action.

6.2.3 Disrespect and Non-compliance

Failure to comply with the directives of university officials acting in performance of their duties is prohibited. Disciplinary action can be applied in such situations including, but not limited to, the following acts:

i. Use of abusive or insulting language

ii. Engaging in indecent and unbecoming gestures

iii. Providing fraudulent or false information to university officials

iv. Showing disrespect or refusing to comply with a reasonable request from a university official

v. Not responding to a reasonable request within a specific timeline, including absence for assigned appointments

vi. Intentionally and knowingly interfering with teaching

vii. Obstructing or hindering the investigation of an incident

6.2.4 Wrongful Utilization of Goods, Services or Information

Students are required to demonstrate sincerity and honesty in their dealings with the university and the public. The following activities are prohibited for

students and their guests:

i. Possessing any property without authorization from another person, group of people or offering any service without authorization

ii. Embezzling, defrauding or procuring money, goods or services under false pretence

iii. Possessing, purchasing or receiving property, money or services knowing them to be stolen or embezzled.

iv. Issuing a cheque for payment of dues or for any other purpose on campus knowing that it will not be honoured when presented for payment

v. Duplicating keys, computer access codes or other devices without proper authorization

vi. Forging, altering or causing any false information to be entered on an administrative record or presented such information at administrative or disciplinary proceedings

vii. Unauthorized use of the computer system, computer access codes and restricted areas of computer services

viii. Possession or use of false identification

ix. Possession and/or use of keys or any other devises (such as number codes or sweep cards) for access to offices or laboratories of department or faculty buildings or rooms of resident halls by anyone other than those authorized by the university.

6.2.5 Unauthorized Collection of funds

Any solicitation of funds for a university purpose, whether organized by students or by the authority, should be pursued only with proper authorization of the Vice-Chancellor. Any external communications requesting sponsorships or funds should be done by a letter addressed to the external organization under Vice Chancellor's approval and signature. Without such approval, solicitation for or collection of funds for political purposes or purported charitable or social activities is not allowed either within or outside the premises.

6.2.6 Solicitation

No outside person, organization or business may solicit on the university campus without the express permission of the Vice Chancellor. This includes holding meetings, distribution of any type of leaflet, or posting, exchange of goods or services and bartering or selling of services or goods.

6.2.7 Possession and consumption of alcohol, drugs and tobacco within the university premises

The university strongly oppose consumption of alcohol, drugs and tobacco as the consumption of all forms of such substances harmful in many ways and hence, derails their mental and physical capacities to continue learning processes as an effective undergraduate. Therefore, the state universities adopt a code of practices that prohibits possession and consumption of alcohol, drugs and tobacco within the university premises.

It has been observed that alcohol, tobacco and other drug industries deliberately target university students through various strategies to promote these substances. Many students have lost their career pathways due to consumption of these substances. Hence, students are strongly advised to refrain from bringing any form of substances mentioned above into the campus and to any premises of the university. Students are discouraged from entering the university premises after consuming such substances.

Gambling is not permissible within the campus. Any form of betting, acceptance of bets, payment or running of any betting scheme is not permitted. Any student/s caught gambling will be punished under the prevailing law and university regulations.

6.2.8 Harassment / Violence

Harassment of an individual or group of individuals or inciting violence inside or outside the university is a punishable offence under the civil law and the civil law regarding harassment and violence is equally applicable both inside and outside the university. This includes, but is not limited to, the following activities against members of the university's faculty, administrative staff, student body or guests by direct or indirect methods.

i. Threatening and /or using physical force on an individual or a group of persons

ii. Engaging in violence or commotion resulting in bodily injuries and/or psychological trauma of individuals or group of individuals and/or damages to properties and

iii. Causing intimidation, bullying or cruelty on individuals or a group of individuals

iv. Pestering or causing annoyance on others

v. Causing harassment through telephone, mail or computer emails or other means of communication Any complaints on the above and any other form of harassment or violence will be referred to the police for

appropriate legal action and may be referred to a disciplinary committee of inquiry appointed by the Vice

Chancellor for necessary disciplinary action.

6.2.9 Hazing / Ragging

Universities are havens for the independent pursuit of academic excellence. Ragging or hazing has reduced and diminished the freedom or independence of students and it hinders the achievement of academic excellence. Ragging is now a criminal offence under the Anti Ragging Law passed by the Parliament in 1998. Unfortunately, ragging/hazing occurs in many national universities due to the organized oppression by individuals who suffer from abnormal mentalities and inferiority complexes and also by the blind followers of destructive political movements. Indeed the 'raggers' may be

the cat's paws in the armoury of political strategies used by some political activists. Hazing or ragging is interpreted as any act (by an individual or group) whether physical, mental, emotional or psychological, which subjects another person, voluntarily or involuntarily, to anything that may abuse, mistreat, degrade, humiliate, harass or intimidate whether on or off the campus. These actions are prohibited and include, but are not limited to, the following.

i. Forcing individuals to perform and/or engage in demeaning or humiliating acts

ii. Bullying or coercing, or intimidating individuals or group of individuals.

iii. Creation of excessive physical or mental fatigue

iv. Causing physical or psychological shocks

v. Forcing to wear clothing which is conspicuous or bad in taste

vi. Forcing an individual or individuals to engage in morally degrading or humiliating acts, games or activities

vii. Forcing individuals or group of individuals to engage in early morning or late evening work sessions which are not in conformity with norms of civil society and/or that may interfere with academic performance

viii. Body marking/painting or any activity that is not consistent with the policy of the university which would adversely affect the University's mission and damage its image.

All reported events of the above nature will be handed over to the police for necessary action under the Anti Ragging Law passed by the Parliament in 1998, while the university will also take appropriate disciplinary action. In this connection the University Grants Commission has already issued several guidelines and circulars to facilitate the enforcement of law and order by the universities and urge universities to adapt strict measures to prevent the occurrence of any hazing or ragging. Moreover, UGC has established Ragging / Sexual and Gender Based Violence (SGBV) complaint portal in ragging and violation prevention.

https://eugc.ac.lk/complaint-portal/

6.2.10 Sexual Harassment / Sexual Misconduct

The university student population is a mixed, usually in equal proportions of males and females. The right to learn in a safe environment is a fundamental right of all university students. Committing acts of sexual nature that is deemed to be degrading, humiliating and unwelcome to the person to whom the acts are directed along with the circumstances surround it, irrespective of whether the act was unintentional or deliberate would be construed as sexual harassment. This has a profound impact on the personality, learning capacity, performance, and dignity of the students.

There are people in any environment who force their will on others causing sexual harassment and misconduct. If any person under the university administration commits an act of sexual harassment or misconduct by trying to impose their sexual desires on another person, be it a person of the opposite sex or of the same sex, and if a complaint is received, action will be taken under the prevailing law to bring justice and punish the offender. Students can report any act of sexual harassment or sexual misconduct both to the university authority and university grants commission via online portal to report such acts.

https://eugc.ac.lk/complaint-portal/

6.2.11 Theft

Stealing physical goods as well as stealing intangible assets such as intellectual properties (*plagiarism; i.e. academic and research work and innovations of others*) are punishable offences under the civil law as well as under the university disciplinary procedures. Such acts could be detrimental to the person in question and its effects would last over the entire career and the lifetime of the person. As such, students are warned to practise transparency and honesty in citing or acknowledging sources of intellectual properties they quote.

6.2.12 Vandalism

Vandalizing property in the university or provoking others to do so will be dealt with under the law of the land concerning public property and privately held assets, and the university regulations. Damage due to vandalism to classroom furniture, hostel furniture, laboratory equipment, computers and accessories, and playground equipment will be charged to the students, if they are found guilty. In the case of student agitation causing vandalism, the replacement cost and penalties will be charged to the organizers responsible for agitation while in the case of isolated acts those students who are officially authorized to occupy or to use the property, will be held responsible and are liable to pay compensation for the damages.

6.2.13 Unauthorized Entry

Universities impose restrictions regarding persons entitled to use its assets. Normally all students are given unrestricted access during working hours to the classrooms, libraries, playgrounds, gymnasium areas etc. Students have access to their hostels, but no visitors are permitted without approval of the warden of the hostel. Similarly, restrictions may be imposed on access to public areas due to various concerns including security matters. Students of other universities who wish to visit a university to which they do not belong must seek permission from the university authorities of both campuses. Anyone found trespassing is liable to be prosecuted under the common law of the land and be dealt with under the university disciplinary procedures. Students must be able to prove their studentship by means of the identity card issued by the university when requested within the university premises.

6.2.14 Co-operation with Authorities and Committees of Inquiry

Universities appoint various committees of inquiry on disciplinary matters and empowered officers may summon students to provide verbal or written evidence. On such events it is necessary for students to

cooperate with the authorities. If students fail to cooperate by being stubborn or by resisting the action taken by authorities, this may be construed as an act of disregard to the university authority and may become the cause for another disciplinary action. Students are strongly advised to cooperate with the authorities whenever requests for information are made.

6.2.15 Right of Appeal

Right of appeal is enshrined in the fundamental rights up until the level of the Supreme Court. This principle applies to the university as well, and therefore one can appeal to the Vice Chancellor against a decision given by the disciplinary authorities regarding any matter. This may be done collectively or individually and a fair hearing for such appeals will be given by the Vice Chancellor through appropriate channels.

7 STUDENT SERVICES

7.1 BANK FACILITIES

Branches of two government banks, the Bank of Ceylon and the People's Bank are located at the university main entrance. In addition, there are several ATMs available within a kilometre distance including a cash deposit machine.

7.2 CANTEENS

The faculty canteen is located at the student centre which provides main meals and tea, fruit juice and various snacks at concessionary rates. Daily operating hours are 7.00 am to 8.00 pm. "Milk Bar" is located at the stage II building provides breakfast, lunch and snacks. It operates from 7.30 am to 5.00 pm. Other than these two canteens, some hostels have their own canteens.

7.3 ACCOMMODATION

The students of the Faculty of Applied Sciences are provided with accommodation at the hostel complex at Mihintale premises and rented houses. Any undergraduate who resides 40 km away from the university premises, is eligible for accommodation facilities.

Contact details of Wardens and Non-academic Sub wardens are available in the section 4. Details of Hostel Rules and Regulations are available at the faculty web site.

FACULTY WEBSITE > ACCOMMODATION > HOSTEL RULES AND REGULATIONS

7.4 MEDICAL CENTRE

The University Medical Centre provides health care and medical advice (both Western and Ayurvedic) for the university community free of charge. A team of medical staff and supporting staff assist to provide a better service to the university.

Basic health care is provided by daily OPD service and for emergency cases and for further treatments patients are referred to Mihintale Hospital and Teaching Hospital Anuradhapura.

Opening Hours: 08.00 AM - 12.00 Noon and 01.00 PM - 04.00 PM (During Weekdays)

Medical Centre	**Mihintale Hospital**	**Anuradhapura Teaching Hospital**
025 226 6791	025 226 6561	025 222 2261
025 2266743		

UNIVERSITY WEB > CENTERS & UNITS> MEDICAL CENTER

7.5 LEARNING MANAGEMENT SYSTEM (LMS)

LMS provides a platform for the online learning. Lecturers could upload and manage online course materials, upload results and access uploaded materials by students. Students could register for the courses, view and download study materials, do online assessments such as quizzes, get notifications and submit assignments online. Moreover, the university has subscribed to Lanka Education and Research Networks which provided video conferencing facility for distance learning. These facilities support to continue regular academic programme, vastly used in online degree programmes and particularly the whole academic programme depends on these in a situation like pandemic or any other situation where university cannot physically run.

FACULTY WEB > LMS@APS

7.6 EXAMINATION INFORMATION SYSTEM (EIS)

EIS is the platform which allows students to register for the courses. In course registration, they should strictly follow the guidelines given in the Student Handbook. The course registration automatically registers them for the examination. Adding as well as dropping from a course is performed by EIS which is limited to Add-Drop time periods. Only optional courses can be dropped.

FACULTY WEB > EIS

7.7 LIBRARY FACILITIES

The Library provides services to under graduates and to the rest of the university community. The Applied Sciences library and main library are located within the Mihintale premises. Library Services offer students a strong collection of both print and online sources. The Library has a computerized online catalogue of all the available materials which is called Online Public Access Catalogue or OPAC. Library users can access the library's full collection of online resources and

databases through the library web page. The Library provides users with Reference Assistance Service (RAS) to assist users in using the Library effectively. Items which are not available at the library can usually be retrieved from another library through interlibrary loans. Library orientation programmes for new students are scheduled at the beginning of each year. User awareness programmes on using resources of different subject areas are held frequently.

FACULTY WEB > FAS LIBRARY

7.8 THE DEPARTMENT OF ENGLISH LANGUAGE TEACHING (DELT)

The DELT serves all six faculties of the university in preparing the undergraduates, who have different levels of proficiency in English, to enhance their English skills and to follow their courses in the English medium where necessary. English Language Teaching (ELT) programmes of the university are aimed at improving both Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP) of the undergraduates which in turn prepares them to function in an English using work environment both inside and outside the university.

English language teaching programmes of the Faculty of Applied Sciences begin with an intensive course in English which is conducted before the commencement of the academic year for the first-year students. The duration of the course is decided by the faculty depending on the time of enrolment of the students. After that, in the first-year first semester, a non-credit compulsory foundation course in English for Science is conducted for all the students. They should obtain at least a grade of "C" to be eligible for awarding of the degree. The course is aimed at recapping the students' knowledge of language structure; improving reading, writing, listening, & speaking skills; developing science vocabulary; and helping the students to comprehend science discourse in the English medium. During the second semester of the 1st academic year, an ongoing course in English is conducted on a remedial basis at present. Steps are underway to replace this course with a two-credit optional course in Academic English.

In the second academic year, the DELT faculty cell offers a course in English for Professional Purposes. This course is offered as an Inter Disciplinary Course (IDC), and it bears the weight of 02 credits. The credit value of this course is used in computation of GPA depending on the study programme. The course is aimed at improving the language skills of the students in order to prepare them to work in an English using work environment, inside and outside the faculty. Assessment is done in both summative and formative forms including the online mode.

FACULTY WEB > ACADEMICS>CENTERS> DELT – FAS CENTRE

7.9 IT CENTRE

The Information Technology Centre of the Rajarata University of Sri Lanka was established along with the establishment of the university in 1996 to enhance the ICT skills of undergraduates. The Information Technology Centre initially focused on conducting basic computer awareness programs for undergraduates of the Faculty of Management Studies and Faculty of Social Sciences and Humanities. As the university expanded, the Information Technology Centre became the prime ICT service provider of the university. The center is open on weekdays from 8:00 am to 6:00 pm. Currently, the Information Technology Center provides the following services to all faculties, centers, and units of the university. Maintaining the university website and the official university Facebook page; Providing email services to staff and undergraduate students; Providing zoom video conferencing services to staff and students; Maintaining a Computer Maintenance and Assembling Unite (CMAU) to rapier Computers; Providing Internet facilities to the university; Maintaining a Network Operations Center (NOC); Maintaining the university's Learning Management System (LMS).

UNVERSITY WEB>CENTERS & UNTS>IT CENTER

7.10 UNIVERSITY CAREER GUIDANCE UNIT

The University Career Guidance Unit (UCGU) is located on University's main premises at Mihintale. The unit is well functioned under the director and supported by coordinators from each faculty. Having the mission, to inspire undergraduates by implementing career guidance programs to facilitate lifelong career development through self-awareness, career exploration, career choices, career planning and developing soft-skills. The unit establishes and maintains relationships with society and a significant base of an employer who has an on-going interest in the employment potential. UCGU is helping to create servant leaders for tomorrow's world of work by changing the attitudes of undergraduates, assist students with a variety of educational, career, and personal problems by counseling, facilitate students' welfare activities, help undergraduates to identify their skills and to choose an optimal career path, introduce the employment sector to the undergraduates through industrial trainings, direct the most suitable graduates to identified private sector opportunities.

UNIVERSITY WEB > CENTERS & UNITS>CAREER GUIDANCE UNIT

FACULTY WEB > STUDENTS >CAREER GUIDANCE

7.11 CULTURAL CENTRE

The Cultural Centre located in the main premises of the University was established with a view of respecting the cultural diversity of various communities of the University and preserving the cultural heritage for the future generation. Programmes and events organized by the Cultural Centre would ensure the religious and ethnic harmony breaking the boundaries existing among the undergraduates who have come from different backgrounds.

UNIVERSITY WEB >CENTERS & UNITS> CULTURAL CENTER

7.12 SPORTS FACILITIES

The main objective of the Department of Physical Education of the University is to promote the sporting abilities of students and provide opportunities to develop individual and team sporting activities. It provides indoor and outdoor facilities for Badminton, Carom, Chess, Cricket, Elle, Football, Hockey, Karate, Netball, Rugby, Swimming, Table Tennis, Track & Field, Volleyball, Weightlifting, Wrestling etc. A strength training centre, a gymnasium and a swimming pool build in accordance with the international standards are also available for students and staff of the University.

UNIVERSITY WEBSITE > SERVICES > SPORTS AND PHYSICAL EDUCATION

7.13 STUDENT SOCIETIES

Students are highly encouraged to actively join with student societies which will enormously help to enrich their sociological skills.

Association of Young Biologists

Society of Chemistry

Industrial Mathematics Student Association

Health Promotion Society

Association of Rajarata ICT

8 BSc DEGREE PROGRAMMES IN THE FACULTY OF APPLIED SCIENCES

8.1 ADMISSION REQUIREMENTS

Admission of students to the Faculty is carried out based on an admission policy laid down from time to time by the University Grants Commission with the concurrence of the Government.

Special entry for BSc in Health Promotion

A proportion of the intake is selected from identified categories of employees of Department of Health who fulfil following criteria to follow BSc in Health Promotion degree.

i. Students who satisfied the minimum entry requirements for admission to the university as stipulated by the University Grants Commission from the A/L Biological Science stream
ii. Minimum three years of working experience in the field of health promotion or Primary Health Care services of Department of Health, Sri Lanka.
iii. Less than 45 years of age at the time of closing date of applications.

Eligible students should pass a test of General Aptitude and a test of Competence in English designed by the Faculty and approved by the Senate upon the recommendation of the Faculty Board.

8.2 DEGREE PROGRAMMES OFFERED BY THE FACULTY OF APPLIED SCIENCES

At present, the following degree programmes are offered by the FAS.

1. Bachelor of Science in Applied Sciences
2. Bachelor of Science Honours in Applied Sciences
3. Bachelor of Science Honours in Industrial Mathematics
4. Bachelor of Science Honours in Biology and Physics
5. Bachelor of Science Honours in Chemistry and Physics
6. Bachelor of Science Honours in Applied Biology
7. Bachelor of Science Honours in Microbiology
8. Bachelor of Science Honours in Chemistry
9. Bachelor of Science in Health Promotion
10. Bachelor of Science Honours in Health Promotion
11. Bachelor of Science in Information Technology
12. Bachelor of Science Honours in Information Technology

8.3 COURSES OF STUDY

BSc Degree Programmes comprise a total of six semesters while the BSc Honours Degree Programmes comprise a total of eight semesters, each semester being of 15-week duration.

(*a*) Degree Programmes in Applied Sciences

The programmes of study in Applied Sciences consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory and Optional courses drawn from the subjects of Biology, Botany, Chemistry, Computer Science, Mathematics, Physics, Statistics and Zoology.

(*b*) Degree Programmes in Information Technology

The programmes of study in Information Technology consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory courses drawn from the field of study of Information Technology.

(*c*) Degree Programmes in Health Promotion

The programmes of study in Health Promotion consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory courses drawn from the field of study of Health Promotion.

Terms of enrolment and eligibility

Each course is a unit of study normally completed within a semester or an academic year.

A student enrolled in a degree programme in Applied Sciences may select courses from any combination of two or three subjects. The flexibility within a programme is enhanced by the availability of optional courses. However, students enrolled in Information Technology and Health Promotion Programmes follow a fixed curriculum.

Students are required to register for courses prior to the commencement of the semester. During the first two weeks students can add or drop courses using the add/drop form which has to be submitted at the end of the second week of the new semester. Subjects specified in the add/drop form will be final.

The minimum and maximum numbers of credits a student can attain in an academic year, excluding repeated courses are **26** and **34** respectively (maximum of **18 credits** per semester).

A student is required to attain a minimum of **90 credits** in order to be eligible for the BSc degree and a minimum of **120 credits** for the BSc Honours degree.

8.4 COURSE

Course unit is a complete course taught within a semester. It consists of one or more contact hours per week. A contact hour is defined as an hour of lectures, practical, tutorials, field studies etc.

8.5 CREDIT RATING

The credit rating is an expression used to denote the "academic value" of a course.

The credit ratings are as follows:

According to the Sri Lanka Qualifications Framework (**SLQF**), **50 notional learning hours** for a *taught course, laboratory course or field studies is* equivalent to **one credit,** and **100 notional hours** for industrial training and research also have the same credit rating. Notional hours include attending classes/ fieldwork/ industrial training and research and all the time spent for the purposes of other modes of learning (self-learning, preparation for assignments, carrying out assignments and assessments etc.). In the SLQF credit system, the student workload of a study programme is defined as **1500 notional learning hours** per academic year.

Fifty (50) notional hours assigned for a one credit can be subdivided into 15 hours of teaching and learning, 30 hours of self-learning and 5 hours of assessments and evaluation.

For courses with lectures only

15 hours of lectures/ tutorials = 1 credit

For courses with laboratory work only

30 – 45 hours of laboratory work = 1 credit

60 – 75 hours of laboratory work = 2 credit

For courses with both lectures and laboratory work only

10 hours of lectures/ tutorials + 15 hours of laboratory work = 1 credit

For courses with field work only

45 hours of field work = 1 credit

Industrial training

2 weeks of industrial training = 1 credit

Research project

2 weeks of research = 1 credit

N.B. Credits earned for Foundation courses will not be used for the calculation of GPA.

8.6 DESCRIPTION OF COURSE CODES

Field of Study	Subject	Code	Meaning of the Code
Applied Sciences	Biology	BIO	Biology
	Botany	BOT	Botany
	Zoology	ZOO	Zoology
		BDC	Biodiversity Conservation
		FAM	Fisheries and Aquaculture Management
		MIB	Microbiology
	Chemistry	CHE	Chemistry
	Computer Science	COM	Computer Science
	Mathematics	MAT	Mathematics
	Physics	PHY	Physics
	Statistics	STA	Statistics
Health Promotion		HPF	Health Promotion - Field Practical component
		HPP	Health Promotion - Project
		HPT	Health Promotion -Theory
Information Technology		ICT	Information Technology
All degree programmes		FDN	Foundation Course
		IDC	Interdisciplinary Course

Each course is assigned a course code which consists of seven alphanumeric characters as follows:

Course Code consists of three upper case letters followed by a space and four digits

First three letters: Field of study / Subject

- **First digit:** Year of study
- **Second digit**: Credit rating
- **Last two-digits:** Serial number of the course

e.g. The course code **CHE 1201** would mean:

CHE => Chemistry **1** => 1st year; **2** => Credit rating of two; **01** => Serial number of the course

8.7 PREREQUISITES AND COREQUISITES

A **Prerequisite** (PR) is a specific course or a requirement that must be fulfilled prior to registering for a more advanced course. Students are required to obtain **at least a D grade** for the courses considered as prerequisites. Some of the prerequisites are subjects taken at the G. C. E. (A/L) Examination.

Some courses that require certain other courses are taken simultaneously with them. Such courses are called **Corequisites** (CR). Practical courses are corequisites for theory courses and *vice versa*.

8.8 FOUNDATION AND INTERDISCIPLINARY COURSES

Foundation Courses (FDNs) and Interdisciplinary Courses (IDCs) are designed to bridge the gap between the G.C.E. (A/L) and the degree programme and to introduce students to knowledge outside their main academic focus. A student **should obtain at least a C grade for FDNs**. Details of the IDCs are given in section 8.8.2. The FDNs and IDCs are given in Table 8.9.1.1. for Applied Sciences degree programmes, in Table 8.9.2.1 for Health Promotion and Table 8.9.3.1 for Information Technology degree programmes.

8.8.1 FOUNDATION (FDN) COURSES (NON GPA COURSES)

8.8.1.1 General English (FDN 1201)

Since English is the medium of instruction for all degree programmes, the faculty has taken several steps to assists students in their transition to this medium of instruction. Before commencement of their academic year 1st year students are required to follow a compulsory intensive English language course (12-16 weeks) conducted by the faculty. The students are grouped according to their competency in English, which will be determined by an examination held at the beginning of the course. In addition, students are tested at the end of the intensive course. All the students are advised

to make the maximum use of this course to improve their competency in English. Students who wish to further improve their English language proficiency may continue the ongoing English language course with the support of DELT-Faculty Cell.

8.8.1.2 Introduction to Computers (FDN 1202)

This is a compulsory course designed to increase the computer literacy of the students (Information Technology students are exempted).

8.8.1.3 General Biology (FDN 1203)

This is a compulsory course for Applied Sciences students who have not studied in the Biological Science stream for G.C.E. (A/L).

8.8.1.4 Basic Mathematics (FDN 1204)

This is a compulsory course for Applied Sciences students who have not studied in the Physical Science Stream for G.C.E. (A/L).

8.8.1.5 Basic Mathematics for Non Mathematics Students (FDN 1306)

This is a compulsory course for Information Technology students who have not studied mathematics for G.C.E. (A/L).

8.8.1.6 Basic Science for Non-Science Students (FDN 1205)

This is a compulsory course for students who have not studied in Biological or Physical Science streams for G.C.E.(A/L).

8.8.2 INTERDISCIPLINARY COURSES (IDC)

The objective of IDCs is to broaden the horizon of students and mould them in producing a well-rounded graduate. A total of seven IDCs is offered out of which Philosophy of Science (IDC 1201), Career Development (IDC 1202) and Scientific Communication (IDC 4201) are compulsory.

All compulsory IDC courses excluding IDC 1202 will be included in the best 90 credits (BSc degrees) or best 120 credits (BSc Honours), and hence will be considered for calculation of the final GPA. Further, a student should obtain a minimum of C grade for IDC 1202. Optional IDCs could be included **if necessary**, for the calculation of the final GPA. Please see tables 8.9.1.1, 8.9.2.1 and 8.9.3.1 for available courses under this category.

8.9 AVAILABLE COURSES FOR DEGREE PROGRAMMES

8.9.1 DEGREE PROGRAMMES IN APPLIED SCIENCES

Table 8.9.1.1. FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201*	2	General English
	FDN 1202*	2	Introduction to Computers
	FDN 1203*	2	General Biology
	FDN 1204*	2	Basic Mathematics
	IDC 1201**	2	Philosophy of Science
	IDC 1202*	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes
	IDC 2203	2	Principles and Practices of Marketing
Third Year	IDC 3201	2	Entrepreneurship Development
	IDC 3202	2	Standards and Quality Management Systems
	IDC 3203	2	Human Resource Management
Fourth Year	IDC 4201**	2	Scientific Communication

* *Compulsory courses - However, credits earned for FDN courses and IDC 1202 will not be used for the calculation of GPA*

** *Compulsory courses*

Table 8.9.1.2 COURSES OFFERED BY THE DEPARTMENT OF BIOLOGICAL SCIENCES FOR BSc DEGREE PROGRAMME

Subject: Biology/ Botany/ Zoology				
Year		**Course Code**	**Course Title**	**Prerequisite**
First Year	Botany	BOT 1201	Plant Diversity	A/L Biology
		BOT 1202	Functional Plant Anatomy and Basic Wood Science	A/L Biology
	Zoology	ZOO 1201	Invertebrate Diversity	A/L Biology
		ZOO 1302	Vertebrate Diversity	ZOO 1201
		ZOO 1203	General Entomology	ZOO 1201
	Biology	BIO 1201	Cell Biology & Biochemistry	A/L Biology
		BIO 1202	Statistical Methods in Biology	FDN 1204
		BIO 1203	General Microbiology	A/L Biology
Second Year	Botany	BOT 2201	Plant Physiology	A/L Biology
		BOT 2202	Economic Botany	1st Year Botany
		BOT 2204	Plant Pathology	BIO1201
	Zoology	ZOO 2201	Animal Histology & Physiology	BIO 1201
		ZOO 2203	Animal Behaviour	ZOO 1302, ZOO 2201
		ZOO 2204	Fish Biology	ZOO 1302
		ZOO 2205	Embryology & Developmental Biology	BIO 1201, ZOO 2201
	Biology	BIO 2201	Systematic Biology	1st Year Botany and Zoology
		BIO 2302	Principles of Ecology	BOT 1201, ZOO 1201, ZOO 1302
		BIO 2203	Genetics and Evolution	1st Year Botany and Zoology

Subject: Biology/ Botany/ Zoology/ Biodiversity Conservation/ Fisheries and Aquaculture Management/ Microbiology			
Year	**Course Code**	**Course Title**	**Prerequisite**
Third Year	BOT 3201	Plant Tissue Culture	
	BOT 3202	Principles and Practice of Horticulture and Landscaping	
	BOT 3203	Postharvest Technology of Plant Products	BOT 2204
	BOT 3204	Flora of Sri Lanka	
	ZOO 3201	Medical Entomology	ZOO 1203
	ZOO 3202	Applied Parasitology	ZOO 1201
	ZOO 3203	Economic Entomology	ZOO 1203
	ZOO 3104	Laboratory Techniques in Zoology	
	BIO 3201	Molecular Biology	BIO 2203
	BIO 3102	Ecotourism	BIO 2302
	BIO 3203	Environmental Pollution	BIO 2302
	BIO 3204	Bioinformatics *	BIO 2203, BIO 3201
	BIO 3205	Ecotoxicology *	BIO 2302
	BIO 3206	Experimental Design and Nonparametric Methods in Statistics	BIO 1202
	BIO 3207	Field Project	BIO 1202, BIO 3206
	BDC 3301	Concepts of Biodiversity Conservation	BIO 2302
	BDC 3202	Environmental Impact and Risk Assessment	
	BDC 3203	Introduction to Geographical Information Systems *	
	BDC 3204	Wildlife Conservation and Management	BIO 2302
	FAM 3201	Fisheries and Aquaculture	ZOO 2204
	FAM 3202	Breeding Techniques in Aquaculture	FAM 3201
	FAM 3303	Ornamental Fish Industry */**	FAM 3201
	MIB 3201	Industrial Microbiology	
	MIB 3202	Soil Microbiology *	
	MIB 3203	Environmental Microbiology *	
	MIB 3204	Food Microbiology	BIO 1203
	MIB 3205	Plant-Microbe Interactions *	
	MIB 3206	Analytical Techniques in Molecular Biology*	
	MIB 3207	Immunology *	

*** Offered only for students following the BSc Honours in Applied Biology/ Microbiology**

** **Offered for students following the BSc Honours in Applied Sciences and BSc Honours in Biology and Physics**

Table 8.9.1.3 COURSES OFFERED BY THE DEPARTMENT OF BIOLOGICAL SCIENCES FOR BSc HONOURS DEGREE PROGRAMMES

	Applied Biology - Biodiversity Conservation		
Year	**Course Code**	**Course Title**	**Prerequisites**
Fourth year	BI0 4204	Scientific Communication	
	BDC 4201	Environmental Policies and Management**	
	BDC 4202	Wetland Conservation and Management**	
	BDC 4203	Forest Conservation	
	BDC 4204	Advanced Geographical Information Systems	
	BDC 4205	Economics of Biodiversity	
	BDC 4206	Limnology and Conservation of Aquatic Resources**	
	BDC 4207	Coastal and Marine Biodiversity Conservation	
	BDC 4208	Current Topics in Biodiversity Conservation	
	BDC 4209	In-plant Training	
	BDC 4810	Research Project	
	Applied Biology - Fisheries and Aquaculture Management		
	Course Code	**Course Title**	**Prerequisites**
	BIO 4204	Scientific Communication	
	FAM 4201	Fishery Resources Management	
	FAM 4202	Aquaculture Engineering	
	FAM 4203	Aquafarming of Macrophytes*	
	FAM 4204	Fish Nutrition and Growth	
	FAM 4205	Fish Health Management*	ZOO 2204, FAM 3201
	FAM 4206	Postharvest Techniques in Fisheries	
	FAM 4207	Fishery Socioeconomics	
	FAM 4208	Current Topics in Fisheries and Aquaculture Management	
	FAM 4209	In plant Training	
	FAM 4810	Research Project	
	Applied Biology - Microbiology		
	Course Code	**Course Title**	**Prerequisites**
	BIO 4204	Scientific Communication	
	MIB 4201	Applied Mycology	
	MIB 4202	Medical Microbiology*	
	MIB 4103	Molecular Microbiology	
	MIB 4204	Virology**	
	MIB 4205	Techniques and Strategies in Molecular Biology*	
	MIB 4206	Molecular Biotechnology	
	MIB 4207	Microbial Genetics	
	MIB 4208	Current Topics in Microbiology	
	MIB 4209	In-plant Training	
	MIB 4810	Research Project	
	Honours in Applied Sciences and Honours in Biology and Physics		
	BIO 4603	Research Project***	

*** Offered to students following either BSc Honours in Applied Biology / Microbiology or BSc Honours in Applied Sciences**

**** Offered only for students following the BSc Honours in Applied Biology / Microbiology**

***** Offered only to students following the BSc Honours in Applied Sciences or the BSc Honours in Biology and Physics**

Table 8.9.1.4 COURSES OFFERED BY THE DEPARTMENT OF CHEMICAL SCIENCES FOR BSc DEGREE PROGRAMME

Subject: Chemistry				
Year	**Course Code**	**Course Title**	**Prerequisite**	**Corequisite**
First Year	CHE 1201	General Chemistry	A/L Chemistry	CHE 1104 *
	CHE 1302	Physical Chemistry I	A/L Chemistry	CHE 1201
	CHE 1203	Organic Chemistry I	A/L Chemistry	CHE 1105*
	CHE 1104	Inorganic Chemistry – Laboratory	A/L Chemistry	CHE 1201
	CHE 1105	Organic Chemistry – Laboratory	A/L Chemistry	CHE 1203
Second Year	CHE 2201	Physical Chemistry II	CHE 1302, CHE 1104, CHE 1105	CHE 2107 * CHE 2108 *
	CHE 2202	Organic Chemistry II	CHE 1203, CHE 1104, CHE 1105	
	CHE 2103	Analytical Chemistry	CHE 1201	
	CHE 2104	Introduction to Biochemistry	1st year Chemistry	
	CHE 2205	Inorganic Chemistry	CHE 1201, CHE 1104	
	CHE 2106	Spectroscopic Methods in Organic Chemistry	CHE 1201, CHE 1203	
	CHE 2107	Organic Chemistry – Laboratory	CHE 1104, CHE 1105	
	CHE 2108	Physical Chemistry – Laboratory	CHE 1104, CHE 1105	
Third Year	CHE 3201	Industrial Inorganic Materials	CHE 1201, CHE 2201	
	CHE 3202	Advanced Biochemistry **	CHE 1203, CHE 2202, CHE 2104	
	CHE 3203	Chemistry of Polymers	1st year Chemistry	
	CHE 3204	Food Chemistry	CHE 1203, CHE 2202	
	CHE 3205	Advanced Inorganic Chemistry I **	1st and 2nd years all Chemistry	
	CHE 3206	Chemical and Process Technology	CHE 1202, CHE 2201	
	CHE 3207	Electrochemistry	CHE 1302	
	CHE 3208	Environmental Chemistry	1st year Chemistry	
	CHE 3209	Natural Products Chemistry	CHE 2202	
	CHE 3210	Research Project	1st and 2nd years Chemistry compulsory	
	CHE 3311	Advanced Analytical Chemistry	CHE 2103, CHE 2106	
	CHE 3213	Industrial Chemistry	1st and 2nd years Chemistry compulsory	
	CHE 3214	Chemistry – Laboratory	1st and 2nd years Chemistry compulsory	
	CHE 3215	Heterocyclic and Synthetic Organic Chemistry**	1st and 2nd years all Chemistry	
	CHE 3216	Advanced Analytical and Environmental Chemistry – Laboratory**	1st and 2nd years all Chemistry	
	CHE 3217	Advanced Inorganic Chemistry – Laboratory **	1st and 2nd years all Chemistry	
	CHE 3218	Advanced Organic Chemistry – Laboratory **	1st and 2nd years all Chemistry	
	CHE 3219	Advanced Physical Chemistry – Laboratory **	1st and 2nd years all Chemistry	
	CHE 3120	Calculations in Chemistry**/***	1st and 2nd years Chemistry compulsory	
	CHE 3121	Industrial Training **	1st and 2nd years all Chemistry	
	CHE 3222	Electronics and IT for Chemists **/***	1st and 2nd years Chemistry compulsory	
	CHE 3223	Current Topics in Chemistry **	1st and 2nd years all Chemistry	

***Only for students following Chemistry as a subject**

** **Offered only for students following the BSc Honours in Chemistry**

*** **Offered only for students following the BSc Honours in Applied Sciences and BSc Honours in Chemistry and Physics**

Table 8.9.1.5 COURSES OFFERED BY THE DEPARTMENT OF CHEMIICAL SCIENCES FOR BSc HONOURS DEGREE PROGRAMMES

Subject: Chemistry			
Year	**Course Code**	**Course Title**	**Prerequisites**
Fourth Year	CHE 4201	Computational Chemistry * / **	
	CHE 4202	Advanced Physical Chemistry I * / **	CHE 3207
	CHE 4203	Surface and Colloidal Chemistry * / **	
	CHE 4204	Advanced Inorganic Chemistry II *	
	CHE 4605	Research Project **	
	CHE 4206	Nanochemistry * / **	
	CHE 4307	Advanced Physical Chemistry II *	
	CHE 4308	Advanced Environmental Chemistry * / **	CHE 3208
	CHE 4309	Advanced Organic Chemistry *	
	CHE 4210	Molecular and Surface Spectroscopy * / **	
	CHE 4212	Pharmaceutical and Medicinal Chemistry * / **	
	CHE 4213	Chemical Toxicology * / **	
	CHE 4814	Research Project and Seminars *	
	CHE 4215	Solid State Chemistry */ ‡	
	CHE 4216	Scientific Research and Communication * / **	

*** Offered only for students following the BSc Honours in Chemistry**

**** Offered only for students following the BSc Honours in Applied Sciences and BSc Honours in Chemistry and Physics**

‡ Offered only for students following the BSc Honours in Chemistry and Physics

Table 8.9.1.6 COURSES OFFERED BY THE DEPARTMENT OF COMPUTING FOR BSc DEGREE PROGRAMME

Subject: Computer Science				
Year	**Course Code**	**Course Title**	**Prerequisite**	**Corequisite**
First Year	COM 1201	Principles of Programme Design		
	COM 1302	Database Management Systems		
	COM 1305	Object Oriented Programming	COM 1201	
	COM 1407	Computer Programming	COM 1201	
	COM 1308	Digital Logic Design		
Second Year	COM 2301	Systems Analysis and Design	COM 1302	
	COM 2303	Web Design	COM 1201, COM 1302	
	COM 2304	Computer Graphics and Image Processing	A/L Combined Mathematics or FDN 1204	
	COM 2307	Data Structures and Algorithms	COM 1201, COM 1407	
	COM 2308	Software Engineering	COM 1305, COM 2301	
Third Year	COM 3401	Data Communication and Networking	COM 2307	
	COM 3303	Artificial Intelligence	COM 2307	
	COM 3204	Information Security	A/L Combined Mathematics, or FDN 1204, COM 2307	
	COM 3405	Group Project	All CS compulsory courses up to 2nd Year	
	COM 3306	Operating Systems	COM 2307	
	COM 3307	Embedded systems	COM 1407, COM 1308	COM3306

Table 8.9.1.7 COURSES OFFERED BY THE DEPARTMENT OF COMPUTING FOR BSc HONOURS DEGREE PROGRAMMES

Subject: Computer Science			
Year	**Course Code**	**Course Title**	**Prerequisites**
Fourth Year	COM 4201	Introduction to Mobile Computing	COM 1407, COM 1302, COM 1305
	COM 4202	Bioinformatics and Computational Biology	COM 1407
	COM 4203	Geographic Information System	COM 1407, COM 1302
	COM 4604	Research Project	COM 3405
	ICT 4201	Fundamentals of E-Learning	COM 2303
	ICT 4302	Intelligent Systems	COM 3303
	ICT 4303	Advanced Computer Networks	COM 2307, COM 3401
	ICT 4305	Parallel and Cluster Computing	COM 3306
	ICT 4306	E Commerce	COM 2303, COM 3204

Table 8.9.1.8 COURSES OFFERED BY DEPARTMENT OF PHYSICAL SCIENCES FOR BSc DEGREE PROGRAMME

Subject: Physics				
Year	**Course Code**	**Course Title**	**Prerequisite**	**Corequisite**
First Year	PHY 1201	General Physics	A/L Physics or FDN 1204	PHY 1205*
	PHY 1102	Waves and Vibrations		
	PHY 1203	Fundamentals of Electromagnetism		
	PHY 1104	Modern Physics		
	PHY 1205	Practical Unit		
Second Year	PHY 2101	Thermodynamics & Radiation	A/L Physics or PHY 1201	PHY 2207*
	PHY 2102	Electromagnetism	A/L Physics, PHY 1203	
	PHY 2103	Electronics I		
	PHY 2204	Physical Optics	PHY 1102	
	PHY 2105	Quantum Mechanics	A/L Physics or FDN 1204	
	PHY 2106	Atomic & Nuclear Physics	PHY 1104, PHY 2105	
	PHY 2207	Practical Unit	A/L Physics, PHY 1205	
	PHY 2208	Graphical Programming for Physics	PHY 1205	PHY 2207
	PHY 2109	Physical Geology	PHY 1102	
	PHY 2210	Atmospheric Physics	PHY 1201, PHY 1104, PHY 2101	
	PHY 2211	Soil Physics	A/L Physics	
Third Year	PHY 3302	Mathematical Methods for Physicists	A/L Physics or FDN 1204	
	PHY 3203	Physical Oceanography	PHY 1102, PHY 2101	
	PHY 3207	Energy Resources	PHY 2103, PHY 2106	
	PHY 3208	Project/ Seminar	Any course offered in the 3rd year	
	PHY 3209	Solid State Physics	1st and 2nd year compulsory Physics courses	
	PHY 3210	Properties of Materials	PHY 3209	
	PHY 3211	Medical Physics	PHY 1201, PHY 2105	
	PHY 3212	Electronics II	PHY 2103	
	PHY 3215	Practical Unit	PHY 1205, PHY 2207	

*** Compulsory for students following Physics as a subject**

Subject: Mathematics			
Year	**Course Code**	**Course Title**	**Prerequisites**
First Year	MAT 1201	Mathematical Methods I	A/L (Combined Mathematics)
	MAT 1202	Numerical Analysis I	A/L (Combined Mathematics)
	MAT 1203	Mathematical Modelling	A/L (Combined Mathematics)
	MAT 1204	Differential Equations I	A/L (Combined Mathematics) or FDN 1204
	MAT 1205	Real Analysis I	A/L (Combined Mathematics)
	MAT 1206	Introduction to MATLAB	A/L (Combined Mathematics) or FDN 1204
	MAT 1207	Algebra I	A/L (Combined Mathematics)
Second Year	MAT 2201	Mathematical Methods II	MAT 1201
	MAT 2302	Linear Algebra	MAT 1207
	MAT 2203	Complex Calculus	MAT 1205
	MAT 2204	Differential Equations II	MAT 1204
	MAT 2305	Real Analysis II	MAT 1205
	MAT 2306	Operations Research I	A/L (Combined Mathematics)
	MAT 2207	Algebra II	MAT 1207
Third Year	MAT 3201	Graph Theory	A/L (Combined Mathematics) or FDN 1204 or FDN 1306
	MAT 3202	Numerical Analysis II	MAT 1202
	MAT 3303	Mathematical Statistics I*	MAT 2305
	MAT 3204	Partial Differential Equations	MAT 2204
	MAT 3305	Mathematical Statistics II*	MAT 3303
	MAT 3206	Operations Research II	MAT 2306
	MAT 3207	Financial Mathematics**	MAT 1204
	MAT 3308	Non-Linear Programming	MAT 3206
	MAT 3309	Network Optimization	MAT 3206
	MAT 3110	Seminar	All 1st and 2nd year compulsory courses

***Not available for the students those who follow Statistics as a subject**

****Offered only for students who are following BSc Honours in Industrial Mathematics**

Subject: Statistics				
Year	**Course Code**	**Course Title**	**Prerequisites**	**Corequisites**
First Year	STA 1301	Introduction to Statistics	A/L (Combined Mathematics) or FDN 1204	
	STA 1202	Introduction to Probability	A/L (Combined Mathematics) or FDN 1204	
	STA 1303	Mathematics for Statistics*	A/L (Combined Mathematics) or FDN 1204	
	STA 1304	Probability Theory	STA 1202	
Second Year	STA 2301	Theory of Statistics	STA 1303 (for non-mathematics students)	
	STA 2302	Applied Nonparametric Statistics	STA 1301	STA 2207
	STA 2303	Applications in Statistics	STA 2207	
	STA 2304	Regression Analysis	STA 1301, STA 2207	
	STA 2305	Multivariate Methods	STA 1301, STA 2207	
	STA 2306	Design and Analysis of Experiments	STA 1301, STA 2207	
	STA 2207	Introduction to R/Python Statistical Language	STA 1301	
Third Year	STA 3401	Statistical Learning	STA 2304	
	STA 3402	Introduction to Neural Networks and Machine Learning	STA 3401	
	STA 3303	Independent Study	All 1st and 2nd year compulsory courses	

***Not available for the students those who follow Mathematics as a subject**

Table 8.9.1.9 COURSES OFFERED BY THE DEPARTMENT OF PHYSICAL SCIENCES FOR BSc HONOURS DEGREE PROGRAMMES

Subject: Mathematics			
Industrial Mathematics			
Year	**Course Code**	**Course Title**	**Prerequisite**
Fourth Year	MAT 4301	Combinatorics	MAT 3201
	MAT 4302	Computational Mathematics	MAT 3202
	MAT 4303	Data Analysis Using Statistical Software***	MAT 3305
	MAT 4304	Measure Theory	MAT 2305
	MAT 4305	Operations Research III	MAT 3206
	MAT 4306	Operations Research IV	MAT 4305
	MAT 4307	Special Topics in Mathematical Programming	MAT 3206
	MAT 4308	Statistical Quality Control	MAT 3305
	MAT 4609	Research Project	
	MAT 4310	Industrial Training Program	

Subject: Physics			
Year	**Course Code**	**Course Title**	**Prerequisite**
Fourth Year	PHY 4201	Biophysics	PHY 1201, PHY 3302#, PHY 3211
	PHY 4302	The Curved Space Times of General Relativity	PHY 1201, PHY 1203, PHY 1104, PHY 2101, PHY 2102, PHY 3302#
	PHY 4203	Classical Mechanics	PHY 1201, PHY 3302#
	PHY 4204	Current Topics in Biophysics*	
	PHY 4308	Characterization Techniques	PHY 3209, PHY3210
	PHY 4209	Physics of Semiconductor Devices	PHY 2103, PHY 2105, PHY 3207
	PHY 4210	Advanced Quantum Mechanics	PHY 1104, PHY 2105, PHY 3302#
	PHY 4211	Nanomaterials and Nanotechnology	PHY 2105
	PHY 4312	Statistical Thermodynamics	PHY 1201, PHY 2101, PHY 3302#
	PHY 4613	Research Project	
	PHY 4214	Current Topics in Chemistry and Physics**	
	PHY 4215	Applied Geophysics	PHY 2109, PHY 2210, PHY 3302#
	PHY 4217	Advanced Energy Resources*	PHY1201, PHY 2101

*** Offered only for students following the BSc Honours in Biology and Physics**

**** Offered only for students following the BSc Honours in Chemistry and Physics**

***** Not available for the students those who has followed Statistics as a subject**

 # Only for the students not following Mathematics as a subject

IMPORTANT

(1) The minimum and maximum numbers of credits a student can attain in an academic year, excluding repeat courses are 26 and 34, respectively.

(2) In order to fulfil the requirements of a particular subject in a degree programme a student must attain at least 24 credits including relevant compulsory courses in that subject. These 24 credits are mandatory in the calculation of the GPA.

(3) The availability of courses in a semester will depend on the number of applicants (minimum of 05) and the availability of lecturers. Please note that the number of applicants does not apply to Honours degree programmes.

8.9.2 DEGREE PROGRAMMES IN HEALTH PROMOTION

Table 8.9.2.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201*	2	General English
	FDN 1202*	2	Introduction to Computers
	FDN 1204*	2	Basic Mathematics
	IDC 1201**	2	Philosophy of Science
	IDC 1202*	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes
Third Year	IDC 3203	2	Human Resource Management

* *Compulsory courses - However, credits earned for FDN courses and IDC 1202 will not be used for the calculation of GPA*

** *Compulsory courses*

Table 8.9.2.2 COURSES OFFERED BY THE DEPARTMENT OF HEALTH PROMOTION FOR THE BSc DEGREE PROGRAMME

Year	Course Code	Course Title
First Year	BIO 1201	Cell Biology and Biochemistry
	HPT 1201	Basic Human Physiology
	HPT 1202	Introduction to Human Diseases
	HPT 1103	Concepts of Health
	HPT 1104	History and Evolution of Health Promotion
	HPT 1205	Communication in Public Health
	HPT 1306	Nutrition and Metabolism
	HPT 1207	Sexual Health and Reproductive Physiology
	HPT 1208	Principles, Strategies and Practices in Health Promotion
	HPT 1209	Measures of Health
	HPT 1210	Research Methods
	HPF 1101	Devising Applicable Measures of Individual and Group Health
	HPF 1102	Measuring Health Status of a Student Group
	HPF 1203	Activities to Improve Health of Student Groups
Second Year	HPT 2301	Psychology and Human Behaviour
	HPT 2302	Working with Communities
	HPT 2103	Principles of Evaluation
	HPT 2104	Introduction to Epidemiology
	HPT 2205	Determinants of Health
	HPT 2206	Indicators and Measurements of Community Health
	HPT 2207	Health Improvement
	HPT 2108	Early Childhood Care and Development (ECCD)
	HPT 2109	Maternal and Child Health (MCH)
	HPT 2210	Statistical Methods in Health Research
	HPF 2201	Applying Measures to Improve Health Status of a Student Group
	HPF 2102	Introduction to Field Settings
	HPF 2103	Engagement of Communities
	HPF 2204	Clarifying Health Issues with Assigned Communities
	HPF 2105	Devising Measures of Health in Partnership with Communities
	HPF 2106	Assessing Changes in Health Status of Student Groups
	HPF 2207	Clarifying Structural Determinants of Health with Communities

	HPF 2208	Addressing Structural Determinants of Health of Communities
	HPF 2109	Monitoring Progress of Communities
	HPF 2110	Clarifying Obstacles to Progress with Communities
Third Year	HPT 3201	Family and Community Health Promotion
	HPT 3202	Commercial Influences on Health
	HPT 3203	Social Structures and Social Influence
	HPT 3104	Philosophical and Ethical Issues in Health Education and Promotion
	HPT 3205	Healthy Public Policy and Legislation
	HPT 3206	Report Writing and Assessment
	HPT 3107	Future Directions in Health Promotion
	HPT 3108	Environment and Health
	HPT 3309	The Sri Lankan Situation of Major Health Issues
	HPF 3101	Reporting Health Changes in Student Groups
	HPF 3302	Addressing Obstacles to Progress with Communities
	HPF 3103	Reviewing Progress with Communities and Redirecting Efforts
	HPF 3204	Progress Evaluation
	HPF 3205	Final Evaluation of Field Settings
	HPF 3206	Project Report Writing
	HPF 3207	Follow Up and Continuing Contact with Communities

Table 8.9.2.3 COURSES OFFERED BY THE DEPARTMENT OF HEALTH PROMOTION FOR THE BSc HONOURS DEGREE PROGRAMME

Year	Course Code	Course title
Fourth Year	HPT 4501	Child Wellbeing and Development
	HPT 4202	Prevention of Sexually Transmitted Infections
	HPT 4503	Reduction and Control of Tobacco, Alcohol and Other Drug Related Harm
	HPT 4204	Reduction of Suicide
	HPP 4801	Project (Part I)
	HPP 4802	Project (Part II)

IMPORTANT

(1) The minimum and maximum numbers of credits a student can attain in an academic year, excluding repeat courses are 26 and 34, respectively.

(2) The availability of courses in a semester will depend on the number of applicants (minimum of 05) and the availability of lecturers. Please note that the number of applicants does not apply to Honours degree programmes.

8.9.3 DEGREE PROGRAMMES IN INFORMATION TECHNOLOGY

Table 8.9.3.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201*	2	General English
	FDN 1203*	2	General Biology
	FDN 1205*	2	Basic Science for Non-Science Students
	FDN 1306*	3	Basic Mathematics for Non Mathematics Students
	IDC 1201**	2	Philosophy of Science
	IDC 1202*	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes
	IDC 2203	2	Principles and Practices of Marketing
Third Year	IDC 3201**	2	Entrepreneurship Development
	IDC 3202	2	Standards and Quality Management Systems
	IDC 3203	2	Human Resource Management

* *Compulsory courses - However, credits earned for FDN courses and IDC 1202 will not be used for the calculation of GPA*

** *Compulsory courses*

Table 8.9.3.2 COURSES OFFERED BY THE DEPARTMENT OF COMPUTING FOR THE BSc DEGREE PROGRAMME

Year	Course Code	Course Title
First Year	ICT 1201	Fundamentals of Computer Systems
	ICT 1402	Principles of Programme Design and Programming
	ICT 1303	Basic Electronics and Digital Logic Design
	ICT 1404	Mathematics and Statistics for Computing
	ICT 1305	Data Structures
	ICT 1306	Object Oriented Programming
	ICT 1407	Database Systems
	ICT 1308	Operating Systems
Second Year	ICT 2301	Design and Analysis of Algorithms
	ICT 2402	Software Engineering
	ICT 2403	Graphics and Image Processing
	ICT 2204	Web Technology
	ICT 2305	Computer Networks
	ICT 2406	Internet Programming
	ICT 2207	Management Information Systems
	ICT 2408	Computer Organization and Architecture
	ICT 2209	Communication Skills
	ICT 2210	Multimedia Technologies
Third Year	ICT 3301	Human Computer Interaction
	ICT 3202	Operational Research
	ICT 3303	Information Systems Security
	ICT 3304	Embedded Systems
	ICT 3205	Information Technology Project Management
	ICT 3207	Professional Practice and Ethics
	ICT 3208	Entrepreneurship
	ICT 3209	Principles of Accounting
	ICT 3212	Introduction to Intelligent Systems*/**
	ICT 3213	Advanced Operating Systems*
	ICT 3411	Group Project

***Optional courses**

****Compulsory for the BSc Honours in Information Technology**

Table 8.9.3.3 COURSES OFFERED BY THE DEPARTMENT OF COMPUTING FOR THE BSC HONOURS DEGREE PROGRAMME

Year	Course Code	Course title
Fourth Year	ICT 4201	Fundamentals of E-Learning
	ICT 4302	Intelligent Systems
	ICT 4303	Advanced Computer Networks
	ICT 4204	Mobile Application Development
	ICT 4305	Parallel and Cluster Computing
	ICT 4306	E-Commerce
	ICT 4307	Bio Informatics and Computational Biology
	ICT 4208	Geographic Information Systems
	ICT 4609	Individual Research Project
	ICT 4410	Industrial Training

IMPORTANT

(1) The minimum and maximum numbers of credits a student can attain in an academic year, excluding repeat courses are 26 and 34, respectively.

(2) The availability of courses in a semester will depend on the number of applicants (minimum of 05) and the availability of lecturers. Please note that the number of applicants does not apply to Honours degree programmes.

8.10 ASSESSMENT

8.10.1 METHODS OF COURSE ASSESSMENT

Knowledge and skills of students will be evaluated by,

- Continuous assessments
- End semester examination

Weightage given to each assessment will be notified at the beginning of the course.

Continuous assessments

Continuous assessments may include mid semester examination, tutorials, spot tests, practical sessions, assignments, quizzes, records, reports, presentations, etc. Marks obtained for continuous assessments will be taken into account when determining the final grade.

End semester examination

A student will be assessed at the end of each semester either by a theory paper or a practical examination or both, depending on the course. The duration of end semester theory examination based on credit value is as follows.

- One credit - one hour to one and a half hour
- Two credits - two hours
- Three credits - two and a half hours to three hours
- More than three credits - three hours or two papers of two hours each

The duration of each end semester practical examination will be notified by the respective department at the beginning of the semester.

Assessment of health promotion field practical component is given in the *'Guideline for field practical placement'*

FACULTY WEB > ACADEMICS > DEPARTMENTS > HEALTH PROMOTION > STUDY PROGRAMME > GUIDELLINES OF THE STUDY PROGRAMME

IMPORTANT

Students are required to satisfy a minimum of 80% attendance in lectures/ practical classes/ tutorials to be eligible to sit the end semester examination.

Note: For a course consisting of both theory and practical end semester examinations, a student should sit for both components in the same attempt.

Students are only allowed to sit the end semester examinations in semesters that they have initially enrolled *during* course *registration*. No student will be allowed to sit examinations offered in semesters other than the intended semester. For example, if a student has enrolled for a course in semester I in the year 2020 he/she should sit the examinations in that semester and not in any other semester or year.

If a student does not sit the final examination of the intended semester *for any reason* without proper consent from the Faculty Board, an E grade will be issued. Any latter attempt for such a final examination will be considered as a repeat, hence the highest grade possible to obtained is a C grade.

If circumstances beyond control of the student prevent from sitting the final examination, he/she can apply for special consideration from the Faculty Board to later sit the same examination.

The special consideration is subject to approval from the Faculty Board.

If a student obtains consent from the Faculty Board, the student is required to sit the examination offered in the immediately available semester.

8.10.2 GRADING SYSTEM

Grade	Grade Point Value	Grade	Grade Point Value
A^+	4.0	C^+	2.3
A	4.0	C	2.0
A^-	3.7	C^-	1.7
B^+	3.3	D^+	1.3
B	3.0	D	1.0
B^-	2.7	E	0.0

8.10.3 GRADE POINT AVERAGE

Grade Point Average (GPA) is the credit-weighted arithmetic mean of grade point values. The GPA is calculated by dividing the total credit-weighted grade point value by the total number of credits.

$$GPA = \frac{\sum(\text{Grade point value of a course } \times \text{ number of course credts})}{\text{Total number of credits}}$$

For example, a student who completed three courses of three credits each, two courses of two credits each and two courses of one credit each with grades A^+, B, D, C^+, E, B^+ and C respectively would obtain a GPA of

$$\frac{(4.0 \times 3) + (3.0 \times 3) + (1.0 \times 3) + (2.3 \times 2) + (0.0 \times 2) + (3.3 \times 1) + (2.0 \times 1)}{3 + 3 + 3 + 2 + 2 + 1 + 1} = \frac{33.9}{15} = 2.26$$

(Truncated to two decimal places without rounding)

8.10.4 PREREQUISITES

Prerequisites are the courses that a student must complete with a satisfactory grade before enrolling in another course prior to registering for certain courses. Students are required to obtain **at least a D grade** for the courses considered as prerequisites.

8.10.5 REFERRED STUDENTS

Students who receive a grade below C may re-sit the examination to improve the grade. However, in subsequent attempts the highest grade achievable is a C grade. If a student is unsuccessful in obtaining a C grade in subsequent attempts, the best grade obtained will be considered. A maximum of three attempts are given to complete an examination. However, the Senate may allow a one extra attempt called “Grace Chance” with the referral from the board of Faculty.

8.10.6 EXAMINATION REGULATIONS

The Faculty adopts the amended regulations “No. 1 of 1989 regulations concerning examination procedures, examination irregularities and punishments (amended) 2014” which was approved by the senate of the University.

8.10.6.1 Examination Irregularities

Examination Irregularities are classified briefly as follows.

01. Keeping unauthorized documents in possession.
02. Copying and plagiarism.
03. Cheating.
04. Removing examination stationery belonging to the university out of the examination hall.
05. Disorderly conduct.
06. Impersonation
07. Getting to know the contents of a question paper unlawfully or attempting to do so.
08. Aiding and abetting examination irregularities.
09. Influencing supervisors, invigilators or other examination officers unlawfully and not adhering to the instructions.
10. Being guilty of the same examination irregularity for the second time.
11. Using or keeping in possession of cellular phones or any such communication devices or unauthorized equipment in the examination hall.
12. Any other examination irregularity determined by the University Senate.

8.10.6.2 Examination Irregularities and Punishments

01. Keeping unauthorized documents in possession

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of one (01) semester and a maximum of three (03) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

02. Copying and plagiarism

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of one (01) semester and a maximum of three (03) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

03. Cheating

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for *a minimum of one (01) semester and a maximum of two (02) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

04. Removing examination stationery belonging to the university out of the examination hall

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and any other punishments imposed, on the recommendation of the University disciplinary committee.

05. Disorderly conduct

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of one (01) semester and a maximum of three (03) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

06. Impersonation

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of four (04) semesters and a maximum of eight (08) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed. If the imposter (second party) is a student of the Rajarata University of Sri Lanka Prohibition of the relevant examinations conducted by the university for a *minimum of four (04) semesters and a maximum of eight (08) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed. If the imposter is not a student of the Rajarata University of Sri Lanka, The University shall be at liberty to file a criminal charge of impersonation in a court of law against the person.

07. Getting to know the contents of a question paper unlawfully or attempting to do so

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of one (01) semester and a maximum of two (02) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

08. Aiding and abetting examination irregularities

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and any other punishments imposed, on the recommendation of the University disciplinary committee.

09. Influencing supervisors, invigilators or other examination officers unlawfully and not adhering to the instructions

Punishment: Punishments imposed, on the recommendation of the University disciplinary committee.

10. Being guilty of any examination irregularity for the second time

Punishment: ***Cancellation of the studentship***

11. Using or keeping in possession of cellular phones or any such communication devices or unauthorized equipment in the examination hall

Punishment: Cancellation of the results of the subject in which the examination irregularity committed and prohibition of the relevant examinations conducted by the university for a *minimum of one (01) semester and a maximum of three (03) semesters and any other punishments imposed*, on the recommendation of the University disciplinary committee. The period of punishment will be effective from the first day of the semester immediately following the semester in which the examination irregularity committed.

12. Any other examination irregularity determined by the University Senate

Punishment: Punishments imposed, on the recommendation of the University disciplinary committee. Other punishments. In addition to the above punishments, the following punishments could be imposed on the recommendation of the University disciplinary committee.

01. Not granting a class pass.

02. Limiting the maximum marks for re-sitting a cancelled paper to an ordinary pass ("C" Grade).

03. Suspension or cancellation of scholarships and bursaries.

04. Not being called for the convocation (degree conferred in absentia)

05. Delaying the release of results of the final examination and other relevant records by one year.

University disciplinary committee shall be at liberty to increase the punishments prescribed in the previous chapters, considering the nature of the examination irregularity committed. The punishments recommended by the University disciplinary committee will be executed on the approval of the University Senate.

8.11 DEGREE AWARDING CRITERIA AND SELECTION FOR THE HONOURS DEGREES

8.11.1 BSc IN APPLIED SCIENCES

To be eligible to receive the BSc in Applied Sciences, a student should attain a minimum of **90 credits**, with at least **26 credits** per each academic year. If a student accumulates more than **90 credits,** the courses corresponding to best **90 credits** will be considered. When the total number of credits does not equal to **90,** the best **91-93 credits** may be considered.

N.B. All courses specified as compulsory for a subject are included in the best 90 credits and hence will be used for the calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **69 credits** with **at least 22 credits per each academic year** and at least a **D grade** in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of six academic years from the first registration.

Guidelines for the selection of courses in the BSc in Applied Sciences are given in the Tables in section 10.1

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **90 credits** within three academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iii. obtain C grades or higher in specified courses equivalent to at least **85 credits** and at least a D grade in the remaining courses within three academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**

ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iii. obtain C grades or better in the specified courses equivalent to at least **80 credits** and at least a D grade in remaining courses within four academic years.

8.11.2 BSc HONOURS IN APPLIED SCIENCES

8.11.2.1 Selection of Students

BSc Honours in Applied Sciences is an option for the third year BSc in Applied Sciences students to pursue an additional year of study. At the end of the fifth semester, students may apply to follow an Honours degree programme offered by the Faculty of Applied Sciences. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises at least three academic staff members and the Heads of the Departments.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for best 65 credits including all compulsory courses offered within the first five semesters.

ii. The credits including all compulsory courses earned during the first five semesters should not include more than 6 credits with D grades and any credit with an E grade.

iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.2.2 Course Structure

A student enrolled for a degree programme in Applied Sciences may select courses from any combination of two or three subjects, provided that he/she attains an average of 30 credits per year including compulsory courses. A student has flexibility of formulating his/her own programme of study and is expected to offer a minimum of 120 credits to be eligible for the BSc Honours Degree in Applied Sciences. The fourth year consists of lectures/ practical classes/ industrial training/ mini projects etc. During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

Guidelines for the selection of fourth year courses in the BSc Honours in Applied Sciences is given in Table 10.2.1.

8.11.2.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.2.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours, a student should attain a minimum of **120 credits**, with at least **26 credits** per each academic year and a minimum of **60 credits** must be attained from Applied Sciences. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum **GPA** of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with at least **23 credits per each academic year** and at least a **D grade** in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.3 BSc HONOURS IN INDUSTRIAL MATHEMATICS

8.11.3.1 Selection of Students

The Honours degree programme consists of a total of four academic years (8 semesters). At the end of the fourth semester, students may apply to follow an Honours degree programme offered by the Department of Physical Sciences. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises at least three academic staff members including the Head of the Department of Physical Sciences.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for all compulsory courses offered within the first four semesters in Mathematics.
ii. A student must obtain a minimum GPA of 3.00 for all compulsory courses specified under the subject combination enrolled.
iv. The credits earned for all compulsory courses should not include more than 6 credits with D grades and any credit with an E grade.
iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.3.2 Course Structure

At the end of the fourth year a student should have earned a minimum of 72 credits from Mathematics. During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the

dissertation at the end of the 4th academic year. The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses are given in the Tables in sections 10.2.2

8.11.3.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.3.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**, with at least **26 credits** per each academic year and a minimum of **72 credits** must be attained from Mathematics. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses of* Mathematics *are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grade or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.4 BSc HONOURS IN BIOLOGY AND PHYSICS / BSc HONOURS IN CHEMISTRY AND PHYSICS

8.11.4.1 Selection of Students

These Degrees jointly involve two subject areas *viz.* Biology & Physics, and Chemistry & Physics. The Honours degree programme consists of a total of four academic years (8 semesters). At the end of the fourth semester, students may apply to follow an Honours degree programme offered by the Department of Biological Sciences, Department of Chemical Sciences and Department of Physical Sciences. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises of at least three academic staff members including the Heads of the two relevant Departments.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for all compulsory courses offered within the first four semesters in Physics, and Biology or Chemistry.
ii. A student must obtain a minimum GPA of 3.00 for all compulsory courses specified under the subject combination enrolled.
iii. The credits earned for all compulsory courses should not include more than 6 credits with D grades and any credit with an E grade.
iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.4.2 Course Structure

At the end of the fourth year a student should have earned a minimum of 45 credits per subject (total of 90 credits) from Physics and Biology, or Physics and Chemistry.

The fourth year consists of lectures/ practical classes/ industrial training/ mini projects etc. During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses are given in the Tables in sections 10.2.3 and 10.2.4

8.11.4.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.4.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**, with at least **26 credits** per each academic year and a minimum of 45 credits per subject (total of 90 credits) from Physics and Biology, or Physics and Chemistry. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal to **120,** the best **121-123 credits** may be considered.

All compulsory courses of relevant subjects are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**

ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.5 BSc HONOURS IN APPLIED BIOLOGY / BSc HONOURS IN MICROBIOLOGY

8.11.5.1 Selection of Students

The Honours degree programme consists of a total of four academic years (8 semesters). At the end of the fourth semester, students may apply to follow an Honours degree programme offered by the Department of Biological Sciences. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises at least three academic staff members including the Head of the Department of Biological Sciences.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programmes are as follows:

i. A student must obtain a minimum GPA of 3.00 for all compulsory courses offered within the first four semesters in Botany and Zoology, or Biology.

ii. A student must obtain a minimum GPA of 3.00 for all compulsory courses specified under the subject combination enrolled.

iv. The credits earned for all compulsory courses should not include more than 6 credits with D grades and any credit with an E grade.

iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.5.2 Course structure

At the end of the fourth year a student should have earned a minimum of 72 credits from Botany and Zoology, or Biology or Microbiology.

During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

During the fourth year, students will be given an in-plant training in industry/ research institute/ business venture relevant to the degree programme under professional supervision. Students must submit a report on their in-plant training.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses are given in the Tables in sections 10.2.5

8.11.5.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.5.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**, with at least **26 credits** per each academic year and a minimum of **72 credits** must be attained from Botany and Zoology, or Biology. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses of Botany and Zoology, or Biology are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.6 BSc HONOURS IN CHEMISTRY

8.11.6.1 Selection of Students

The Honours degree programme consists of a total of four academic years (8 semesters). At the end of the fourth semester, students may apply to follow an Honours degree programme offered by the Department of Chemical Sciences. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises of at least three academic staff members including the Head of the Department of Chemical Sciences.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for all compulsory courses offered within the first four semesters in Chemistry.
ii. A student must obtain a minimum GPA of 3.00 for all compulsory courses specified under the subject combination enrolled.
iv. The credits earned for all compulsory courses should not include more than 6 credits with D grades and any credit with an E grade.
iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.6.2 Course structure

At the end of the fourth year a student should have earned a minimum of 72 credits from Chemistry.
During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

During the fourth year, students will be given an in-plant training in industry/ research institute/ business venture relevant to the degree programme under professional supervision. Students must submit a report on their in-plant training.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses are given in the Tables in sections 10.2.6

8.11.6.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.6.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**, with at least **26 credits** per each academic year and a minimum of **72 credits** must be attained from Chemistry. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses in Chemistry are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.7 BSc IN HEALTH PROMOTION

To be eligible to receive the BSc in Health Promotion, a student should attain a minimum of **90 credits**, with at least **26 credits** per each academic year. If a student accumulates more than **90 credits,** the courses corresponding to best **90 credits** will be considered. When the total number of credits does not equal **90,** the best **91-93 credits** may be considered.

N.B. All courses specified as compulsory in Health Promotion are included in the best 90 credits and hence will be used for the calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **69 credits** with **at least 22 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of 6 academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **90 credits** within three academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **85 credits** and at least a D grade in the remaining courses within three academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **80 credits** and at least a D grade in the remaining courses within four academic years.

8.11.8 BSc HONOURS IN HEALTH PROMOTION

8.11.8.1 Selection of Students

BSc Honours in Health Promotion is an option for the third year BSc in Health promotion students to pursue an additional year of study. At the end of the fifth semester, students may apply to follow a Honours degree programme offered by the Department of Health Promotion. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises at least three academic staff members including the Head of the Department.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for 70 health promotion credits within the first five semesters.
ii. The credits earned for all compulsory courses should not include more than 6 credits with D grades and any credit with an E grade.
iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.8.2 Course Structure

During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

8.11.8.3 Option of reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.8.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses in Health Promotion are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. complete the relevant requirements within a period of eight academic years.

Award of Classes

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**,
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**
ii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iii. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

8.11.9 BSc IN INFORMATION TECHNOLOGY

To be eligible to receive the BSc in Information Technology, a student should attain a minimum of **90 credits**, with at least **26 credits** per each academic year. If a student accumulates more than **90 credits,** the courses corresponding to best **90 credits** will be considered. When the total number of credits does not equal **90,** the best **91-93 credits** may be considered.

N.B. All courses specified as compulsory for a subject are included in the best 90 credits and hence will be used for the calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **69 credits** with **at least 22 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for the ICT 3411,
iv. obtain at least a **C grade** for FDNs and compulsory IDCs, and
v. complete the relevant requirements within a period of 6 academic years.

Award of Classes

A student should complete all requirements given in section 8.11.9. to be considered for the award of a Class.

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**,

ii. obtain at least a **C grade** for the ICT 3411,

iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iv. obtain C grades or higher in specified courses equivalent to at least **90 credits** within three academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**

ii. obtain at least a **C grade** for the ICT 3411,

iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iv. obtain C grades or higher in specified courses equivalent to at least **85 credits** and at least a D grade in the remaining courses within three academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**

ii. obtain at least a **C grade** for the ICT 3411,

iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and

iv. obtain C grades or better in the specified courses equivalent to at least **80 credits** and at least a D grade in remaining courses within four academic years.

8.11.10 BSc HONOURS IN INFORMATION TECHNOLOGY

8.11.10.1 Selection of Students

BSc Honours in Information Technology is an option for the third year BSc in Information Technology students to pursue an additional year of study. At the end of the fifth semester, students may apply to follow an Honours degree programme offered by the Department of Computing. A limited number of students will be selected for the Honours degree programme by a subcommittee appointed by the Faculty Board. The subcommittee comprises at least three academic staff members including the Head of the Department.

The number of positions available for the Honours degree programme each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

The minimum requirements to apply for the Honours degree programme are as follows:

i. A student must obtain a minimum GPA of 3.00 for 65 credits including all compulsory courses offered within the first five semesters.

ii. The best 65 credits including all compulsory courses earned during the first five semesters should not include more than 8 credits with D grades and any credit with an E grade.

iii. FDNs and the compulsory IDC must be completed at least with a minimum of C grade by the time students apply for the Honours degree programme.

N.B. Extra-curricular activities will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

8.11.10.2 Course Structure

During the fourth year, the student must carry out a research project under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year. The student is required to complete the research project and submit the dissertation at the end of the 4th academic year.

During the fourth year, students will be given an in-plant training in industry/ research institute/ business venture relevant to the degree programme under professional supervision. Students must submit a report on their in-plant training.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

8.11.10.3 Option of Reverting to the BSc Degree

A student registered for any four-year degree programme may revert to a three-year degree, upon strict recommendation of the student request committee and the approval of the Faculty Board, if all the requirements of the three-year degree programme are fulfilled to the satisfaction of Board of Examiners.

8.11.10.4 Degree Awarding Criteria

To be eligible to receive the BSc Honours degree, a student should attain a minimum of **120 credits**. If a student accumulates more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. When the total number of credits does not equal **120,** the best **121-123 credits** may be considered.

N.B. All compulsory courses in Information Technology are included in the best 120 credits and hence will be used for calculation of the final GPA.

In addition, a student must

i. obtain a minimum GPA of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **92 credits** with **at least 23 credits per each academic year** and at least a D grade in the remaining courses,
iii. obtain at least a **C grade** for the ICT 4609,
iv. obtain at least a **C grade** for FDNs and compulsory IDCs, and
v. complete the relevant requirements within a period of eight academic years.

Award of Class

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of **3.70**,
ii. obtain at least a **C grade** for the ICT 4609,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. obtain C grades or higher in specified courses equivalent to at least **120 credits** within four academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30**,
ii. obtain at least a **C grade** for the ICT 4609,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. obtain C grades or higher in specified courses equivalent to at least **112 credits** and at least a D grade in the remaining courses within four academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00**,
ii. obtain at least a **C grade** for the ICT 4609,
iii. obtain at least a **C grade** for FDNs and compulsory IDCs, and
iv. obtain C grades or better in the specified courses equivalent to at least **108 credits** and at least a D grade in the remaining courses within five academic years.

9 COURSES

9.1 OUTLINE OF THE COURSES

9.1.1 FIRST YEAR PROGRAMME OF STUDY

9.1.1.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

FDN 1201 - GENERAL ENGLISH

Before the commencement of the academic year for the 1st year students, an intensive course in English, duration of which is 12-16 weeks is conducted by the Faculty. It is compulsory for all the 1st year students to attend these classes regularly. The students are grouped according to their standard of English, which is determined by means of an examination held at the beginning of the course. The students are also tested at the end of the intensive course. All the students are advised to make the maximum use of this course to improve their knowledge of English, as English would be the medium of instruction of all the Degree Programmes. Although this course is delivered in general as mentioned above, the Faculty may decide to conduct the course during the first semester of study.

FDN 1202 – INTRODUCTION TO COMPUTERS

Introduction to computers: General computer architecture, Components of the computer, Hardware & software, Programming languages. **Operating Systems**: DOS and windows. Micro-Computer Applications: A Word Processor – MS Word: Table, Drawing, Inserting objects, A spread sheet – MS Excel, An RD BMS – MS Access, A Web designing tool-MS frontpage.

FDN 1203 - GENERAL BIOLOGY

The Nature of Biology: The branches of Biology, Methods of inquiry in Biology, some basic concepts, Applied Biology. Biomes to Microhabitats. Communities and Ecosystems. Pollution and Conservation. Systematics: The taxonomic hierarchy, Naming of organisms. **Classification of Organisms:** Prokaryota, Monera, Protista, Fungi, Plantae, Animalia. The Cell as a basic unit: Fine structure of Prokaryotic and Eukaryotic cells. Tissues, Organs 0and Individuals: Animal tissues, Plant tissues, Organs and organ systems. **Nutrition:** Autotrophic and heterotrophic nutrition, Photosynthesis.

Respiration: Aerobic and anaerobic respiration, BMR. Transport in animals and plants. Defense against diseases: Defense systems in animals, Plant defenses against diseases. **Reproduction:** Asexual and sexual reproduction. **Principles of Heredity:** Monohybrid inheritance, Dihybrid inheritance. Evolutionary trends.

FDN 1204 – BASIC MATHEMATICS

Sets and inequalities, System of linear equations, Quadratic Equations, Functions and their graphs. Trigonometric Functions, Limits, Derivatives, Curve sketching, Maximum-minimum problems, Exponential and logarithmic functions, Antiderivatives, Techniques of Integration, Areas and volumes, Introduction to vectors, Scalar product and Vector product, Cylindrical and spherical polar coordinates, Introduction to Matrices and Determinants.

FDN 1205 – BASIC SCIENCES FOR NON- SCIENCE STUDENTS

Introduction: Science, Technology, Scientific method. Astronomy: The universe, the solar system, constellation of stars, Galaxies and other astronomical objects. **Earth Science**: The earth, rock, minerals, earthquakes, volcanoes, ocean, earth's atmosphere, storm, and weather forecasting. **Matter**: States of matters, properties of matter. **Motion**: Speed, Velocity, Acceleration, Force, Torque, Momentum. **Heat**: Conduction, Convection and radiation, Insulation. **Energy**: Electricity, Solar energy, Geothermal energy, Wind energy, Tidal energy, and Nuclear energy. **Light**: Refection and refraction, mirrors, lenses, eye, optical devices, color vision, eye defects, photography. Sound: Sound waves and their properties, production and recording of sounds, musical instruments, ear mechanism of hearing, hearing aids, ultrasonic waves and its application. **Radiation**: Types of radiation, technological uses and human exposure, Carbon dating. **Electronics and Communication:** Semiconductors, diodes, transistors, telephone, fax. **Constituents of Matter**: Atoms, Elements, Isotopes, Compounds and mixtures. **Chemical Reactions**: Formulae and equations, bonding and types of reactions. Acids and **Bases**: Electrolytes, pH scale, acids, bases, buffers, salts, batteries. Polymers: Addition polymers, condensation polymers, rearrangement polymers, polymer additives. **Food and Nutrition**: Proteins, fats, carbohydrates, minerals, vitamins, food additives. **Chemical compounds and their impact in daily life**: Cosmetics, Deodorants, Disinfectants, Agrochemicals, Drugs and Hazardous wastes. **Life on Earth**: Origin of life, classification of living organism. **Evolution**: Animal and plant diversities, natural selection. **Ecosystems**: Classification of ecosystems, bio-geo chemical cycles and human impact. **Microbes and their Applications**: Microbial classification, Interactions, Applications. **Pollution and Control**: Pollutants, Control measures.

FDN 1306 – BASIC MATHEMATICS FOR NON – MATHEMATICS STUDENTS

Sets and inequalities, Linear equations, Quadratic Equations, Functions and their graphs. Trigonometric Functions, Limits, Derivatives, Curve sketching, Maximum-minimum problems, Exponential and logarithmic functions, Antiderivatives, Techniques of Integration, Areas and volumes, Introduction to vectors, Scalar product and Vector product, Cylindrical and spherical polar coordinates, Introduction to Matrices and Determinants, Representation of data, Histograms, Frequency polygons, Mean, Median, Mode, Interquartile range, Variance, Standard deviation, Sample space, Events, Introduction to probability, Random variables, Normal distribution.

IDC 1201 - PHILOSOPHY OF SCIENCE

The aims and objectives of philosophy, Historical development of philosophical thought, Problems related to Theory of Knowledge, Analysis of Metaphysical problems, Analysis of ethical issues, Analysis of the problem of Inductive Knowledge, Philosophical analysis of the reliability of scientific knowledge. Can fundamental philosophical questions be answered by the science, the limitations of empirical knowledge.

IDC 1202 - CAREER DEVELOPMENT

This course has been designed to provide the students with the key elements of career development and progression, enabling them to choose their career path during the study programme. The students should get registered for this course in the second semester of the first year and they will be assessed through continues assessments and a portfolio assessment at the end of the third year. Please note that this is a compulsory and a non-GPA course.

9.1.1.2 BIOLOGY

BIO 1201 - CELL BIOLOGY AND BIOCHEMISTRY

Biomolecules and Molecular Organization: Inorganic ions, Carbohydrates, Lipids, Proteins, Nucleic acids, Identification of Biomolecules, DNA Replication, Transcription and translation of genetic information; **Cytology:** Cell ultra- structure, Cell Division; Biological membranes: Structure and functions; **Enzymes:** General properties and mechanism of action; Enzyme kinetics, Bioenergitics.

BIO 1202 - STATISTICAL METHODS IN BIOLOGY

Introduction to the scope and nature of statistics, Data collection and visual representation of data, Measures of position and dispersion, Normal distribution and its applications, Confidence intervals, Concept of hypothesis testing, Chi square test of independence and goodness of fit, Scatter plots and correlation, Least squares regression, Use of statistical software.

BIO 1203 - GENERAL MICROBIOLOGY

The microbial world and you, microbial naming and classification, microscopy, bacterial cell structure and functions, bacterial identification, nutrition and metabolism of microorganisms, microbial growth, microbial interactions, ecological and economic importance of microorganisms; plant growth promoting rhizobacteria, blue green bacteria and actinomycetes, mycoplasma, introduction to viruses, viroids and prions, general structural characteristics of viruses, disease mechanisms, host/pathogen relationships, virus and cancer, antibiotic producing microorganisms, control of microbial growth, microbial biofilm formation.

9.1.1.3 BOTANY

BOT 1201 - PLANT DIVERSITY

Historical development of biological classification, Key events of plant evolution, Characteristics of major taxonomic groups in kingdoms Fungi, Protista (only algae) and Plantae (excluding Anthophytes), Economic and ecological importance of fungi, algae, bryophytes, pteridophytes and gymnosperms, Habitat preference and evolutionary affinities in and among fungi, algae, bryophytes, pteridophytes and gymnosperms, Introduction to lichens- an alliance between kingdoms

BOT 1202 - FUNCTIONAL PLANT ANATOMY AND BASIC WOOD SCIENCE

Introduction: Organization of plant body; Types of meristematic tissues and their origin and functions; Primary structure and secondary growth of typical stem and root in relation to functions. Anatomy of typical dicot, monocot leaves and circular leaf in relation to functions; Anomalous secondary growth in plant stems and roots; Ecological Plant Anatomy: variation in structure, related to habitat; Wood: Physical and chemical structure of wood, relationship between wood anatomy and physical properties and technical performance of timber, identification of timber with special reference to local species, defects of wood, grading of timber, wood seasoning, wood preservation and wood based industries in Sri Lanka.

9.1.1.4 ZOOLOGY

ZOO 1201 - INVERTEBRATE DIVERSITY

Animal body plans, Diversity of major invertebrate phyla: Protozoan groups and Phyla Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda, Mollusca, Annelida, Onychophora, Arthropods, minor invertebrate phyla, Echinodermata.

ZOO 1302 - VERTEBRATE DIVERSITY

Chordate Body plan, Major features of Phylum Chordata, Diversity of major Vertebrate classes: Jawless fish, Jawed fish, Amphibia, Reptilia, Aves, Mammalia

ZOO 1203 - GENERAL ENTOMOLOGY

Characteristics of the Classes of Phylum Arthropoda, Definition of Insecta, Abundance and causes of success, Insect as enemies of man: value of insects to man, methods of injury by insects; External structures of insect body and their functions, Segmentation and body regions, head, thorax and abdomen, mouthparts and their modifications, Sensory organs, Types of antenna and their functions, Body wall and its functions, Wing venation and modifications of wings, Internal anatomy: digestive, respiratory, circulatory, excretory, reproductive, and nervous systems; Metamorphosis, Insect classification. Evolution of insects, Insect collection methods and preservation techniques.

9.1.1.5 CHEMISTRY

CHE 1201 - GENERAL CHEMISTRY

Atomic Structure: Planetary Model and Bohr's Model for the Atom, Atomic Spectrum of Hydrogen, Quantum Mechanical for the Atom, Basic Principles of Quantum Mechanics, Electron Clouds, Wave function, Four Quantum Numbers, Multi-electron Atoms, Electronic Configuration, Periodic Law and Periodic Properties. **Chemical Bond:** Introduction and Types of Bonding, Lewis, Sidgwick-Powell and VSEPR Theories, Overlap of Atomic Orbitals and Hybridization, Valence Bond Theory, Molecular Orbital Theory, Structure of Ionic Crystals, Energies of Ionic Compounds, Covalent Character of Ionic Bonds. **Chemistry of Elements:** Alkali Metals, Alkaline Earth Metals, Group 13 Elements, Halogens, d-Block Elements.

CHE 1302 - PHYSICAL CHEMISTRY I

The International System (SI) of units of measurement: Fundamental units. Derived units, Dimensional analysis, Unit conversions. **Gases:** Introduction to Gas Laws, Kinetic Molecular Theory of Gases, Applications of the Kinetic Molecular Theory of Gases, General Behaviour of Gases, Van der Waals Equation of State, Other Equations of State, Liquefaction of Gases, Critical Region and Critical Constants. **Chemical Thermodynamics:** Basic Concepts and Terminology, First Law of Thermodynamics, Applications of the First Law of Thermodynamics, Thermochemistry, Second Law of Thermodynamics, Entropy, Applications of the Second Law of Thermodynamics, Free Energy Functions, Thermodynamic Potentials, Thermodynamic Equations of State. **Electrochemistry:** galvanic cells, Electrolysis cells, Standard electrode potential, liquid junction potential, Cells with transference and without transference, Activity, Nernest equation, Cell e.m.f, Thermodynamics of cells, Applications of cell emf measurements, Potentiometric titrations, Conductivity, molar conductivity. Limiting molar conductivity, Kohlrausch's law of independent migration, Applications of Conductivity measurements, Condutometric titrations.

CHE 1203 - ORGANIC CHEMISTRY

Nomenclature of organic compounds, Alkyl halides, Substitution and elimination reactions, Free radical reactions, Alkenes and alkynes, Electrocyclic reactions and cycloadditions, Aldehydes and ketones, Nucleophilic-additions, Carboxylic acids andtheir derivatives, Enolates and carboanion building blocks for organic synthesis, Amines, Aromatic electrophilic substitution, Aromatic nucleophilic Substitution, Benzyne mechanism, Carbanions, Carbenes.

CHE 1104 - INORGANIC CHEMISTRY - LABORATORY

Introduction to apparatus and equipment, Handling techniques. Entering and calculations, Qualitative and quantitative Inorganic chemistry, Titrimetric methods, Microanalysis of Inorganic compounds, Halides, Carbonates, Sulphates and Metal ions.

CHE 1105 - ORGANIC CHEMISTRY - LABORATORY

Organic analysis: Identification of acidic, basic, phenolic, and neutral organic substances; Detection of nitrogen, sulfur and halogens; Test for aliphatic and aromatic nature of substances; Test for saturation and unsaturation. **Identification of functional groups**: carboxylic acids, phenols, aldehydes, ketones, esters, carbohydrates, amines, amides and halogen compounds.

9.1.1.6 COMPUTER SCIENCE

COM 1201 - PRINCIPLES OF PROGRAMME DESIGN

Techniques of Problem Solving: Problem solving, Methodologies, Algorithms, Flowcharts, Pseudo Codes, Paper Simulations, Programming Paradigms.

COM 1302 - DATABASE MANAGEMENT SYSTEMS

Basic Concepts: File Systems, File handling (Sequential access, Direct access, and Random access), What it is a Database System? What is a Database? Why Database? Data independence, Three levels of architecture (External, Conceptual, and Internal), Database access, Page sets and files, Indexing, Hashing, Compression techniques. Relational Data Structure: Domains, Relations, Relational Databases. **Relational integrity rules:** Primary keys, Entity integrity rule, Foreign keys, Referential integrity rule. **Relational algebra:** Syntax of Relational Algebra, Traditional set operations, Special relational operations, Additional operators, Relational assignment. **Database design:** Functional dependence, First, Second, and Third normal forms, Good and bad decompositions, Boyce/Codd normal form, 4th and 5th normal forms, Entity/Relationship model, E/R diagrams, Database design with E/R model. **Relational systems:** SQL, Data definition, Data manipulation.

COM 1305 - OBJECT ORIENTED PROGRAMMING

Introduction: What is an object? What is a class? Difference between classes and objects, Object-oriented view of a system, Structured Programming Vs. Object-oriented programming. **UML:** Use case diagrams, Class diagrams, Sequence diagrams, Activity diagrams and State chart diagrams. **Classes and Objects:** Determining Object Behavior, Defining Methods, Instance Variables, Static Variables, Variable Lifetime and Scope, Constructors, Instantiation, Destructors, Static Variables, Static Methods, Super class, Sub class. Public, Private and Protected classes. Methods: Method Implementation, Static Methods, Method Overriding, Accessor and Mutator Methods, Operator Overloading. **Inheritance:** Single Inheritance, Multiple Inheritance, Inheritance Hierarchies, Static and

Dynamic binding, Polymorphism, Converting between class Types, Preventing Inheritance.

COM 1407 - COMPUTER PROGRAMMING

Fundamentals of C Programming: Structure of a C Programme, Input/Output, Variable Declaration, Arithmetic Operations, Relational Operations, Logical Operations. **Control Structures:** If/Else, While repetition, For repetition, Switch multiple selection, Do/While, Break and Continue, Functions, Scope of Variables and Parameters, Recursion, Arrays, Records, File processing, Comparison of structure and class, Pointers, Dynamic memory allocation, Pointers to functions.

COM 1308 - DIGITAL LOGIC DESIGN

Digital concepts: basic logic operations, logic functions, introduction to ICs. **Logic Gates and Circuits:** AND, OR, NOT, NOR, NAND, XOR. **Boolean Algebra and Logic Simplification**: Boolean Operations, De Morgan's theorem, Karnaugh Map. **Combinational logic:** design in combinational logic, adders, comparators, decoders, encoders, multiplexers, DE multiplexers. **Sequential logic:** design in sequential logic flip-flops, timers, counters, shift registers, memories.

9.1.1.7 MATHEMATICS

MAT 1201-Mathematical Methods I

Algebra of Vectors: Introduction to vectors, Linear combinations, Linear dependence and independence, Bases and dimensions, Scalar product, Vector product, Triple scalar product, Triple vector product. **Vector Applications in Geometry:** Collinear vectors, Coplanar vectors, Vector equation of a line, Vector equation of a plane, Tetrahedron, Parallelopiped, Pyramid and prism. **Calculus of Vector-valued Functions:** Differentiation and integration, Space curves, Tangent and normal, Frenet-Serret formulae. **Scalar and Vector Fields:** Scalar and vector fields, Directional derivatives, Gradient, Divergence and curl operators, Scalar potential of a conservative field, Applications of scalar and vector Fields.

MAT 1202-Numerical Analysis I

Basic principles: Computer representation of numbers, Round-off errors, Absolute and relative errors, Truncation error, Significant digits. **Roots of Non-Linear Equations:** Bisection method, Secant method, Newton-Raphson method, Müller's method, Chebyshev method, Error analysis of iterative methods. **Interpolation and polynomial approximation:** Introduction, Newton's & Gauss's forward and backward formulae, Central difference formula, Stirling's formula, Lagrange's and Taylor polynomial, Newton's divided difference formula, Relation between divided and forward differences, Hermite's and Cubic spline interpolation, Approximation with Chebyshev polynomials, Least squares approximation and Min-Max polynomial approximations. **Numerical Differentiation and Integration:** Numerical differentiation, Richardson's extrapolation, Elements of numerical integration (Trapezoidal rule, Simpson's rule and Midpoint rule). **Computer Software:** Usage of MATLAB.

MAT 1203-Mathematical Modelling

Introduction to Mathematical Modelling, Classifications and Simple Illustrations: Linear and quadratic models, Polynomial and rational models, Traffic flow models. **Mathematical Modelling Through Ordinary Differential Equations: Economic Models:** Economic Functions; supply, Demand, Cost, Revenue, Elasticity, Consumer's Surplus, Producer's Surplus, Income determination model, Harrod–Domar model, Equilibrium in economic resources, Fixed point theory, Continuous-time systems, Discrete-time systems, Stability theory, **Biological Models:** Decay model, Exponential and logistic growth, The Predator-Prey model, A model for competitive species. **Mathematical Modelling Through Difference Equations:** Introduction to difference equations, Formulation of models using difference equations.

MAT 1204-Differential Equation I

First Order Ordinary Differential Equations: Introduction, Separable variables and reduction of order, Exact equations, Linear equations, Bernoulli's equation, Applications. **Higher Order Ordinary Differential Equations:** Linear equations with constant coefficients, differential operator, Homogeneous equations, Characteristic equations, Particular, and general solution, Simultaneous equations. **First Order Non-linear Differential Equations:** Clairaut's equation, Riccati's equation.

MAT 1205-Real Analysis I

Introduction: Real number system as a complete ordered field, Complex number system, Topology of the real line, Neighborhoods, Limits of real-valued functions, Theorems on limit. **Continuity and Differentiability:** Left hand and Right-hand continuity, Uniform

continuity, Sectional continuity, Intermediate Value Theorem, Differentiability, Rolle's Theorem, Mean Value Theorem, Taylor's Theorem, L'Hospital rule. **Sequences and limits:** Limits of a sequence, Bounded and monotonic sequences, Cauchy sequences.

MAT 1206-Introduction to MATLAB

Introduction: MATLAB 's power of computational mathematics, Features of MATLAB, Uses of MATLAB, MATLAB environment. **Fundamental Operators and Commands:** Basic syntax, Data types, Data type conversions, String and numeric functions, M-files, Commands for managing session, Vectors, Matrices and arrays, Vector operations, Matrix operations, Colon notation, Plotting and graphics, Commands for working with the system, Input and output commands, Creating and running scripts, Operators (arithmetic, relational, logical, bitwise and set). **Basic Programming Structures:** If statement, Nested if statement, Switch statement, Nested switch statement, Loops, Nested loops, Loop control statements, Functions, File handling. **Applications in Linear Algebra and Basic Calculus:** Solving basic algebraic equations, Solving quadratic equations, Solving higher order equations, Expanding and collecting equations, Factorization and simplification of algebraic expressions, Calculating limits, Derivatives of functions, Finding maxima and minima of curves, Solving differential equations, Integration of functions, Evaluating polynomials, Finding roots of polynomial equations and polynomial curve fitting.

MAT 1207-Algebra I

Sets and Logic: Introduction to sets, Set operations, Propositions and truth values, Logical connectives, Truth tables. **Relations, Functions and Binary Operations:** Equivalence relation, Partitions, Injective, Surjective and Bijective functions, Inverse of a function, Binary operations. **Permutations:** Theorems on the product of disjoint cycles, Transpositions and the uses, Parity, and signature of a permutation. **Algebraic System of One Binary Operation:** Definition of a group, Group tables, Subgroups, Elementary properties of cyclic groups, Dihedral group of order 2n and its properties, Symmetric and alternating groups, Homomorphism and isomorphism of a group, Permutation groups, Cayley's Theorem. **Elementary Number Theory:** Euclid's algorithm, Greatest common divisor and least common multiple and their relationship, Solution of linear Diophantine equations in two variables, Linear congruences.

9.1.1.8 PHYSICS

PHY 1201 - GENERAL PHYSICS

Forces of Nature: The principle of inertia, Inertial frames, Newton's principles of relativity, Accelerating frames and inertial forces; Gravitational mass, Accelerating frames an gravity, Gravitation, Kepler's laws of planetary motion, Newton's laws of gravitation, Determination of the value of g, Weightlessness, Collisions and conservation laws, Conservation of liner momentum, Action, reaction and impulse, Motion of a rocket. Rotational Dynamics: Angular momentum and its conservation, Moment of inertia, Gyroscopic motion and precession. **Fluids, their flow and properties:** Stream line flow, Equation of continuity, Bernoulli's theorem, Air lift and drag, Viscous forces and viscosity, Poiseuille's formula and corrections, Methods of determination of viscosity, Surface energy and surface tension, Methods of determination of surface tension.

PHY 1102 - WAVES AND VIBRATIONS

Simple Harmonic Vibrations: Composition of simple harmonic vibration (a) at right angles; Lissajous figures, (b) in the same straight line, Same period, Using amplitude phase diagram (c) in the same straight line, Different periods. Huygens' Principle and **Applications:** Laws of reflection and refraction for plane wave at plane surface, Doppler Effect. **Wave Motion:** Simple harmonic and a harmonic oscillator, Damped harmonic oscillators, Fourier analysis, Wave equation, longitudinal waves, Transverse waves, Energy consideration of waves, Reflection and refraction of waves, Helmholtz resonator, Group velocity and phase velocity**. Musical Sounds and Instruments:** Vibrations in strings, Air columns, Plates and rods, Kundt's tube.

PHY 1203 - FUNDAMENTALS OF ELECTROMAGNETISM

Electrostatistic: Review of basic concepts of electrostatics, Coulomb's law, Electric flux and Gauss' law, Potential difference, equipotential surfaces, Charge distribution on conductors, Electric images, and Point discharge. **Current Electricity:** Ohms law and its derivation using free electron theory, Temperature dependence of the resistance, Cary-Foster bridge, Rayleigh potentiometer, Kirchoff's laws, Maxwell's cyclic currents, Unbalanced Wheatstone bridge. **Electromagnetism:** Biot-Savart law, Helmholtz coils, Solenoid magnetic shell, Ampere's circuital theorem, Force on a current carrying conductor, Laws of electromagnetic induction, Eddy currents, Search coil, Self inductance and mutual inductance.

PHY 1104 - MODERN PHYSICS

Charged particles: Conduction of electricity in gases, Production and properties of X-rays, Thompson's and Bainbridge's mass spectrograph, Charged particle accelerators. **Spectra:** Rutherford's model of the atom, Bohr's model of the hydrogen atom, Explanation of line spectra, Series spectra, X-rays, X-ray spectra, Mosley's law. **Special theory of relativity:** Introduction to inertial frames, Galilean transformation equations, Invariance of physical laws, Propagation of light, Einstein's postulates, Time dilation, Length contraction, Doppler effect, Space time diagram, Lorentz transformation equations, Energy-momentum relation.

PHY 1205 - PRACTICAL UNIT

Introduction to apparatus and equipment. Handling techniques, Selection of measuring instruments and methods, Entering and calculations, some selected practical related to first year lectures.

9.1.1.9 STATISTICS

STA 1301 - Introduction to Statistics

Introduction to basic contents in Statistics: Data definition and Data collection, Summarizing data. Data visualization using tables and graphs: Histograms, Frequency polygons, Bar charts, Pie charts, Ogive, Stem and Leaf diagrams, Box plots. Describing distributions with statistical measures: Measures of Location (Mean, Median, Mode, Quartiles, Deciles, Percentiles), Measures of Dispersion (Range, Interquartile range, Standard deviation), Variation, Coefficient of variation, Moments, Skewness, Kurtosis. Handling Outliers using Bell shaped distributions. Relationships between variables: Quantitative Variables: Scatter plot, Coefficient of correlation, Simple Linear Regression, Rank correlation, Spearman's rank Correlation Coefficient. Categorical Variables: Displaying Relationships, Risk, Relative Risk, Assessing the Statistical Significance, Contingency tables. Normal and Standard Normal Distribution. Introduction to Inference: Estimation of confidence intervals, Hypothesis testing, p-value, Inference for mean of a population, Comparing two means, One-way and Two-way analysis of variance. Introduction to nonparametric test procedures using computer software: Wilcoxon and Mann Whitney test, Kruskal-Wallis and Friedman test, Spearman and Kendall rank correlations.

STA 1202 - Introduction to Probability

Counting Techniques: Sets, Partitions, Combinations, Permutations. Elements of Probability: Experiments, Sample space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Mutually exclusive events, Laws of probability, Conditional probability, Independence and Product Rules, Bayes theorem. Random Variables: Concept of a Random Variable, Discrete and Continuous random variables. Probability mass function, Probability density function, Cumulative distribution function. Definition and use of Expectation, Variance and Covariance. Moment generating function. Properties of Discrete (Binomial, Geometric, Negative Binomial, Hypergeometric, Poisson) and Continuous (Uniform, Normal, Gamma, Beta) Probability distributions. Tchebyshe's Theorem.

STA 1303 - Mathematics for Statistics

Modelling with Functions: Real numbers and functions, Data fitting with Linear and Periodic functions, Power functions and Scaling laws, Exponential growth, Function building, Inverse functions and Logarithms, Sequences and Difference equation. Limits and Derivatives: Rates of change and Tangent lines, Limits, Limit laws and Continuity, Asymptotes and Infinity, Sequential limits, Derivative at a point, Derivatives as functions. Derivative Rules and Tools: Derivatives of polynomials and Exponentials, Product and Quotient rules, Chain rule and Implicit differentiation, Derivatives of trigonometric functions, Linear approximation, Higher derivatives and approximations, L'Hospital's rule. Integration: Antiderivatives, Accumulated change and Area under a curve, The definite integral, The fundamental theorem of calculus, Substitution, Integration by parts and partial fractions, Numerical integration. Matrices and Vectors: Properties and operations, Eigenvalues and Eigenvectors.

STA 1304 - Probability Theory

Multivariate Probability Distributions: Joint/ Bivariate and Multivariate Probability Distributions, Marginal and Conditional Probability Distributions, Independent Random Variables. Expected value, Covariance and Conditional Expectation of function of random variables. The Multinomial Probability Distribution and Bivariate Normal Distribution. Finding Probability Distribution of Function of Random Variables: The method of distribution function, transformations, moments, multivariable transformation (Jacobian) and order statistics. Special Sampling Distributions: Student's t distribution, F distribution, Chi-square distribution. Concepts of Stochastic Convergence: Convergence in probability, Weal Law of Large Numbers (WLLN), Central Limit Theorem.

9.1.2 SECOND YEAR PROGRAMME OF STUDY

9.1.2.1 INTERDISCIPLINARY COURSES

IDC 2201 - English for Professional Purposes

This is a 2 credit course offered in the second year – first semester. The objective of the course is to prepare students to function in an English-speaking work environment before and after graduation. The course contents include interview skills, presentation skills, meeting skills, CVs and Cover Letters, Business correspondence including emails and official letters, Computer Assisted Language Learning (CALL), and language structure for professional communication.

IDC 2203 - Principles and Practices of Marketing

Marketing as an organizational function (introduction), Core marketing concepts, Marketing environment and environment analysis, Orientations of marketing, Consumer behavior, Segmenting, targeting and positioning, Marketing mix, Product and branding strategies, Pricing strategies, Marketing channels and strategies, Promotional strategies, Preparation of a marketing plan.

9.1.2.2 BIOLOGY

BIO 2201 - SYSTEMATIC BIOLOGY

What is systematics, Numerical taxonomy, Phylogenetics/Cladistics, Evolutionary Taxonomy, Species Concepts, Characters in Systematics: Morphological and Biochemical, Animal taxonomy: Zoological nomenclature, Plant taxonomy: History of plant taxonomy, Importance and objectives, Plant identification, Plant classification including briefly the historical development of different systems,

Plant nomenclature emphasizing certain areas in ICN, Field and herbarium techniques, Policies and regulations in field collections, Sources of taxonomic evidence including micro molecules and proteins, Historical development of plant taxonomy in Sri Lanka.

BIO 2302 - PRINCIPLES OF ECOLOGY

Nature of Ecology, Physical Environment, Aquatic environment and terrestrial environment: Soil formation and Soil characteristics; Population Ecology of Single Species: Population size estimation, Population growth, Properties of population; Quantitative population studies, Population growth and life tables; Life history- Age specific mortality, Reproductive effect, Number and size of offspring, Interactions, Competition, Limited resources and competition; Community structure and dynamics; Disturbance and succession, Food chain length and indirect effects, Nutrient cycling and Energy flow, Community dynamics. Landscape dynamics and Human ecology, Analysis of ecological data using statistical software packages

BIO 2203 - GENETICS AND EVOLUTION

Heredity: Early ideas on heredity, Mendelian and non-Mendelian patterns of inheritance, Population genetics, Genetic disorders and genetic counseling, Mutations and cancer, Barr bodies and sex determination, Determination of blood groups, Karyotyping, Translocation and behavior of chromosomes in meiosis, History of evolutionary biology, Concepts in microevolution, Concepts in macroevolution, Human evolution.

9.1.2.3 BOTANY

BOT 2201 - PLANT PHYSIOLOGY

Soil plant atmosphere continuum, components of water potential, challenges in ecohydrology and plant–water relations, mechanisms of stomatal movements, essential mineral nutrients, mechanisms of nutrient absorption, photosynthesis, C3, C4 and cam pathways, source sink relationship, subcellular transport of metabolites, oxidative phosphorylation and electron transport chain mechanisms, proton pumping, inhibitors of ATP synthesis, energetic of the TCA cycle and glucose oxidation, plant growth regulators and movements, signal perception and transduction, phytochromes and phytotrophic signal transductions, physiology of growth and development, physiology of flowering, vernalisation, seed dormancy and germination, fruit ripening, bud dormancy, structure, occurrence and biosynthesis of the plant secondary metabolites, allelochemicals and allelopathy, stress physiology, mechanisms of stress acclimation in plants, climate change and ecophysiology

BOT 2202 - ECONOMIC BOTANY

Introduction to economic botany, man's association with plants, crop plants and their domestication, centers of origin and distribution of cultivated plants, classification of plants (in general), crop wild relatives, plant breeding and propagation (in general), marketing of crops and crop products, human and animal nutrition, human food and food additives, feed for livestock, food for bees and other desirable invertebrates, timber, wood products and fuel, vegetable fibres, phytochemicals, plant toxins and their applications, human and veterinary medicinal plants, useful ferns, bryophytes, algae, fungi, bacteria and viruses, environmental and social uses, and future role of plants in relation to mankind.

BOT 2204 - PLANT PATHOLOGY

Introduction to plant pathology, development of diseases in plants, effects of pathogens on plant physiological functions, environmental effects on the development of disease, genetics of plant disease, plant disease epidemiology, methods of attack by plant pathogens, defense mechanisms of plants against plant diseases, diagnosis of plant diseases, control and management of plant diseases, plant diseases caused by fungi, plant diseases caused by bacteria, plant diseases caused by viruses, plant diseases caused by nematodes, plant diseases caused by parasitic higher plants.

9.1.2.9 ZOOLOGY

ZOO 2201 - ANIMAL HISTOLOGY AND PHYSIOLOGY

Principle types of tissues: Epithelial tissues, Connective tissues, Muscle tissues, Nervous tissues; Structure and histology of organ systems: Digestive system, Circulatory system, Urinary system, Reproductive system, Form & Function: Locomotion, Digestion, Circulation, Respiration; Regulation: sensory and nervous system, Endocrine system, Immune System, Homeostasis, Reproduction: Reproductive strategies of animals: Male and Female reproductive systems, Physiology of human reproduction.

ZOO 2203 ANIMAL BEHAVIOUR

Animal behaviour and human society, proximate and ultimate explanations of animal behaviour, testing hypotheses in animal behavior studies, hormones and neurobiology, Learning and cultural transmission, predators and antipredatory behaviour, sexual selection, mating systems, kinship, cooperation, living in groups, foraging, habitat selection, play behaviour, behavior sampling methods, use of specialized software such as UCINET and idTracker.

ZOO 2204 - FISH BIOLOGY

Taxonomy and evolution of fish, common fish species of Sri Lanka, morphometric and meristic characteristics of fish, general anatomy and physiology – digestive system, food and feeding habits, circulatory system, osmoregulation, nervous and endocrine systems, sensory systems; growth and age determination, fish behaviour, reproductive biology and life histories.

ZOO 2205 – EMBROYOLOGY AND DEVELOPMENTAL BIOLOGY

Mechanisms of Developmental Organization, Mechanisms of Developmental Patterning, Differential Gene Expression and Cell Differentiation, Cell-to-Cell Communication and Morphogenesis, Stem Cells, Gametogenesis, Fertilization, Early Development: Cleavage, Gastrulation and Axis Formation in Different Taxa (Protostome and Deuterostome Invertebrates, fishes, amphibians, reptiles, birds and mammals), Neural Tube Formation and Nervous System Patterning, Mesoderm and Its Derivatives, Endoderm Formation, Post Embryonic Development, Development in Health and Disease, Evolution and Development.

9.1.2.10 CHEMISTRY

CHE 2201- PHYSICAL CHEMISTRY II

Phase Equilibria: Terminology, Phase Rule, Thermodynamics of Phase Changes in Univariant Systems, One Component Systems, Two Component Systems, Raoult's Law, Phase Diagrams and Distillation of Binary Systems, Phase Diagrams of Non-Ideal Mixtures, Solid-Liquid Equilibria, Solid Solutions. **Quantum Mechanics**: Birth of Quantum Mechanics, Basic Principles of Quantum Mechanics, Mathematical Aspects of Quantum Mechanics, Applications of Quantum Theory to Simple Systems. **Chemical Kinetics:** Basic concepts & terminology, Rate & order of a reaction, Factors Affecting the rate of a reaction, Complex reactions, Chain reactions, Catalysis. **Surface Chemistry:** Surface properties, Liquid-gas interface, Gibbs adsorption isotherm, Solid–gas interface, Langmuir adsorption isotherm, Colloid & macromolecular chemistry.

CHE 2202 - ORGANIC CHEMISTRY II

Stereoisomerism: Optical and geometrical isomerism, Absolute and relative configurations, Asymmetric synthesis. Aromaticity, Valence bond and Molecular Orbital approach, Arenes, Alkenyl benzenes, Polyphenyls, Aromatic substitution, Aromatic nitro compounds, Aromatic sulphonic acid, Phenols and Quinones, Aromatic ethers, Aromatic carboxylic acids, Dyes.

CHE 2103 - ANALYTICAL CHEMISTRY

Quantitative Analysis: Sampling procedures, sample population, significance of representative sampling, working curve, blank solution, standard-addition technique, curve fitting, graphical analysis, Quality Control/Quality Assurance. Measurements and errors in chemical analysis, Significant figures, Statistical treatment of data, Graphical analysis. Gravimetric calculations. Titration curves. Theory of pH. Indicators and Buffers. Complexometric titrations. Chromatography: Paper chromatography, Thin layer chromatography and gas chromatography

CHE 2104 - INTRODUCTION TO BIOCHEMISTRY

The macromolecules and chemical reactions of Life; amino acids and proteins, isoelectric points, primary secondary, tertiary, and quaternary structure of proteins; protein folding and denaturation, hemoglobin structure and function, oxygen binding capacity of Hb and Mb, Bohr effect; introduction to enzymes. Simple and complex carbohydrates; monosaccharides, disaccharides, polysaccharides (structural and storage polysaccharides, homo and hetero polysaccharides). Lipids and membranes, phospholipids, glycolipids, cholesterol, membrane mobility. Vitamins and cofactors, nucleotides and nucleic acids; structure of DNA and RNA; ATP as a source of biochemical energy.

CHE 2205 - INORGANIC CHEMISTRY

Coordination Chemistry: IUPAC nomenclature of transition metal complexes, Type of ligands, Coordination chemistry of metal complexes, Isomers, Hybridization and geometry. Bonding theories of transition metal complexes, crystal field theory, ligand field theory and molecular orbital theory. Jahn Teller theory and its applications. Variation in colour, Magnetic properties and reactivity of coordination complexes. Solid state: Classification of Solids: Crystalline solids, amorphous solids, distinction between crystalline and amorphous solids, molecular crystals (Van der Waals crystal), covalent crystals, ionic crystals. X-ray Diffraction: Diffraction methods in the study of solids, Bragg equation, the use of x -rays in structural studies, single crystal and powder diffraction methods in the determination of crystal systems, unit cell parameters, number of formula units in the unit cell, application of powder diffraction data. Nuclear and radio chemistry: Atomic nucleus, radio isotopes, binding energy, nuclear stability, radioactivity and decay, nuclear reactions, effects of radiation on matter.

CHE 2106 - SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY

Introduction to the use of spectroscopic/spectrometric methods in structure elucidation, electromagnetic radiation and absorption spectroscopy. Ultraviolet-Visible spectroscopy: Electronic excitations of molecules, effect of conjugation, chromophores, auxochromes and solvent effects, Woodward-Fieser rules and Beer Lambert law. Infrared spectroscopy: Modes of fundamental vibrations, IR active, force constant, vibration coupling, Fermi resonance and absorption characteristics of functional groups, fingerprint region and instrumentation. NMR Spectroscopy: Nuclear precession, NMR Spectrometer, 1H- NMR, Chemical shift and its measurement, Factors influencing chemical shift, Long range coupling, First order splitting, Chemical exchange and splitting, Coupling constants and molecular structure. Mass spectrometry: Molecular ion, important fragmentation pathways, rearrangements of molecular ions, McLafferty

rearrangement, isotopic peaks, metastable peaks, mass spectrometer and various ionization techniques in mass spectrometry - Electro spray ionization.

CHE 2107 - ORGANIC CHEMISTRY - LABORATORY

Organic synthesis. Separation techniques: Paper chromatography, thin layer chromatography, column chromatography and organic synthesis, Solvent Extraction, Analysis of IR, UV, NMR, Mass and AA spectra.

CHE 2108 - PHYSICAL CHEMISTRY - LABORATORY

Analytical calculations, sampling, types of errors, precision, accuracy, standard deviation, error propagation, Q-test, confidential limits, graphical methods, reaction kinetics, phase equilibrium and electrochemistry: conductometry, potentiometry and colorimetry.

9.1.2.11 COMPUTER SCIENCE

COM 2301 - SYSTEMS ANALYSIS AND DESIGN

Systems: Types of organizations, types of systems. Analysis: Requirements gathering methods, Surveys, Questionnaires and interviews, STROBE, Determining System Requirements, validating requirements, User Interfaces, prototyping, Human-Computer Interaction (HCI) considerations, Feasibility study, Preparing Software Requirement Specifications, Use of CASE tools. Design: System modeling and Data modeling, Architectural design, Design patterns, Database, and Processes.

COM 2303 - WEB DESIGN

Introduction to Internet and World Wide Web (WWW): World Wide Web Consortium (W3C), History of the Internet, History of the WWW, History of SGML. HTML: Markup languages, Editing HTML, Common Elements, Headers, Lining, Images, Special characters and more line breaks, Unordered lists, Nested and ordered lists, Tables, Forms, Internal linking, Creating and using image maps, <meta> tags, Frames. Cascading Style Sheets (CSS). Web Page and Site Design: Ease of navigation and maintenance, Reducing page size. Client-Side Processing: Client-side scripting, client-side data validation, Objects, Properties, Events, and Methods. Navigation, Event handling, Forms handling, Hidden Fields, and Images. Server-Side Processing: Server-side scripting, Server-side data validation, Forms handling, and Database access.

COM 2304 - COMPUTER GRAPHICS AND IMAGE PROCESSING

Graphics Systems: Devices, Graphics software. Graphics primitives and attributes: Points & Lines, Line drawing algorithms, Circles, Other curves, Fill areas, Character generation, Colour, Two dimensional transformations: Windowing & clipping: Windowing concepts, Clipping algorithms, Window to view port transformation. Animation: Real time animation, Full animation, In-between. Image Processing: Elements of a digital image processing system: Digitizers, Display & recording devices, Digital image fundamentals: Sampling and quantization, Relationships between pixels, Connectivity. Image Enhancement: Histogram equalization, Smoothing, Sharpening, noise removal. Image segmentation: Edge detection, Boundary detection, Thresholding, Representation and description.

COM 2307 - DATA STRUCTURES AND ALGORITHMS

Asymptotic Notation and Analysis of Algorithms: The definition of O(f(n)), Definition and choice of elementary operation, Determining worst and average-case asymptotic behaviour, Correctness and Efficiency, Expressing algorithms, Growth rates. Data Structures: Containers, Dictionaries, Arrays, Lists, Lined lists, Stacks, Queues, and Trees. Sorting algorithms: Insertion, Selection, Merge, Quick, Bubble and Heap sort Algorithms, Comparison of properties of the different algorithms Searching algorithms: Binary search, Fibonacci search. Hash tables: Choosing hash functions, Collision resolution 26 techniques including open addressing, linear and quadratic probing, and chained addressing Linked lists: Dynamic implementation of lists, inserting and deleting nodes, singly and doubly linked lists, header nodes, and pass-by-reference parameters Stacks and queues: Pointer and circular array implementations, applications Trees: Non-linear data structures, terminology, general trees, binary search trees, inserting and deleting nodes, pre/in/post-order traversal Priority queues: Definition and implementation, heaps Graphs: Terminology, undirected vs directed graphs, weighted graphs, adjacency matrix vs adjacency list representations, depth/breadth/best-first traversals.

COM 2308 - SOFTWARE ENGINEERING

Scope of Software Engineering: Software crisis, Software engineering objectives, Software Development Life Cycle. Software Process Models: Waterfall model, component-based Software Engineering, Spiral Model and Prototyping, Extreme Programming, Rational Unified Process, and Agile Technology. Non-functional Requirements: Software Systems, Properties of Software Systems, socio-technical systems, Reusability, Portability, Interoperability, Maintainability, Usability, Safety, Security and Efficiency. Functional Requirements: Use–Case modeling, Use-Case Descriptions, Activity Diagrams and Entity Classes. Requirement Specification: Requirement analysis, Specification documents. Design Techniques and software architectures: Cohesion, Coupling, Sequence diagram, Collaboration diagram and detailed class diagram, software design frameworks, Computer Aided Software Engineering (CASE), introduction to design patterns, introduction to web services and service-oriented architecture. Software Implementation: software engineering best practices, Testing: White Box testing, Black Box testing, test case generation, Software Inspection, Unit, Integration and Acceptance testing, Regression testing. Software Quality: Software matrices and Measurements, Structured and Object-Oriented Approaches. Current topics: emerging software engineering concepts.

9.1.2.12 MATHEMATICS

MAT 2201-Mathematical Methods II

Orthogonal curvilinear Coordinates (OCC): Co-ordinate surfaces, Co-ordinate curves and related unit vectors, Elements of arc length, Area and volume, Cylindrical polar coordinates, Spherical polar coordinates, Grad, Div, Curl in OCC. **Vector Calculus:** Line integrals, Surface integrals, Green's theorem, Stokes theorem, Volume integrals, Divergence theorem. **Fourier Series:** Periodic Functions, Fourier Series over the interval $(-\lambda,\lambda)$, Dirichlet's Conditions, Half-range Fourier Series (Sine/Cosine series). **Laplace Transforms:** Definition and basic results, Elementary properties, Inverse Laplace transforms and its properties, Convolution theorem, Laplace transform of special functions, Evaluation of integrals, Solving ordinary and partial differential equations. **Fourier Transforms:** Infinite Fourier Sine/Cosine transforms and their inverse formulae, Finite Fourier Sine/Cosine transforms and their inverse formulae, Solutions of boundary value problems using Fourier transforms.

MAT 2302-Linear Algebra

Introduction: Vector spaces and subspaces, Null space and range, Linear independence and dependence, Linear span, bases, and dimension of a space. **Matrices:** Matrices, Operations with matrices, Linear equations, and inverse of a matrix, Rank of a matrix. **Determinants:** Expansion by cofactors, Properties of determinants, Pivotal condensation, Cramer's rule. **Simultaneous linear equations**: Linear systems, Solutions by inversion, Gaussian elimination. **Linear transformations:** Definition and properties of Linear transformations, Rank-Nullity theorem. **Eigenvalues and Eigenvectors:** Definitions of Eigenvalues and Eigenvectors, Properties of eigenvalues and eigenvectors. **Inner Product Spaces:** Abstract inner products space, norms, Distance and angle between two vectors, Cauchy-Schwarz theorem, The Gram-Schmidt orthogonalization process, Linear operator in inner product spaces, Positive definiteness.

MAT 2203-Complex Calculus

Introduction: Basic definitions, Geometric interpretation of complex numbers, Basic properties of complex number, Topology of complex plane. **Functions of Complex Variables:** Limit, Continuity, Differentiability and Analytic functions, Entire functions and the fundamental theorem of algebra, Cauchy-Riemann equations, Harmonic functions. **Integration in Complex Plane:** Contour integrals, Cauchy's theorem, Cauchy's integral formulae. **Series and Residues:** Taylor series, Singular points, Laurent's series, Classification of singularities, Cauchy's residue theorem, Evaluation of real valued integrals by means of residues. **Conformal Mappings:** Introduction to Conformal mappings.

MAT 3204-Differential Equations II

Second Order Linear Differential Equations: The non-homogeneous equation, The method of variation of parameters, Series solutions. **Existence and Uniqueness of Solutions:** Existence and uniqueness theorem, Picard iteration method. **Systems of differential equations:** The eigenvalue- eigenvector method of finding solutions, Complex roots, Equal roots, Fundamental matrix solutions. **Qualitative Theory of Differential Equations:** Introduction, Stability of linear systems, Stability of equilibrium solutions, the phase plane, Phase portraits of linear systems.

MAT 2305-Real Analysis II

Series: Infinite series, Test for convergence and divergence, Absolute and conditional convergence, Power series. **Riemann integral:** Upper and lower Riemann integrals, Improper integrals. **Functions of Several Variables:** Partial derivatives, Chain rule, Differentiation under the integral sign, Lagrange multipliers, multiple integrals, change of variables in integrals, Jacobian inverse and implicit function theorems, Iterated integrals and multiple integrals, Change of variables of multiple integrals. **Metric Spaces:** Introduction to metric spaces.

MAT 2306-Operations Research I

Introduction: Introduction to operations research, Operations research models (Probabilistic and Deterministic). **Convex analysis:** Convex combinations, Convex sets, Extreme points of a convex set, Convex polyhedron, Hyper planes, Half-spaces and polytopes, Convex functions. **Linear Programming (LP):** Mathematical formulation of the LP problem, LP in twodimensional space, Graphical solution methods, General LP problem. **The simplex method:** Simplex algorithm, Two-phase simplex algorithm, Revised simplex algorithm, LP problems with unrestricted variables, LP problems with bounded variables. **Duality in LP:** Duality in LP problems, Duality theorems, Applications of duality, Dual simplex algorithm. **Special types of LP problems:** Transportation problem, Assignment problem. **Computer Practical:** Introduction to optimization software, Excel Solver in problem solving.

MAT 2207-Algebra II

Groups: Cosets, Normal subgroups and factor groups, Direct product and semi-direct products, Homomorphisms and Isomorphism theorems, Permutation groups, Cayley's theorem, Isomorphism between dihedral and symmetric groups. **Rings:** Commutative rings, Rings with unity, Integral domains and fields, Subrings, Ring homomorphisms, Ideals and factor rings, Principal ideal domains, Euclidean domains and unique factorization domains. **Fields of Quotient:** Properties of a field, Properties of a multiplicative group of a field, Finite fields.

9.1.2.13 PHYSICS

PHY 2101 - THERMODYNAMICS AND RADIATION

Thermodynamics: Laws of thermodynamics, Carnot cycle, Internal energy and heat engines, Entropy, General thermodynamic functions, Free expansion and throttling process, Phase transformation, Thermoelectricity, Seebeck, Joule, Peltier and Thompson effects. Radiation: Blackbody radiation, Kirchoff's law, Expression for energy density of radiation inside an enclosure, Stefan-Boltzmann law, Wien's distribution law, Rayleigh-Jean's formula, Failure of classical theory, Old quantum theory and Planck's radiation formula.

PHY 2102 - ELECTROMAGNETISM

A.C. Theory: Inductance, Capacitance and Resistance, Use of vectors, Use of complex numbers, Series and parallel circuits, Power dissipation, Quality factor, Simple radio receiver, AC measurement. Electromagnetic Theory: Summary of vector algebra, Gradient, Divergence and Curl, Maxwell's equations in free space, Properties of E.M. waves, Power dissipation, E.M. waves (a) in a conducting medium (b) in an insulator, Dielectric constant.

PHY 2103 - ELECTRONICS I

Junction Diodes: Energy bands in crystals, Intrinsic and Extrinsic semiconductors, Hall effect, p-n Junction, Rectifier and voltage multifier circuits, Diode clippers and clamps, Other type of diodes. Transistor Amplifier Circuits: Junction transistor and its characteristics, Single stage amplifier, Equivalent circuits and analysis, Feed- back multistage amplifiers, Multi vibrators. Oscillators: Basic sinusoidal oscillators and non-sinusoidal oscillators. Operational Amplifiers: Properties and uses of operational amplifiers.

PHY 2204 - PHYSICAL OPTICS

Refraction of Light: Refraction at spherical surfaces, Sign conventions, Theory of rainbow, Prisms, Thin lens formula, Power of a thin lens and of a combination of lenses, Principal points and nodal points, Lens aberration. Interference: Wave nature of light, Superposition of two sinusoidal waves, Interference patterns, Intensity distribution and Mathematical representation, Coherence and incoherence, Fabry-Perot interferometer, Young's double slit, Michelson Interferometer, Fresnel's biprism, Newton's rings and wed films. Diffraction: Fraunhofer diffraction, resolving power of optical instruments, Diffraction gratings, Fresnel diffraction, Zone plate. Polarization: The nature of polarized light, Polarization by crystals, Rayleigh scattering and the colors in the sky.

PHY 2105 - QUANTUM MECHANICS

Introduction: Birth of Quantum mechanics, De Broglie hypothesis, Heisenberg uncertainty Principle, Schrodinger equation, Wave function of a quantum mechanical system, Normalization, Probability density, Expectation values, Eigen functions and Eigen values. Application of the Schrodinger Equation: A particle in an infinite potential well, finite potential step, Rectangular potential barrier, Barrier penetration.

PHY 2106 - ATOMIC AND NUCLEAR PHYSICS

Atomic Spectra: Introduction to 3–D time independent Schrodinger equation, Outline of the solution of the hydrogen atom, Comparison with Bohr theory, Spatial quantization, Larmor precession, Electron spin, Fine structure of spectral lines (L-S coupling), Normal and anomalous Zeeman effect, Selection rules, Stimulated emission. Nuclear Physics: Binding energy and the liquid drop model, Semi empirical mass formula, Fission and fusion, Nuclear reactors, Alpha particle scattering, Radioactive transformations, Secular and transient equilibria, Beta decay.

PHY 2207 - PRACTICAL UNIT

Practical related to second year lectures (e.g. Electronics, Electricity, Sound, Physical Optics etc.)

PHY 2208 - GRAPHICAL PROGRAMMING FOR PHYSICS

Introduction to graphical programming (LabVIEW), Introduction to Virtual Instruments: Front Panel, Block Diagram, Icon and Connector pane, Graphical Programming tools, Notation and names: Notation and Naming Conventions: Scalars, Constants, and Arrays, Array Operation Notations, LabVIEW Environment. Building the Front Panel: Controls and Indicators, Building the Block Diagram, Running and debugging VIs, Creating VIs and sub VIs, Loops and Case Structures, Event-Driven programming, Grouping data using Strings, Arrays and Clusters, Local and Global Variables, Graphics and Charts, Graphics and Sound, Instrument drivers.

PHY 2109 - PHYSICAL GEOLOGY

Changing earth with time, Minerals and matter, Origins and occurrence of intrusive igneous rocks, Origin and occurrence of extrusive igneous rocks, Weathering and soils, Sedimentation and sedimentary rocks, Metamorphic rocks, Absolute time and geologic time, Deformation, Earthquakes and the earth's interior, Oceans plates, Continents and drift, Movements of surface material, Underground water and running water, Energy, Useful materials.

PHY 2210 - ATMOSPHERIC PHYSICS

Introduction: Origin and composition of the Atmosphere, The distribution of Atmospheric mass and gaseous constituents, The temperature distribution and charged particles, Atmospheric **Thermodynamics:** The hydrostatic equation and its applications, Heat imbalance and weather. The Thermodynamics of Water Vapor and Moist **Air:** Equation of state, Phase change and latent heats, The Clausius–Clapeyron equation, Adiabatic process of saturated air, Thermodynamic diagram. Hydrostatic Stability and **Convection:** Upper air soundings, Altimetry, The dry moist adiabatic lapse rates, the parcel method, the slice method, Entrainment and the bubble theory.

Radiation in the Earth-Atmosphere: Geographical and seasonal distribution of solar radiation, radiative heating and cooling of clouds, Atmospheric absorption of solar radiation, atmospheric absorption and emission of infrared radiation. The Global Energy Balance: Wind in the earth atmosphere: Properties and Behavior of Cloud Particles: Atmospheric aerosol, Equilibrium vapor pressure over a curved surface, condensation nuclei and the equilibrium vapor pressure over solutions, Distribution of aerosols, growth of droplets, Equilibrium vapor pressure over ice and water, Precipitation, artificial cloud modification, Cloud types, Dew, Fog. Electrical Activities of Clouds: Meteorological instruments and observations, Humidity and stability, Weather modification, Weather analysis and forecasting,

PHY 2211 - SOIL PHYSICS

The soil in perspective: Soil forming processes, The soil profile, Major components of soil, Mineral (inorganic) and organic soil, **Physical properties of soils:** Soil texture (Particle size distribution), Methods of mechanical analyses, Particle and bulk – density of mineral soil, Pore spaces of mineral soil, Soil classification systems. **Soil water:** Properties of water, Static pressure in water, Capillary moisture, Saturated water flow, Unsaturated water flow, Water vapor movement in soil, Hydraulic grad lent. **Nature and behavior of clay:** Structure of the principle clay minerals, Genesis of clays, Physical properties of clay minerals. **Temperature and heat flow:** Modes of energy transfer, Conduction of heat in soil, Thermal conductivity of soil, Soil stress and strain; Concepts of strain and stress, Elasticity and plasticity, Failures of soil bodies. **Shear strength:** Measurements of shear strength, Shear strength of clay.

9.1.2.14 STATISTICS

STA 2301 - Theory of Statistics

Estimations: Bias and Mean Square Error of Point Estimations, Common unbiased Estimators, Evaluating the goodness of Point Estimations. Properties of Point Estimations: Relative efficiency, Consistency, Sufficiency, Completeness, and Ancillarity. Interval Estimations. Methods of Estimations: Rao-Blackwell Theorem and Minimum Variance Unbiased Estimation, The Method of Moment, Maximum Likelihood. Hypothesis Testing: Tests on population parameters, Tests on independent and paired samples, Neyman-Pearson lemma, Uniformly Most Powerful tests, Likelihood Ratio tests.

STA 2302 - Applied Nonparametric Statistics

Test the location of a population and the difference between two paired populations: one sample sign test, signed rank test. Compare two independent populations: Mood's Median test, Wilcoxon and Mann Whitney test, Wald-Wolfowitz runs test. Compare more than two independent groups: Kruskal-Wallis test. Compare three or more paired groups: Friedman test. Non-parametric correlation tests: spearman rank correlation coefficient test and Kendall statistics. Goodness of fit and Normality tests: Kolmogorov-Smirnov test, Anderson-Darling test, Lilliefors' test for Normality. Inference on contingency tables: risk ratio, odds ratio. Introduction to bootstrapping and randomization test.

STA 2303 - Applications in Statistics

Conduct statistical tests procedures in R/Python environment. Develop, debug, test and run new and available codes and algorithms. Write packages in R and develop libraries in Python. Extract and filter data from web sources. Manage and visualize large data sets.

STA 2304 - Regression Analysis

Simple Linear Regression: Concept of Simple Linear Regression, Principle of Least Squares, Significance of the Regression Coefficients, Interval Estimation, Prediction, Analysis of Variance Approach, Diagnostic and Remedial Measures, Correlation and Coefficient of Determination, Use of Matrix Algebra. Multiple Linear Regression: Complex Regression Models, Variable Selection Methods, Model Selection Procedures, Regression with Transformed Variables. Polynomial Regression. Logistic Regression. Nonlinear Regression. Applications using R Statistical Package.

STA 2305 - Multivariate Methods

Multivariate data: Estimations and hypothesis testing, Multivariate Normal Distribution, Multivariate one and two sample tests, Confidence Regions, Multivariate Analysis of Variance, Multivariate Analysis of Covariance. Multivariate Methods: Principal Component Analysis, Factor Analysis, Discriminant Analysis, Canonical Correlation, Cluster Analysis. Statistical Computing Packages utilized in handling Multivariate Data.

STA 2306 - Design and Analysis of Experiments

Review of Statistical Concepts, Sampling techniques: simple random sampling for means and proportions, stratified sampling, cluster sampling, two-stage sampling. Design and analysis techniques of experiments: One- way analysis of variance, Multiple comparison methods, Two-way analysis of variance, principles of design, completely randomized and complete block design, Latin Squares Design and its variations, Covariance Analysis, Factorial experiments, incomplete block designs, confounded factorial designs, nested designs, basic ideas in construction of design and comparison of designs.

STA 2207 - Introduction to R/Python Statistical Language

Basics in R/Python programming languages. Data structures in R/Python: Defining Variables, Data types, Importing / Exporting / Producing data, create a vector and its manipulations, Matrix and its Operations, use of Factors, Characters, Lists and Data-frames.

Functions. Numerical differentiation and integration. Data pre-processing. Drawing curves and plots. Handle Descriptive Statistics (Mean, Mode, Median, Skew, Kurtosis), Simple linear regression and correlation. Write and retrieve functions in statistical programing.

9.1.3 THIRD YEAR PROGRAMME OF STUDY

9.1.3.1 INTERDISCIPLINARY COURSES

IDC 3201 - ENTREPRENEURSHIP DEVELOPMENT

Introduction to business, the challenge of entrepreneurship, developing successful business ideas, feasibility analysis, selecting the form of ownership, building the business plan, creating a solid financial plan, managing cash flow, building a marketing plan.

IDC 3202 - STANDARDS AND QUALITY MANAGEMENT SYSTEMS

Introduction, Evolution of Quality Management Systems, application of Quality Management Systems, Type of Industries, Sri Lankan Food and Beverage industry, Available Quality standards for Sri Lanka food and beverage industry, legal and legislative framework for Local Food Industry, Accreditation process and accreditation bodies, type of audits, Quality management systems and benefits

IDC 3203 – HUMAN RESOURCE MANAGEMENT

Introduction: Introduction to HRM. **Employment Planning:** Job design and job analysis, Human resource planning. **Staffing:** Recruitment and selection, Employee placement and induction. **Human Resource Development:** Human resource development, Employee performance evaluation. **Rewards Management:** Employee compensation and welfare management. **Employee and Labor Relations:** Employee health and safety management, Employee discipline management and Employee grievances handling, Industrial relations. **Strategic Aspects of HRM:** The future of HRM.

9.1.3.2 BIOLOGY

BIO 3201 - MOLECULAR BIOLOGY

Introduction to the hereditary material of life, DNA Replication in prokaryotes and eukaryotes, DNA repair, Transcription in prokaryotes and eukaryotes, RNA splicing, Prokaryotic translation, Eukaryotic translation, Principles of protein structure, Posttranslational modifications, Regulation of gene expression in prokaryotes and eukaryotes, DNA isolation and quantification, PCR techniques and its applications and gel electrophoresis.

BIO 3102 - ECOTOURISM

Introduction to fundamental concepts in tourism, Introduction to Ecotourism, Ecotourists, Ecotourism Environments, The Ecotourism Business, Socio-economics of Ecotourism, Ecotourism Development Planning, Community based sustainable tourism

BIO 3203 - ENVIRONMENTAL POLLUTION

Environmental Pollution Introduction, Air Pollution from different sources, photochemical smog; Environmental effects due to air pollution Noise Pollution; Water Pollution, Agricultural Pollution, Solid waste and its management, Hazardous Waste Pollution, Energy and the Environment, Mitigatory Measures for environmental pollution, Economic and Legal questions and Environmental Action

BIO 3204 - BIOINFORMATICS

Introduction to bioinformatics, Molecular databases, Bioinformatics and computational biology software and freeware, Sequence alignment, Phylogenetic analysis, Functional genomics, DNA microarrays, Protein structure analysis and modeling, Motif identification, Evolutionary alignments and structure prediction.

BIO 3205 - ECOTOXICOLOGY

Introduction, history and terminology. Sources and different categories of toxins & toxicants. Exposure routes, uptake, and Elimination of toxicants. Transport and environmental fate of toxicants with particular emphasis on Bioavailability, Bioaccessibility, Bioaccumulation, Bioconcentration, Biomagnification, and Biotransformation, Mammalian toxicity tests and Standard Ecotoxicity testing methods. Factors affecting the toxicity, Hazard & Risk assessments, Environmental toxicology of engineered nano materials. Evaluation of acute and chronic toxicity, bioassays and biomarkers; Radiation and health risks.

BIO 3206 - EXPERIMENTAL DESIGN AND NON PARAMETRIC METHODS IN STATISTICS

Introduction to experimental design, Experimental study, Observational study, Experimental design phase, Statistical analysis phase, Terms and concepts in designs of experiment, Basic concepts, Comparing two means, Randomized block designs (Paired Designs), Two Factor Experiments, Multivariate Data Analysis Techniques.

BIO 3207- FIELD PROJECT

A research project, totaling to 2 Credits is assigned to each student under the supervision of a senior academic staff member. The projects can be carried out in the areas of Ecology, Biodiversity, Wildlife conservation, Fisheries Management, Aquaculture, Biotechnology, Molecular biology and Microbiology. Before commencement of the research work, a proposal should be submitted

including plan, the methodology of the project and expected outcome and presented at a seminar before a panel of examiners. Progress of the project should be presented in the 10th week of the semester and a report should be submitted to the supervisor. A dissertation should be submitted before the end of the academic year on or before an agreed date by following the given thesis guidelines. Finally the findings of the project should be presented before a panel of examiners.

9.1.3.3 BOTANY

BOT 3201 – PLANT TISSUE CULTURE

Introduction and history of plant tissue culture; Techniques, equipment and media; ***In-vitro*** **methods in plant tissue culture** such as micro propagation, callus, suspension culture, meristem and organ culture, regeneration and morphogenesis, **Role of PGRs in plant tissue culture,** Cryopreservation**, Crop improvement techniques**: haploid cultures, somaclonal variation, protoplast isolation, culture and fusion, embryo rescue cultures, Genetic transformation and production of transgenic plants. *In-vitro* production of secondary metabolites, Plant Cell Bioreactors, Current status of the application of tissue culture in Sri Lanka, Entrepreneurship in the 21st century, intellectual property protection for plants.

BOT 3202 – PRINCIPLES AND PRACTICE OF HORTICULTURE AND LANDSCAPING

Importance and limitations of horticulture, Methods in propagating horticultural plants, Techniques in improving horticultural plants, Use of plant growth regulators and related chemicals in horticulture, Manipulating tree architecture (physical control), Methods of controlling external environment, Methods employed, advantages and limitations of hydroponics, Postharvest (PH)handling of horticultural products, Introduction to legislation related to horticulture, Feasibility and future prospects of horticulture and floriculture as an industry in Sri Lanka, Focal points in landscaping, Styles of gardening, Types of gardening, Indoor gardening, Rooftop gardening, Landscaping sites of public importance, Horticulture and landscaping as a business venture

BOT 3203 – POST HARVEST TECHNOLOGY OF PLANT PRODUCTS

Postharvest physiology of plant products, biological and environmental factors involved in deterioration, postharvest losses, postharvest diseases, pre-harvest management, harvesting and field handling, harvesting maturity, packing house operations, cooling, storage, transport, marketing, handling systems of minor commodities, minimal processing and modified atmosphere packaging, emerging technologies of postharvest disease management

BOT 3204 - FLORA OF SRI LANKA

Introduction and significance of studying floristic diversity of Sri Lanka, Climatic conditions and vegetation classification of Sri Lanka, Floristic regions of the Island, Salient plant-animal interactions in the natural forests of Sri Lanka, Natural and man-made vegetation types and forest and non-forest vegetation of the island, Structure and floristic composition of main vegetation types, Special floral groups, Threats on the flora of Sri Lanka, conservation and management issues of forest products and resources.

9.1.3.4 ZOOLOGY

ZOO 3201- MEDICAL ENTOMOLOGY

Introduction to medical entomology, history of medical entomology, role of the medical entomologist, arthropods as medical importance, general characteristics of medically important arthropod orders (Orders – Scorpiones, Araneae, Acari, Thysanura, Blattodea, Hemiptera, Pthiraptera, Hymenoptera, Siphonaptera and Diptera), factors involved in vector-borne diseases, general disease cycle, methods of transmission, mechanisms by which arthropod vectors transmit parasites, characteristics of the arthropod element in the transmission cycle, biology, ecology and behavior of mosquitoes, biology, ecology and behavior of vectors other than mosquitoes (sand flies, tsetse flies, house flies, black flies, house flies, biting midges, fleas, lice, bed bugs, triatomine bugs, cockroaches, ticks and mites), major vector borne diseases in Sri Lanka and the globe, vector control, prevention and control of arthropod borne diseases, vector surveillance, emergence and resurgence of vector-borne diseases, environmental changes and vector borne diseases.

ZOO 3202 – APPLIED PARASITOLOGY

Introduction to parasitology, types of parasites, host parasite interactions, Introduction to the general biology of the parasitic protozoans, helminths, nematodes, mollusks, arthropods of humans and domestic animals. Study on morphology, taxonomy and function. Life cycles and pathogenesis of representative taxa of major groups of parasites, Importance of control of parasites, Methods of control of parasites, Field visits to Medical Research Institute to obtain field and laboratory experience of ecology and biology of parasites, Survey of parasites of domestic animals.

ZOO 3203 – ECONOMIC ENTOMOLOGY

Economically important insect and arachnid orders, definition of insect pest, population dynamics of insects, symptoms of damage caused by insect pests, economic decision levels for pest populations, insect pest outbreaks, pest management theory, evolution of pest control practices, cultural, mechanical, physical, biological, chemical, behavioural, legislative and genetically management of insect pests, hostplant resistance to insects, integrated pest management, Novel methods of insect control; use of pheromones, Sterile insect techniques, juvenile hormone and genetic engineering, Insecticide formulations and their

application, classes, mode of action, toxicity, LD50 value, and environmental impact; WHO classification of insecticides, Pesticide registration and legal requirements in Sri Lanka, biology and ecology of important insect and mite pests of rice, coconut, tea, sugarcane, selected fruit and vegetable crops and stored products, Insects of commercial value: apiculture (species of honeybees in Sri Lanka, Sri Lankan honey bee colony, division of labour in a honey bee colony, behavior of honeybees, management of a honey bee colony

ZOO 3104 - LABORATORY TECHNIQUES IN ZOOLOGY

Safety in a biological laboratory, Preparation of widely used chemical reagents, Microscopy, Microtome, Preparation of temporary & permanent slides of Parasitological and Histological specimens using single and double staining methods, Taxidermy, Preparation of permanent mounts of insects, Preparation & mounting of skeletons, Embedding biological specimens in liquid plastic, Field techniques for zoological specimen collection and preservation.

9.1.3.5 BIODIVERSITY AND CONSERVATION

BDC 3301 - CONCEPTS OF BIODIVERSITY CONSERVATION

Biodiversity and conservation: Introduction and overview of biodiversity, genetic diversity, its measure and its modifications, biogeography, zoogeography and phytogeography, species loss and extinction, theory of Island biogeography on species extinction, species inventory & its measures, global habitat classification, uses and values of biodiversity, environmental and economic valuation methods of biodiversity, threats and loss of biodiversity, invasive species and threatened species, conservation and Management of biodiversity: conservation education, ex-situ and in-situ conservation, ex-situ centers for fauna & flora conservation, conservation of rare and endanger animals, captive breeding and success story on reintroduction.

BDC 3202 - ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

An introduction to EIA, Legal and Institutional background, EIA process, methodologies for assessing Impacts, Quantification of environmental impacts techniques of valuing environmental impacts; Assessment of environmental impacts, Public participation in environmental performance reviews and the managerial response. Risk and uncertainty in EIA: The nature of uncertainty, Risk Assessment; Hazards identification, & accounting, Risk characterization & management, Human Risk Assessment, Comparative risk assessment, Ecological Risk Assessment and Risk to economic welfare.

BDC 3203 - INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS

Scope and Application Areas, Purpose and Benefits of GIS. Functional Elements of GIS, Mapping Concept, coordinate system, datum, and projection systems, Geometric Rectification. Raster Data Structure, Vector Data Structure, Data Compression Techniques. Analogue to digital conversion, Accuracy of digitization. Data from Remote Sensing Imagery, GPS based data acquisition. Data Manipulation Techniques, Spatial Analysis Techniques - statistical and geometrical, Geoprocessing Techniques, Model Development, Data Quality, Accuracy Assessment using Statistical Tests. Layout of Maps, Intelligent Maps, Charting and Tabular representation of the results using GIS

BDC 3204 WILDLIFE CONSERVATION AND MANAGEMENT

Goals and management decisions, Food and nutritional ecology, Behaviour and the dynamics of populations and communities, Population growth, Dispersal, dispersion and distribution, Population regulation, Fluctuation and competition between species, Facilitation between species, Predation, Parasites and pathogens, Consumer resource dynamics, Population census techniques, Model evaluation and adaptive management, Experimental management, Conservation theory, Conservation in practice, Wildlife harvesting, Wildlife control, Ecosystem management and conservation.

9.1.3.6 FISHERIES AND AQUACULTURE MANAGEMENT

FAM 3201 - FISHERIES AND AQUACULTURE

Fisheries - World fisheries; Regulation of International and national fisheries; Fisheries legislation, prohibited and restricted fish species for exportation; Fishing gear and crafts; Marine fisheries - costal, inshore and offshore fisheries, pelagic and demersal fisheries; Potential of Brackish water fisheries; Inland fisheries – riverine fisheries, reservoir fisheries; Basic principles of fisheries management. **Aquaculture:** History of world aquaculture and status of aquaculture in Sri Lanka; Site selection criteria for aquaculture; Production methods and systems; Water quality management; Culture of Fin fish and Shell fish; Fish nutrition and health management; Basic principles in preservation and processing of fish and fishery products.

FAM 3202 - BREEDING TECHNIQUES IN AQUACULTURE

Natural spawning of fish; Brood stock selection and management; Controlled spawning of finfish, crustaceans and mollusks; Natural spawning; Conditioning; Induction of breeding – semi artificial & artificial; Collection and incubation of eggs.

FAM 3303 - ORNAMENTAL FISH INDUSTRY

Status of world ornamental fisheries; Constraints and problems in ornamental fisheries sector; Identification of important ornamental fish varieties – freshwater and marine; Breeding of ornamental fish; Selection and management of brood stock; Stock

improvement; Use of biotechnology in stock improvement; Producing hybrids; Breeding methods of different species; Nursery management; Mud pond preparation; Stocking and harvesting; Pond Management; Important water quality parameters; establishment and maintenance of aquaria, setting up of an aquarium (including construction of tanks, filter systems etc.) Harvesting, packing and transportation; Legislation including quarantine, wild catch, export etc.

9.1.3.7 MICROBIOLOGY

MIB 3201 - INDUSTRIAL MICROBIOLOGY

Microbial growth processes and kinetics, fermentation technology- bioreactor/ fermentor design, solid surface fermentation, microbial product development, regulation and safety, enzymes biotechnology, biotransformation, Introduction to industrial processes, biofertilizers, bioherbicides and biopesticides production, biofuels and industrial chemicals - ethanol, amino acids, microbial polysaccharides, single cell oils, antibiotics, vaccines, vitamins, production of steroid hormones, vinegar production, biomass production, environmental applications, microbial analysis of water, water treatment processes, waste water treatment, solid waste compost production, soil remediation processes, heavy metal bioabsorption, biomining, biosurfactants, biopolymers and bioplastics production, biosensors and applications.

MIB 3202 - SOIL MICROBIOLOGY

Introduction, soil microbial community, soil as a special habitat, soil microbial diversity and interactions, soil microbial communities (colonization, succession, microbiostasis), survival strategies of microorganisms, quantitative microbial ecology, substrate for colonization, disease suppressive and permissive soils, overview of rhizosphere as a special soil environment, soil microorganisms and plant health and productivity, microbial inoculations of soil, modern methods of assessment of microbiota in soil

MIB 3203 - ENVIRONMENTAL MICROBIOLOGY

Bioremediation: substrate, organisms, environment, acclimation, Carbon utilization and technologies available, Microbes in biogeochemical cycling in terrestrial and aquatic environments and the influence on human, Biofilms, Microbial communities in extreme environments, energy from wastes, Solid wastes management in urban communities, Student seminars on current environmental issues, Practical assignments: sampling, isolation Strategies

MIB 3204 - FOOD MICROBIOLOGY

Introduction to food microbiology, dairy microbiology, milk testing, natural antimicrobials in milk, probiotics, prebiotics, intrinsic and extrinsic factors affecting microbial growth, microbe-food interactions, Production of fermented foods and food additives, single cell proteins, mushroom production technology, microbial food spoilage, foodborne pathogens, foodborne diseases, virus and prions foodborne diseases, conventional and rapid methods for the microbiological examination of foods, food preservation methods, food packaging, use of biopreservatives, functional foods and GM foods, food safety, Hazard Analysis Critical Control point (HACCP) plans.

MIB 3205 - PLANT-MICROBE INTERACTIONS

Rhizosphere microflora, plant growth promoting rhizobacteria (PGPR), mutualistic symbiosis, Physiological and biochemical processes in nitrogen fixation, Nodulation, genetic and molecular fundamentals of biological nitrogen fixation, Physiology and molecular biology of non-symbiotic nitrogen fixation, Fungal symbiosis- mycorrhizae, biology of mycorrhizal symbiosis in natural and agro-ecosystems, Ecology and genetics of the arbuscular mycorrhizal symbioses, Taxonomy and detection methods of mycorrhizal fungi, Methods and applications of mycorrhization, Case studies using recent publications

MIB 3206 - ANALYTICAL TECHNIQUES IN MOLECULAR BIOLOGY

Extraction, fractionation, purification and characterization of organelles and biomolecules: Extraction techniques, Centrifugation, fractional precipitation using salt and organic solvents, dialysis, column chromatography and Electrophoresis, spectroscopy: Absorbance, transmission, fluorimetry; Chromatography in analysis and preparation of micromolecules; Thin Layer and Paper chromatography, High Performance Liquid Chromatography , Medium Pressure Liquid Chromatography, Gas Chromatography with Mass Spectroscopy, Qualitative and quantitative methods of analyzing separated compounds.

MIB 3207 - IMMUNOLOGY

Introduction to immunology; concepts, terminology and overview, Cells in immunity, Innate and adaptive immunity, Maturation, activation and regulation of lymphocytes Antibodies; types, structure and function, Ig diversity, T cell receptors, Complement system, MHC molecules, Autoimmune diseases, Cytokines and Immune Function, Immunity in defense against transplantation and tumors, Techniques in immunology.

9.1.3.8 CHEMISTRY

CHE 3201 - INDUSTRIAL INORGANIC MATERIALS

Glass Industry: Raw materials and manufacture of glass; Chemistry involved in the production of glass; Types of glass; Glassy state phenomena and annealing of glass; Production of safety glasses, thermodynamics of glass formation, kinetics of crystallization and glass formation; Heat treatment of glasses, general properties and their applications. **Ceramics Industry:** Raw materials used in the ceramic industry; Chemistry involved in the production of ceramic articles and wares; Types and classification of ceramic products;

Manufacture of ceramic products, purpose and methods of glazing. **Cement Industry:** Raw materials used for cement production; Chemistry involved in the production of cement; Manufacture of cement by wet and dry processes; Types of cement and composition of clinker. Chemistry involved in the setting and hardening of cement and quality control in cement. **Gem minerals:** Optical properties: polarization, refraction, chemical characteristics, colour in gemstones. Dispersion, 'fire' and diffraction, colouring elements; allochromatic and idiochromatic materials. Origin of colour in gem materials; luminescence; Pleochroism; the dichroscope, Absorption spectra: alexandrite, emerald, enstatite, peridotite, Sin halite, ruby, blue sapphire; analytical techniques for gem testing; Artificial and synthetic gems and different treatment methods of gems. Ilmenite and extraction of TiO_2. **Graphite:** Characteristic properties of graphite, chemical composition, structure, flake graphite, vein graphite and amorphous graphite, world market of natural graphite. Spectroscopic techniques for identification, *Applications:* pencil, crucible, batteries, lubricants, paints etc. Synthetic graphite, Value addition to graphite in Sri Lanka: graphene technology. **Fertilizers:** Raw materials, types of fertilizers, nitrogenous, phosphates, potassium and mixed complex fertilizers, manufacturing processes - phosphate rocks as raw material for manufacturing P-fertilizer, super-phosphates, rhenania-phosphates, ammonia, urea. Industrial pollutants and industrial safety.

CHE 3202 - ADVANCED BIOCHEMISTRY

Enzymes: function, modes of catalysis, Michaelis-Menten kinetics, inhibition (competitive, non-competitive, uncompetitive), analysis of kinetic data (Lineweaver-Burke and Eadie-Hofstee plots), kinetics schemes for two-substrate enzyme reactions. Transport across membranes - mechanisms and energetics. Metabolism: overview, role of ATP, role of cofactors in certain reactions (explained as needed); use of isotope labelling in studying metabolic pathways; glycolysis, citric acid cycle, respiration, pentose phosphate pathway, gluconeogenesis, glycogen metabolism, photosynthesis, fatty acid biosynthesis, beta-oxidation of fatty acids, outline of amino-acid biosynthesis and degradation. Central dogma of Biology: overview of the process of translating DNA coded information into proteins. Basic separation techniques in Biochemistry: methods of disintegration of tissues/cells, separation of sub-cellular organelles, solvent and salt precipitation, paper & thin layer chromatography; column chromatography - molecular sieving, affinity, ion exchange; electrophoresis with some practical applications and ultracentrifugation.

CHE 3203 - CHEMISTRY OF POLYMERS

Polymer Structure: Definition of polymer, difference between polymers and macromolecules, classification of polymers, degree of polymerization, nomenclature and tacticity, basic structure of polymers (linear and branched polymers; moderately cross linked polymers), molecular forces and chemical bonding in polymers. Physical chemistry of polymers: Number average, molecular weight average, Z-average and viscosity average molecular weight, distribution of molecular weight, determination of molecular weight by end group analysis, osmotic pressure measurement, light scattering, viscosity measurement, Mark-Houwink-Sakurada relationship, Huggins and Kramer equation, polymer solutions, concept of solubility parameters, Flory-Huggins Theory, theta conditions and temperature, amorphous and crystalinity, determination of thermal transitions. Polymerization: Types of Polymerization - (a) Step-growth (condensation) polymerization: Mechanism and kinetics of stepwise polymerization, polydispersity index, statistic molecular weight control, (b) Radical chain (addition) polymerization: Mechanism, initiation, propagation, termination, kinetics and thermodynamics of radical polymerization, radical life time, degree of polymerization and chain transfer, ceiling temperature, (c) Cationic and ionic polymerization: similarities and contrasts in ionic polymerization, mechanism and kinetics of cationic anionic polymerization, living polymers; Radiation and photo-polymerization. Preparation, Properties and Uses: Phenol-formaldehyde resins, melamine-formaldehyde resins, urea-formaldehyde resins, epoxy resins, polyester polyamide, polyethylene, PVC, polystyrene, polyesters, polycarbonates and polymethyl methacrylate. Biological Polymerization: Introduction, nucleic acid, protein, enzymes, silk, wool, collagen, biopolymer from renewable resources, polysaccharide, starch, chitin/chitosan and alginate. **Polymer Technology**: Fibers - Introduction, production, textile fibers, Natural fibers; Plastic: overview, processing, thermoset/thermoplastic and polymer blends. **Chemistry of Natural rubber**: Latex collection & purification, materials used in rubber product manufacture and compounding of dry rubber, chemistry of other important rubbers such as neoprene, butyl rubber, nitrile rubber, synthetic rubbers and elastomers; Vulcanization (crosslinking) of rubber (vulcanizing agents and systems), effect of temperature and time on cross-linking, types of crosslinks and relevance to properties; Measurement of cure characteristics and Vulcanizate properties.

CHE 3204 - FOOD CHEMISTRY

Water in food dispersed systems (structure of water and its physical properties, water activity, properties of solutions, moisture sorption, water diffusion, capillary condensation and phase transition). **Amino acids, peptides and proteins** (denaturation of proteins, solubility and water binding, emulsifying, foaming & gelation, viscosity, texturization & fiber formation; extrusion), ninhydrin reaction, essential amino acids, curd formation and buffering action of proteins. **Carbohydrates and their functional properties** (crystallization, muta-rotation, caramelization, gelation, polyols and properties, starch and modified starch, hemicelluloses, pectosans & cyclodextrins, pectines, dietary fibers). **Lipids** (nomenclature and classification of saturated and unsaturated fatty acids, physical and chemical properties, chemical reactions, lipid oxidation and role of antioxidants). Fatty acids and triglycerides, analysis of oils and fats, sources and extraction of oils and fats, fat splitting techniques, oils and fats in the food industry, manufacture of margarine, mayonnaise and ice cream, physical aspects of emulsions, solubilization and stabilization. **Vitamins** (classification of fat-soluble and water soluble vitamins, biological role, requirement, occurrence, stability, degradation). **Enzymes** (isolation and nomenclature, catalysis, specificity, structure, enzyme cofactors, enzyme kinetics, factors influencing enzyme reactions, food modification by enzymes, immobilized enzymes in food processing). Minerals (Uses of main elements sodium, potassium, magnesium, calcium, chlorides and phosphorus. **Food additives** (chemistry of food additives: antimicrobial agents & antioxidants, acids and bases, chemical leavening systems, buffer systems and salts, chelating agents and their functions). **Food flavours** (different tastes, natural compounds & their chemistry, artificial sweeteners and their activity). Food Analysis (determination of moisture content, ash, protein, amino acid profile, fat, fatty acid composition, saponification number, iodine number, carbohydrates, energy).

CHE 3205 - ADVANCED INROGANIC CHEMISTRY I

Electronic Spectra of Coordinated Complexes: Energy levels of atoms, Russell Saunders coupling, fine structure, Zeeman and Stark effect; Ligand Field Theory - Molecular Orbital Theory, Orgel diagrams; Electronic spectra of transition metal complexes - spectroscopic terms, selection rules for electronic spectra of transition metal complexes, structural effects; Inorganic reaction mechanisms: Electron transfer reactions between octahedral complexes - inner-sphere & outer-sphere mechanisms and non-complementary electron transfer reactions. **Oragnotransition Metal Chemistry**: Introduction: Fundamentals for the organometallic chemistry - concepts of electronegative, electropositive, electron density, electron rich and electron deficient, Lewis dot structures and valences electron counts, trends in periodic table and general trends in periodic table, metal catalysis definition and function; Importance of organotransition metal chemistry, classification of ligands according to the number of electrons donated; The 18 and 16 electron rule, coordinative unsaturation; oxidation state formulation; Hapticity (ηn), geometry of transition metal complexes vs coordination number and electron configuration (dn); Metal-Ligand bonding: Ligands include CO, N_2, olefins, acetylenes, NO, group VB donors, isocyanides, carbenes, carbynes, allyls, cyclobutadienes, cyclopentadienes and benzene; Magnetic properties: types of magnetic behaviour; spin-only formula; Magnetic susceptibility, coupling, correlation of μ_s and μ_{eff} values; Electronic spectra of transition metal complexes. **Catalysis and Reaction Mechanisms of Organotransition Metal Complexes**: Reactive patters: Oxidative additions, insertion reactions-migratory insertions of ligands, reductive elimination, association, dissociation, substitution, elimination (α, β, γ, δ, ε) and oxidative coupling; Reactivity of coordinated ligands - electrophillic and nucleophillic attack; **Homogeneous Catalysis**: General remarks, olefin isomerisation, olefin hydrogenation, hydroformylation reaction, Monsanto acetic acid synthesis, water gas shift reaction, hydrosilation and hydrocyanation of unsaturated compounds, hydration of alkenes, polymerization of olefins, olefin metathesis.

CHE 3206 - CHEMICAL AND PROCESS TECHNOLOGY

Overview of Chemical industry: Role and Development of the Chemical Industry; Characteristics of the Industry: World's major chemical industries and their research and development, organizational structures, technological economics. Requirements to establish a chemical industry. **Theory of chemical Industry**: Thermodynamics and chemical kinetics of industrial processes. Stoichiometry, extent of a chemical reaction, conversion, yield and selectivity; Complex flow sheets: Mass and Energy transfer. Ficks laws of diffusion and their industrial application. Reactor theory. Batch reactor, continuous stirred reactor (CSTR), Plug flow reactor (PFR) and Hybrid reactors. **Industrial Catalysts**: Homogeneous and heterogeneous catalysts and their industrial applications, poisoning of catalysts, Theory of Industrial reactor designs. Current advances in chemical industry. Next generation industry: Theoretical aspects of reactor disasters, Industrial safety and Environmental protection. Green industrial technology.

CHE 3207 - ELECTROCHEMISTRY

Dynamic electrochemistry: Concepts of equilibrium potential, Polarization and over potential; concentration and activation polarization, polarizability of the interface, equilibrium exchange current density, rate of electron transfer, effect of potential, Corrosion and the Stability of Metals: Mechanisms of corrosion, thermodynamics of corrosion and the stability of metals, pourbaix diagrams; Ni-H_2O, Fe-H_2O and Al-H_2O systems; Kinetics of corrosion: Corrosion current and corrosion potentials, mixed potential theory of corrosion; Uses of Evan's diagrams for understanding of corrosion: Corrosion reaction under cathodic control, corrosion reaction under anodic control, corrosion reaction under diffusion control, passivation. Determination of rate of corrosion by corrosion current; Corrosion of different forms: Galvanic corrosion, crevice corrosion, pitting corrosion, erosion corrosion, stress corrosion, hydrogen damage, corrosion control methods; Inhibitors: anodic, cathodic and mixed inhibitors, Cathodic protection: sacrificial anode method, impressed current method; Anodic protection: Galvanic protection and impressed current protection. Electrochemical Energy Storage and Energy Conversion devices: Terminology related to energy conversion and storage: Primary, secondary and fuel cells; Primary batteries: Examples for them; Secondary batteries: lead acid battery etc., lithium batteries, nickel cadmium batteries, thermodynamic of batteries; Fuel cells: hydrogen oxygen cell, hydrogen air cell, bio-enzymatic fuel cells. Photo Electrochemical (PEC) cells, photovoltaic cell of first, second, third and fourth generation, hybrid solar cell. Electrochemistry in Industry: **Industrial electrolysis and electrosynthesis**; Chloro alkali process, metal extraction, metal finishing electrodialysis and its applications. Electrocatalysis and electrosynthesis; hydrogen oxidation and oxygen reduction reactions, electrocatalytic hydrogenation, rechargeable and non-rechargeable batteries, corrosion reactions, water electrolysis, electrosynthesis of selected organic compounds. Electrodeposition; current efficiency, deposit thickness, atomistic aspects of electrodeposition, pulse deposition techniques, Electroplating: Requirements for electroplating, mechanism of electrtroplating. Electro-polymerization; Polyaniline, polythiophene, applications of conducting polymers. Electrochemical technology in water treatment: The advantages and limitations of electrochemical technology; Metal ion removal from process solutions, regeneration of chromic acid electroplating baths; Electro coagulation technique for the removal of excess fluoride and hardness in water.

CHE 3208 - ENVIRONMENTAL CHEMISTRY

Atmospheric Environmental Chemistry: Composition and structure of atmosphere; Chemistry of the stratosphere and troposphere, both in the gas phase and in and on particles; Formation of aerosols; Sources, transport, and fate of pollutants; Lifetimes of chemical compounds, radicals and radical families; Gas phase and heterogeneous chemistry; Atmospheric circulation and its implications for the transport and mixing of atmospheric pollution; The climate system including discussion of the greenhouse gases, both natural and anthropogenic; Effects of air pollution on climate, water and soil. Sampling and analytical techniques for air. **Aquatic Environmental Chemistry**: The dissolved CO_2 system in natural waters, alkalinity, total C, buffering, alkalinity and titrations, precipitation and dissolution, mineral solubility and the Gibbs phase rule, complexation, redox reactions, pe and Eh, Water quality parameters, sampling of water, health aspects of pollution of water, analytical techniques for water quality; Interaction with soil (agricultural soil pollution and eutrophication) and measurements in water pollution; Irrigation water quality: Salinity/electrical conductivity, Na absorption ratio (SAR), effect of adjusted sodium absorption ratio, adjusted RNa and the permeability of soil and levels of Cl^-, carbonates, nitrates/N, sulphates, borates and phosphates. **Environmental Soil Chemistry**: The classification of common pollutants in soils. Soil pollution in

relation to soil functioning, fate and effects of pollutants in soil environments. Detailed insight into the chemistry of soils including specific surface of soil minerals, surface charge of soil minerals, chemistry of soil organic matter, soil solution-solid phase equilibrium, sorption phenomena on soils, bioavailability, Ion exchange process, reaction at limited sites, bioavailability, degradation, transport and biological/toxicological effects in soil. Introduction to Biogeochemistry: Biogeochemistry in Freshwater; Wetlands lakes and Oceans; Primary production and nutrient cycling in lakes, lake budgets, and climatic change, aquatic; The basics redox reactions in natural environments.

CHE 3209 - NATURAL PRODUCTS CHEMISTRY

Introduction to Natural products: Chemically active natural compounds, Natural sources and uses, Naturally derived medicines. **Carbohydrates**: Classification, structures and reactions of monosaccharides, disaccharides, polysaccharides. **Amino Acids, Peptides and Proteins**: classification, Zwitterion, Levels of protein structure, reactions of amino acids, peptides, structure elucidation of peptides, N-terminal identification, Carboxy terminal identification, Synthesis of Amino Acids. **Terpenes:** classification and biosynthesis of terpenes, reaction, formation of geranyl pyrophosphate, farnesyl pyrophosphate and squalene. **Steroids:** introduction, types of steroids, corticosteroids, estrogens and progestogens, androgens, synthetic steroid, biosynthesis of cholesterol, vitamin D, bile acids, corticosteroids, sex hormones, reactions of steroids. **Alkaloids:** Introduction and classification, distribution, extraction, purification and isolation of alkaloids, synthesis of nicotine, quinine. reactions of alkaloids.

CHE 3210 – RESEARCH PROJECT

The course consists of research work at the bench with a selected supervisor, submission of a final research report and some lectures on research methodology, literature search and how to write a final research report. The supervisor can be from the internal academic staff of Rajarata University of Sri Lanka or from a recognized research institute. Students are free to choose a research topic based on their research interests with the help of a supervisor. Some research topics will be made available by the academics. In order to approve the proposed project, it should be primarily chemically-based. At the end of the semester, the student must submit a comprehensive report of the work accomplished to the head of the department with the approval of the research adviser. Grade will be awarded based on the report and the final presentation.

CHE 3311 - ADVANCED ANALYTICAL CHEMISTRY

Separation and spectroscopic methods: Colorimetric and Spectrophotometric Methods: Principles of colorimetric and spectrophotometric methods, combined Beer-Lambert law and its application in UV-Vis spectroscopy, deviations of Beer-Lambert law, matrix effects and corrections. Atomic Spectrometric Methods: Atomic absorption spectroscopy (AAS), Emission spectroscopy, flame emission spectrometry, plasma emission spectrometry (Inductive Couple Plasma), applications in quantitative analysis. Ion-exchange Methods. Solvent Extraction: Distribution coefficient, distribution ratio, factors favouring solvent extraction, quantitative treatment of solvent extraction equilibria, synergistic extraction, ion association complexes, extraction reagents, solvent extraction of metals. **Chromatographic Methods**: Principles of paper chromatography (PC), thin layer chromatography (TLC), gas-liquid chromatography (GLC), Ion chromatography (IC), high performance liquid chromatography (HPLC) and Column chromatography. Electro-Analytical Chemistry: Ion selective electrodes, electro-gravimetry and Coulometric Methods of Analysis: Current voltage relationship during electrolysis, ohmic potential drop, concentration polarization, kinetic polarization, over potential; Coulometry: Chemical analysis using polarography and its limitations; Modified polarographic techniques: Normal and differential pulse polagraphy and square wave polarography. Analytical Techniques in Biochemical Analysis: Methods of disintegration of tissues/ cells, Separation of sub-cellular organelles, Solvent and salt precipitation, Column chromatography, HPLC, fast protein liquid chromatography (FPLC), spectrofluorometry, Electrophoresis with some practical applications, Ultracentrifugation. Nuclear Analytical Techniques.

CHE 3213- INDUSTRIAL CHEMISTRY

Metallurgy and Alloys: Occurrence of metals, basic concepts of metallurgy, classification of metallurgical processes, concentration of ores, extraction of metals, hydro-metallurgy, pyro-metallurgy, refining (e.g.: extraction of Al, Cu, Mg, Zn, Fe, Ti), Thermodynamics of the oxidation of metals to metal oxides, Ellingham diagrams and their applications in metal extraction. Allotropic forms of iron, Cast Iron: Iron-Iron carbide and iron-carbon phase diagrams, transformations resulting into white cast iron, grey cast iron, malleable cast iron, S. G. iron, alloy cast iron; correlation of properties to their microstructures and applications; Alloy steels, effect of alloying elements on steel properties. **Heat Treatment of Steels:** Time-Temperature-Transformation diagram, isothermal and continuous transformations; Austenitic grain size control/grain refinement, study of effects like temper-brittleness, overheating and burning of steels study of heat-treatment processes with heat treatment cycles for plain C steels such as different types of annealing. Applications of above processes for the industrial practices; Non-ferrous alloys, Al-Cu alloys, Al-Si alloys, Mg-Al alloys, Ti and its alloys, Ni based alloys and alloys for high temperature applications. **Petroleum chemistry**: Occurrence and origin of petroleum, oil exploration, production of petroleum from tar sands, oil shale and crude oil, refining and classification of refinery products, tests for petroleum products, cracking of petroleum, octane rating and methods of upgrading, petrochemicals, products from carbon black, production of alkanes and aromatics, products from alkanes, aromatics and olefins, naphtha: polystyrene and production of range of plastics, the impact of the petroleum industry on the environment.

CHE 3215 - HETEROCYCLIC AND SYNTHETIC ORGANIC CHEMISTRY

Heterocyclic Chemistry: Classes of heterocycles and heteroaromatic compounds, systems of nomenclature, aromaticity of 5- and 6-membered heterocycles, comparisons with benzene. Properties, synthesis, and reactions of pyridine, the diazines, quinoline and isoquinoline, pyrrole, thiophene, and furan, other 5-membered heterocycles, indole, purines. Synthetic Organic Chemistry. Retrosynthetic analysis, disconnections, synthons, and transforms. **Synthesis of C-C bonds**: simple approaches (alcohols from Grignard reagents and carbonyls, acetylide anions, aromatics); acid-base properties of organic molecules, generation of carbanions by deprotonation, umpolung, carbanion alkylations; use of aldol and Claisen condensations, conjugate additions, cuprates, strategies for synthesizing 1,2-, 1,3-, 1,4-, and 1,5-dioxygenated systems; synthesis of C=C double bonds, 3-, 4-, 5-, and 6-membered carbocyclic rings, Diels-Alder reaction, synthesis of C-N bonds and C-O bonds (functional group interconversions); oxidations and reductions; use of protecting groups.

CHE 3216 - ADVANCED ANALYTICAL AND ENVIRAMENTAL CHEMISTRY - LABORATORY

Calibration of glassware, direct measuring instruments and analytical instruments. Use of spectrometers; UV-visible, atomic emission and atomic absorption spectrophotometers. Electro-analytical instruments (voltammeters, ion selective electrodes) and chromatographic equipment (gas chromatograph and liquid chromatograph) from analysis of natural samples. Use of basic software packages for data processing and reporting of analytical results. Conditional effects on titrimetry and gravimetry, non-aqueous titrations. Techniques of environmental sample collection, sample preparation and sample storage. Study of inorganic and organic chemical properties of natural and wastewaters. Study of processes of generation, propagation and transformation of environmental pollutants in the geosphere and biosphere, Investigations on pollution mitigation methods.

CHE 3217 - ADVANCED INORGANIC CHEMISTRY - LABORATORY

Synthesis and analysis of the coordination complexes, UV-visible, FTIR spectroscopy of coordination complexes, characterization of synthesized organometalic compounds by UV-Visible, FTIR and voltammetry.

CHE 3218 - ADVANCED ORGANIC CHEMISTRY - LABORATORY

Phytochemical screening of natural products; chemical tests for the detection of natural products (carbohydrates, tannins, alkaloids, glycosides, steroids, saponins, terpenes and flavonoids), semi-micro scale multi-step synthesis of organic compounds, microwave synthesis of heterocyclic organic compounds, isolation, purification, quantification and characterization of natural products using chromatographic techniques (normal and reversed phase TLC, normal and reversed phase column chromatography, gel permeation chromatography, GC, HPLC, 1D, 2D NMR, IR, mass spectrometry etc), bioassay guided fractionation of natural products, chemical modification and synthesis of potentially active drugs.

CHE 3219 - ADVANCED PHYSICAL CHEMISTRY - LABORATORY

The experiments involved are in Thermodynamics of solution Chemistry; calculation of Gibbs Free Energy change of mixing, construction of phase diagram for a ternary system, Electrode potentials; Redox titrations, determination of thermodynamic parameters by electrode potential measurements, Voltammetric studies; cyclic voltammetry, chronoamperometry, Reaction Kinetics, Semiconductor Electrochemistry; construction of dye-sensitized solar cell, Molecular Spectroscopy, computer-assisted data acquisition and analysis, plot a function using Excel, plotting the solutions to the 1-D and 2-D Schrödinger equation.

CHE 3120 - CALCULATIONS IN CHEMISTRY

Coordinate Systems: Cartesian and polar coordinates in two and three dimensions; solids and surfaces. **Complex numbers:** Theory of complex numbers, Argand diagrams, de Moivre's theorem, Euler formula, complex conjugates. Techniques in integration: Standard integrals, boundary conditions and definite integrals; Gaussian integrals; method of change of variables, integration by parts. **Differential equations:** Introduction to differential equations; examples of differential equations in Chemistry, e.g., Newtonian and Hamiltonian mechanics, angular momentum, quantum mechanics, chemical kinetics and thermodynamics, transport phenomena, exponential growth and decay; techniques for solution, separation of variables, eigenfunctions and eigenvalues; first and second order linear differential equations; partial differential equations, differential operators in Cartesian and polar coordinates. Infinite series: Simple arithmetic and geometric series; convergence; Taylor series and their applications. **Probability:** Introduction to probability theory; probability distributions (normal (Gaussian), Poisson, binomial, and Boltzmann).

CHE 3121 - INDUSTRIAL TRAINING

Training in a research institute/ industry relevant to the chemistry special degree programme for a period of 4-6 weeks, under a professional supervision; Hands on experience in all aspects in functioning of an organization, Application of knowledge and skills in work place situations, Adherence to protocols, Quality management and standards, Management structure and legal framework of an organization.

CHE 3222 - ELECTRONICS AND IT FOR CHEMISTRY

Analogue Electronics: Law of Electricity; Ohm's, Kirchhoff's and power laws, voltage dividers, current splitters, direct current, voltage and resistance measurement, errors in voltage measurement. Alternative Current Circuits; Sinusoidal signals, inductive and capacitor reactance, series RC circuits, current change in RC circuits, phase relation, impedance in RC circuits, low pass and high pass filters based on RC circuits, basics of chemical impedance spectroscopy. Semiconductor devices; Transistor biasing and transistor as an amplifier, voltage gain, transistor as a switch, Introduction to field effect transistors, JFETs and MOSFETs. Operational amplifiers; Inverting and non-inverting amplifiers, comparators, current followers, summing amplifiers, op-amp based electronic ammeters and voltmeters,

semiconductor device applications in chemical industry. **Digital Electronics:** Analog and digital signals, binary numbers, digital-to-analog converters, analog-to digital converters; Basic logic gates, introduction to logic families, logic operators and Boolean laws, designing of combinational logic circuits, map methods, construction of a half adder and full adder circuits and Interfacing methods, Chemical electronic sensors. **Information Technology in Chemistry:** Spread sheet application: High resolution chemical drawing software QA/QC software, Symbolic mathematical software for chemical application and electronic laboratory book (Mathermatica, TM), Chemical data processing software.

CHE 3223 - CURRENT TOPICS IN CHEMISTRY

Presenting a research topic which demonstrate the communication skills and the calibre of understanding the subject knowledge relevant to a current topic in the field of Chemistry.

9.1.3.9 COMPUTER SCIENCE

COM 3401- DATA COMMUNICATION AND NETWORKING

Data Communications: Data Transmissions, Digital Coding, Analog Signals, Modulation and Demodulation, Digital-to-Analog Conversion, Data Encoding. Communication Media: Twisted Pair Wires, Coaxial Cables and Optical Fiber. Transmission Impairments: Forward and Backward Error Control, Error Detection and Correction. Computer Networks: Why Computer Networks? Bus, Star, Ring, Hybrid, Tree, Complete and Irregular Network Topologies, LAN, MAN and WAN. Layered Network Architecture: Layers, Protocols, Interfaces, Design Issues for Layers, OSI and TCP/IP reference models. Application, Presentation, Session, Transport, Network, Data-Link and Physical Layers. Protocols: TCP, UPD and IP Protocols, IP Addresses, IP Packet Format, Direct and Indirect Delivery, Routing, Classless and Subnet Addresses, CIDR, Transparent Routers, Proxy ARP, ARP, RARP, ICMP. Applications: Email (SMTP, POP), HTTP, FTP, TELNET and DNS. Physical Layer Interfaces: RS-232 and X.21.

COM 3303- ARTIFICIAL INTELLIGENCE

Artificial Intelligence: Introduction, Intelligent Agents; Problem Solving: Solving Problems by Searching, Beyond Classical Search, Adversarial Search, Genetic Algorithms, Constraint Satisfaction Problems; Knowledge and Reasoning: Logical Agents, First-Order Logic, Inference in First-Order Logic, Prolog, Classical Planning, Planning and Acting in the Real World, Knowledge Representation; Uncertain Knowledge and Reasoning: Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions, Fuzzy Logic; Learning: Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning , Artificial Neural Networks; Communicating, Perceiving, and Acting; Natural Language Processing: Natural Language for Communication, Perception, Robotics.

COM 3204 - INFORMATION SECURITY

Security Problem in Computing: Attacks, The meaning of computer security, Computer criminals, Methods of defense. Elementary Cryptography: Terminology and background, Mathematics for Cryptography, Symmetric encryption, Public key encryption systems, Substitution Ciphers, Transpositions, Making “Good” encryption algorithms, The data encryption standards (DES), The AES encryption algorithm, Public key algorithm, The Uses of encryption. Programme Security: Secure programmes, Nonmalicious programme errors, Viruses and other malicious code, Targeted malicious code, Controls against programme threats. Protection in General – Purpose Operating System: Protected objects and methods of protection, Memory and address protection, File protection mechanism,

User authentication. Security in Networks: Threats in networks, Network security controls, Firewalls, Intrusion detection systems, Secure E-mail. Administering Security: Security planning, Organizational security policies, Physical security.

COM 3405 - GROUP PROJECT

Students must select an application domain and submit a project proposal to the faculty. Academic staff members may also propose project topics based on current requirements and interests of the faculty. Students are expected to apply the knowledge they have gained throughout the first three years of study and come out with an innovative and useful solution.

Project identification and proposal preparation, Analysis and specification, domain specific and technology specific research and literature review, concept development, software development life-cycle selection, system design and specification, selection of technologies and CASE tools for implementation, use of software engineering best practices, system implementation and testing, system deployment, report writing, research paper writing and publication, project demonstration, project marketing.

COM 3306 - OPERATING SYSTEMS

Operating System Principles: Process Management, Memory Management, Input/ Output Management, File System Design Concepts and Features: Single–Tasking OS, Batch Processing OS, Multi–Tasking OS, Real–Time OS Advanced Functions of Operating Systems: System Calls, Ready/ Block State Transitions, Advanced Features of IPC, Implementation of Semaphores, Remote Procedure Call, Deadlock Recovery, Fault Handling in Memory, Cache Management, Interrupt Handling, Stable Storage Synchronization and Communication: Mutual Exclusion in Distributed Systems, Clock Synchronization in Distributed Machines, File systems design, Protection and security, Fault tolerance, OS structure and extension techniques

COM 3307 - EMBEDDED SYSTEMS

Introduction: Embedded systems overview, Design challenge – optimizing design metrics, Embedded system technologies: Processor technologies, IC technologies, Design Technologies; General Purpose Processors and special purpose processors; Embedded system programming: MIPS/SPIM Assembly Programming, Embedded Programming in C, Designing embedded systems: Designing Custom

Single Purpose Processors, Using Standard Single Purpose Processors, Embedded system development life Cycle, Peripheral interfacing: Industry Standard Buses: RS232, I2C, SPI,CAN, Microcontroller architecture: RISC, CISC, Intel 8052, PIC, ARM, IO, Memory, Microcontroller applications: Introduction to Microcontrollers & PIC Microcontroller based interfacing.

9.1.3.10 MATHEMATICS/ INDUSTRIAL MATHEMATICS

MAT 3201 - Graph Theory

Introduction to Graphs: Varieties of graphs, Walks and connectedness, Degrees, The problem of Ramsey, External graphs, Intersection graphs, Operations on graphs. Blocks: Cut points, bridges and blocks, Block graphs and cut point graphs. **Trees:** Characterization of trees, Centers and centroids, Block-cut point trees, Independent cycles and co-cycles, Matroids. Connectivity: Connectivity and line-connectivity, Graphical variations of Menger's theorem, Partitions. **Traversability:** Eulerian graphs, Hamiltonian graphs. **Line Graphs:** Some properties of line graphs, Characterization of line graphs, Special line graphs, Line graphs and traversability, Total graphs.

MAT 3207 - Financial Mathematics

An Introduction to Options and Markets: Financial instruments, Options, Futures, Forward contracts, Pay offs, Traders. Interest and **Present Value Analysis:** Interest rates, Present value analysis, Rate of return. **Geometric Brownian Motion:** Brownian motion, Geometric Brownian motion. Pricing Contracts via Arbitrage: Put-call parity, Examples of pricing via arbitrage. Arbitrage Theorem: The Arbitrage theorem, The Multiperiod binomial model. **Black Scholes Option Pricing Formula:** Introduction, The Black-Scholes formula. **Portfolio optimization:** Introduction, Portfolio value at risk, Efficient portfolio with two risky assets, Optimal portfolios.

MAT 3303 - Mathematical Statistics I

Distribution of Random Variables: Introduction, The probability set function, Random variables, The probability density function, The distribution function, Mathematical expectation, Chebyshev's inequality. Conditional Probability and Stochastic Independence: Conditional probability, Marginal and conditional distributions, The correlation coefficient. **Some Special Distributions:** The Binomial, Trinomial and Multinomial distributions, The Poisson distribution, The Gamma and Chi-Square distributions, The Normal distribution, The Bivariate normal distribution. Distributions of Functions of Random Variables: Sampling theory, Transformations of variables of discrete and continuous types, the t and F distributions, Extensions of the Change-of-variable technique, Distributions of order statistics, The Moment generating function technique, The distributions of $\bar{X}$ and $\frac{nS^2}{\sigma^2}$, Expectations of functions of random variables. Limiting Distributions: Stochastic convergence, Limiting Moment-generating functions, The Central Limit Theorem.

MAT 3206 - Operations Research II

Advanced Linear Programming: Dantzig-Wolf decomposition algorithm, Goal programming. Multi-objective Linear Programming. **Integer Programming:** Model formulation, Cutting plane algorithms (Dual Fractional Integer Programming, Dual Fractional Mixed Integer Programming), Branch and bound algorithms (Land & Doig Method and Dakin's Method). **Computer Practical:** Introduction to Lingo optimization software to solve optimization models.

MAT 3202 - Numerical Analysis II

Numerical Solutions to Systems of Linear Equations: Introduction to systems of linear equations, Gaussian elimination, and backward substitution. **Numerical Solutions to Systems of Non-linear Equations:** Fixed points for functions of several variables, Newton's method, Quasi-Newton methods, Steepest descent techniques. **Initial-value Problems for Ordinary Differential Equations:** The elementary theory of Initial-value problems, Euler's method, Higher-order Taylor methods, Runge-Kutta methods. Boundary-value **Problems for Ordinary Differential Equations:** The linear shooting method, The shooting method for nonlinear problems, Finite-difference methods for linear problems, Finite-difference methods for non-linear problems. **Computer Software:** Usage of MATLAB software in numerical analysis.

MAT 3305 - Mathematical Statistics II

Estimation: Point estimation, Measures of quality estimations, Confidence intervals of means, Confidence intervals for difference of means, Confidence intervals for variances, Bayesians estimates. Statistical Hypotheses: Certain best tests, uniformly most powerful tests, Likelihood ratio tests, **Other statistical tests:** Chi-Square tests, The distributions of certain quadratic forms, A test of the equality of several means, Noncentral$\chi^2$and Noncentral F , The analysis of variance. **Nonparametric Methods:** Confidence intervals for distributions quantiles, Tolerance limits for distributions, The sign test, A Test of Wilcoxon, The equality of two Distributions, The Mann-Whitney-Wilcoxon test, Distributions under alternative hypotheses, Linear rank statistics. **Sufficient Statistics:** A sufficient statistic for a parameter, The Rao-Blackwell theorem, Completeness and uniqueness, The exponential class of probability density functions, Functions of a parameter.

MAT 3204 - Partial Differential Equations

Introduction to First Order Partial Differential Equations: Introduction, Classical solutions, Initial conditions and boundary conditions, Linear equations, Non-linear equations. **Introduction to Second Order Partial Differential Equations:** Equation with constant coefficients, Equations with variable coefficients, Heat equation, Wave equation, Navier-Stokes equation, Schrodinger equation, Boundary value problems in rectangular and cylindrical coordinates. **Integral Transforms:** Laplace transforms, Fourier transforms, Hankel transforms, Fourier method for partial differential equations.

MAT 3308 - Non-linear Programming

Introduction: Non-linear models formulation, Lagrangian method, Kuhn-Tucker conditions, Quadratic programming, Separable programming, Fractional programming, and Geometric programming, Direct search and gradient method (One-dimensional search and Multi-dimensional search). **Computer practical:** Introduction to MATLAB Optimization toolbox to solve non-linear models, Excel Solver and LINGO optimization software to solve non-linear models.

MAT 3309 - Network Optimization

Introduction to Network Optimization: Review of graph theory. Minimal-cost Network Flows: The minimal-cost network flow problem, The simplex method for network flow problems, Finding an initial basic feasible solution, Network flows with lower and upper bounds, Degeneracy, Cycling and stalling, Generalized network problems. The Out-of Kilter Algorithm: The Out-of Kilter formulation of a minimal-cost network flow problem, Strategy of the Out-of-Kilter algorithm, A labeling procedure for the Out-of-Kilter algorithm, Relaxation algorithms. **Multi-commodity Flow and Network Synthesis Problems:** The Maximal flow problem, The shortest path problem, Multi-commodity flows, Synthesis of multi-terminal flow networks. Computer Practical: Introduction to Excel Solver to solve network optimization models.

MAT 3110 - Seminar

Scientific Writing: Searching the scientific literature, scientific writing style, writing research papers, proposals, projects, and thesis components. Scientific Presentation: Preparing scientific presentations, presentation of data, using visual aids and using word processing, spreadsheet, and presentation software, oral and poster presentations, Ethics in research and scientific writing, Plagiarism. **Conducting a Project:** Students are formed into groups and each group is expected to conduct a project based on an industrial application. Completion of the project of each group is expected to write a project report and make a presentation based on the project.

9.1.3.11 PHYSICS

PHY 3202 - MATHEMATICAL METHODS FOR PHYSICISTS

Coordinate Systems: Cartesian, Spherical, cylindrical, Matrices and determinants: Orthogonal Matrices, Hermitian Matrices, Unitary Matrices, Diagonalization of Matrices, Normal Matrices, Eigen values and Eigen vectors. **Complex Numbers:** Cauchy-Riemann condition, Cauchy's integral formula for derivatives, Taylor's expansion, Laurent expansion, Singularity. Infinite Series: Convergence Tests, Alternating Series, Series of Functions, Power Series, Alternative series (Leibnitz test), Asymptotic Series. Differential Equations: Ordinary and Partial differential equations, Riemann Integral Functions. Fourier series: General properties of Fourier series, application of Fourier series, Fourier Transform convolution theorem, Laplace transforms. Special Functions: Hermitian differential operators, orthogonality and completeness of Eigen functions, Legendre polynomials, generating functions, recurrent relations, spherical harmonics.

PHY 3203 - PHYSICAL OCEANOGRAPHY

Introduction, Ocean dimensions, Shapes and bottom materials, Sea-floor dimensions, Scales, Shore, Continental shelf, Deep sea bottom and sounding. Physical properties of sea water, Salinity and conductivity, Properties of pure water, Salinity and conductivity, Temperature, Density, Effect of salinity and temperature on density, Other characteristic properties, Sound in the sea, Light in the sea, Color of sea water. Waves in the ocean, Physical distribution of water, Characteristics in the oceans, Density distribution, Temperature distribution, Salinity distribution, Water, Salt and Heat budget of the ocean, Circulation and water masses of the oceans, Indian ocean, Pacific Ocean, Equatorial circulation, Easterly boundary currants and E1-Nino, Atlantic Ocean, Southern oceans, Coastal oceanography, Coastal upwelling, Estuaries.

PHY 3207 - ENERGY RECOURSES

Fossil Fuel and Petroleum: Origin, Mining and refining, Industries based on petroleum products. **Batteries and Fuel Cells:** Primary and rechargeable batteries, Electrode materials, Ionically and electronically conducting polymers, Polymer composite materials, H_2-O_2 fuel cells, Methanol fuel cells etc. Solar Energy: Solar spectrum, Energy harvesting materials (semiconductors, dyes, chlorophyll etc.) Physics of Semiconductor Solar Cells: p-n junction solar cells, Hetero junction, Interface and thin film solar cells; Dye sensitized nano crystalline solar cells, Dye sensitized p-n solar cells, Solar radiation conversion efficiency, Photodecomposition of water, H_2 gas clean fuel. **Nuclear Energy:** Fission and fusion, Waste handling. Hydro power, Wind power, Tidal power**.**

PHY 3208 - PROJECT

Students will carry out individual projects under the supervision of senior academic staff members.

PHY 3209 - SOLID STATE PHYSICS

Inter-atomic bonds: Ionic, Covalent, Metallic and Van der Walls bonds, Crystal structure, Space lattices, Crystal systems, Indices of planes and directions, The common crystal lattice structures, Reciprocal lattice concept, **Lattice imperfections:** Lattice vibrations, Point defects, Line defects and plane defects, Amorphous materials, **Structure determinations:** X-ray, Neutron and electron diffraction, Electron in solids, The effective mass of electron, Band theory of solids, The Kronig-Penny model.

PHY 3210 - PROPERTIES OF MATERIALS

Conducting properties of materials, Semiconductors and Super-conductors, Mechanical properties of materials; Mechanical tests, Elastic and plastic behavior, Fracture; Brittle and Ductile fracture and fatigue failure, Creep, Optical properties; Absorbance, Color, Luminosity, Photosensitivity, Scattering.

PHY 3211 - MEDICAL PHYSICS

Introduction to Medical Physics: Review of atomic and nuclear physics: Various attenuation coefficients, X-rays: X-ray tubes and generators, X-ray production and properties, Imaging with X-rays and film processing, X-ray imaging modalities (General radiography, Mammography fluoroscopy and computed tomography), Image quality influence factors, methods of optimizing quality and image system capabilities. Introduction to nuclear imaging: gamma camera, Basics of radiotherapy: Teletherapy machines, simple treatment planning, dosimetry principles and detectors. Radiobiology: Basics of radiobiology, radiation protection. Physical basis of light: Visible light, IR, UV and Laser, Interaction of light with biological systems, transillumination and endoscopy. Lasers: Principles of laser production, types of commercially available lasers and their features, biological effects caused by lasers, Laser instrumentation, Clinical applications of lasers and laser hazards. UV radiation: Production of UV radiation, Interaction with human body, Biological effects of UV radiation. Ultrasound: Basic physics behind diagnostic ultrasound/ultrasound wave, Properties of ultrasound (US), Generation and reception of US, Imaging with US and scanning methods, types of US scanners (A-mode, B-mode, M-mode) and their features, Typical applications of US in diagnostic radiology and biological effects. Medical applications of visible light. Fiber optics: Theory and medical applications. Nuclear magnetic resonance: Nuclear magnetic resonance, Nuclear magnetic resonance pulse sequences, relaxation processes and their measurement, Nuclear magnetic image acquisition and reconstruction, MRI Instrumentation, MRI safety.

PHY 3212 - ELECTRONICS II

Bipolar Junction Transistors: Advanced BJT circuits, Ebbers-Moll equation, **Field Effect Transistors:** Junction FETs, Characteristics, comparison with BJT, Applications: Amplifier, Switch, current limiters, Voltage controlled resistors. **MOSFET logic Switches:** PMOS, NMOS, CMOS. Digital Electronics: decimal, binary, octal, hex and base conversion. Codes: BCD, Gray, ASCII and parity. Basic digital logic gates and truth tables. **Boolean Algebra:** Postulate and theorems, equation reductions and circuit implementations. DeMorgan's theorems - NAND and NOR gates and implementation. Sum of Product circuits. Karnaugh map and circuit simplification. Multiplexers, demultiplexers, decoders. 12 Basic SR Flip-Flops, D Latch, Clocked and Edge Triggered D Flip-Flops. Edge Triggered JK Flip-Flop. One Shot Multivibrators and 555 type timers. Ripple Counter. Sequential Logic - Synchronous Counters, Shift Registers and basic State Machine concepts. Memory Systems– RAM, ROM, PROM, and EPROM.

PHY 3215 - PRACTICAL UNIT

Electrical & electronics measurements and measuring instruments, diode characteristics, diode applications, filter circuits, transistor characteristics, transistor applications, microcontroller programming, diffraction, scattering, characteristics of solar cells, material characterization.

9.1.3.12 STATISTICS

STA 3401 - Statistical Learning

Linear Regression: Comparison of Linear Regression with k-nearest neighbors. Classification: Logistic Regression, Linear Discriminant analysis. Resampling Methods: Cross-validation, the Bootstrap. Expectation and Maximization (EM) algorithms. Linear Model Selection and Regularization: Subset Selection, Ridge Regression and the Lasso, Principal Components Regression and Partial Least Squares. Nonlinear Models: Polynomial Regression, Step Functions, Basic Functions, Regression and Smoothing Splines, Local Regression, Generalized additive models. Tree-based methods: The basics of Decision Trees, Random Forests, Boosting. Support-vector machines (SVM): Support Vector Classifier, Support Vector Machine, ROC Curves, SVM with multiple classes, applications to data. Unsupervised Learning: Principal Component analysis, Clustering methods (k-means and hierarchical), applications to data.

STA 3402 - Introduction to Neural Networks and Machine Learning

Biological function of a Neuron; Neural Network Basics: Basic Neural Network architectures (Neuron Model and Network Architecture, Perceptron Learning Rule, Supervised Hebbian Learning, Backpropagation, Associative Learning, Competitive Networks), learning algorithms for applications in pattern recognition, image processing and computer vision. Supervised Learning: Parametric/Nonparametric algorithms, Support Vector Machines, Kernals, Neural Networks; Unsupervised Learning: Clustering, Dimensional Reduction, Recommender Systems, Deep Learning; Reinforcement Learning: The agent environment framework, success of reinforcement learning, Bandit problems and online learning, Markov decision processes.

STA 3303 - Independent Study

Individual research project in a field of special interest under the supervision of a Faculty member, a substantive paper or a written report containing significant analysis and interpretation of a previously approved topic. Prior consent of the instructor is required.

9.1.4 FOURTH YEAR PROGRAMME OF STUDY

The course units of fourth year of Honours degree programmes are given below.

9.1.4.1 INTERDISCIPLINARY COURSES

IDC 4201 - SCIENTIFIC COMMUNICATION

The importance of scientific communication, types of scientific communications, types of scientific papers, structure of a scientific paper, citation styles and bibliographic software, selecting a journal, the peer-review process, responding to reviewer comments, ethics of scientific publishing (COPE), Oral communication and presentation aids, preparing effective PowerPoint presentations and effective delivery of presentations, handling questions, structure of a proposal and effective proposal writing, preparing a budget and budget justification.

9.1.4.2 BIODIVERSITY AND CONSERVATION

BDC 4201- ENVIRONMENTAL POLICIES AND MANAGEMENT

Principles of environmental Management, current practices in environmental protection and legislation, Policy formulation process in Sri Lanka, Environmental conservation and management policies in Sri Lanka, System of granting approval for development projects and high polluting industries in Sri Lanka, Environmental Protection licensing (EPL) process, Environmental standards, Environmental management under provincial administration, National legislation, International conventions: Biodiversity convention: Current practice in conservation, application of biodiversity convention in Sri Lanka.

BDC 4202 - WETLAND CONSERVATION AND MANAGEMENT

Basic Concepts on Wetland Ecology, Wetland characteristics, Wetland vegetation and adaptations, Wetland biogeochemistry with special reference to the importance of inorganic and organic compounds transformations in wetlands, Wetland zonation, Wetland functions, values and economic benefits, Major threats to wetlands, Biological diversity of wetlands, Factors affecting animal and plant diversity in wetlands, Monitoring of Wetlands, Managing hydrology; Control of Siltation and Pollution, Restoration of degraded wetlands and wetland creation, along with the construction of wetlands for pollution abatement. Wetland conservation and management and Sustainable use of wetlands.

BDC 4203 - FOREST CONSERVATION

Introduction to the Forestry Sector of Sri Lanka and Overview of Natural Forests in Sri Lanka, Multiple-Use Natural Forests: Services and Products, Non-Wood Forest products, Wood Products and Timber Processing, Assessment of Forest Resources and Inventory Process, Forest Policy, Legislation and Institutions, Conservation of Biodiversity in Forests, Forestry in Soil and Water Conservation, Forest Protection and Forest Influences, Carbon Trading and Sequestration, REDD and REDD+ programmes, Agroforestry and Agroforestry Systems, Social Forestry and Related Systems, Forest Economics and Marketing, Silviculture and Silvicultural Systems, Tree Improvement Methods, Forest Plantations, Home gardens and Non-Forest Tree Resources, Forestry Research, Extension and Future Trends in Forestry.

BDC 4204 - ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

Introduction to Advances in GIS Technology, Accuracy of Geo-spatial Databases, Uncertainty of Geo-spatial data, locational Uncertainty Processing, attribute uncertainty processing, S-Buffer Model; Digital Elevation Models. The Analysis of Discrete Entities in Space: Operations on attributes of Geographic Objects, Cartographic operations, Pattern Detectors: Nearest neighbor analysis, Application; Characteristics of Linear Features: Network analysis, Directional statistics; The spatial pattern descriptors, Spatial indices, Customization and Automation in GIS: Customization to end user needs, Introduction to programming in GIS, Automation in GIS functionality; GIS on Internet: Scope and concept of Open GIS, Developing an internet GIS.

BDC 4205 - ECONOMICS OF BIODIVERSITY

Definitions for Economics, utility, goods, services, demand, supply, consumer, producer, factors of production. economics as a social science, rationality, Economic Behaviour in developing countries and in developed countries, culture, institutions and mentalities, Evolution of the discipline Economics, Market equilibrium, producer surplus, consumer surplus, price mechanism, central planned economies and mixed economies, income, consumption, savings and investments, MPC, MPS, APC and APS, theories of consumption in general and with reference to Biodiversity, main economic schools of thought: classical, neo-classical, Keynesian, New Classical and New Keynesian.

BDC 4206 - LIMNOLOGY AND CONSERVATION OF AQUATIC RESOURCES

Ecological concepts and function of various aquatic systems (inland and marine), Light energy, thermal regime, water movement and mixing process, nutrient cycle and budget, trophic dynamics and biological productivity in aquatic systems, Pollution of aquatic system: water quality, degradation, indicators of water pollution, pollution mitigating measures, conservation of aquatic resources and biodiversity

BDC 4207 - COASTAL AND MARINE BIODIVERSITY CONSERVATION

Coastal communities and their ecological and economic importance, Problems and threats associated with coastal and marine ecosystem, Impacts of anthropogenic activities, Natural events including, Tsunamis and tidal waves on coastal production systems, Protected marine organisms of the Sri Lankan Sea, Use of GIS and remote sensing and mapping on the evaluation and assessment of coastal resources, Participation and role of the government, NGOs and the coastal communities in the sustainable utilization,

management and governance of coastal resources, an overview of laws relevant to biodiversity and environmental protection of coastal ecosystems.

BDC 4208 - CURRENT TOPICS IN BIODIVERSITY CONSERVATION

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

BDC 4209 / FAM 4209 / MIB 4209 - IN-PLANT TRAINING

Training in a research institute/industry/business venture relevant to the Degree Programme, under a professional supervision; Hands on experience in all aspects in functioning of an organization, Application of knowledge and skills in work place situations, Adherence to protocols, Quality management and standards, Management structure and legal framework of an organization.

BDC 4810 / FAM 4810 / MIB 4810 - RESEARCH PROJECT

A research project is assigned to each student under the supervision of a senior academic staff member. The projects can be carried out in the areas of Ecology, Biodiversity, Wildlife conservation, Fisheries Management, Aquaculture, Biotechnology, Molecular biology and Microbiology. Before commencement of the research work, a proposal should be submitted including plan, the methodology of the project and expected outcome and presented at a seminar before a panel of examiners. Progress of the project should be presented in the 10th week of the semester and a report should be submitted to the supervisor. A dissertation should be submitted before the end of the academic year on or before an agreed date by following the given thesis guidelines. Finally, the findings of the project should be presented before a panel of examiners.

9.1.4.3 FISHERIES AND AQUACULTURE MANAGEMENT

FAM 4201 - FISHERY RESOURCES MANAGEMENT

Marine fishery resources – Deep sea, offshore and coastal Resources; Brackish water fishery resources – Lagoons and estuaries; Inland fishery resources – Streams, rivers, reservoirs, perennial and seasonal tanks; Importance and constraints in fish stock assessments; Development of empirical models for fish yield predictions; Population dynamics; Overfishing; Community based fisheries management; Co-management of fishery resources; Role of legislature in fisheries management, use of GIS in Fisheries; Pollution and its effects on fisheries and aquaculture.

FAM 4202 - AQUACULTURE ENGINEERING

Hydrological information for design and operation of aquaculture systems, Soil engineering for design of ponds, canals and dams, Design and construction of fish farms, ornamental aquatic plant production centers and maintenance of aquafarms, Pond construction engineering, design and construction of fish cages, tanks, and other impounding structures, hatchery units, classification and design of different types of water pumps, types of aeration and filtration devices used in ponds, their design and construction. Waste management techniques in aquaculture production, biofiltration system used in ponds, type of aerators, degassing etc. Water recirculation systems

FAM 4203 - AQUAFARMING OF MACROPHYTES

Course Capsule: Introduction to aquatic and amphibious plants and ornamental aquatic plants, Ornamental properties and adaptations of aquatic and amphibious plants, Water bodies of Sri Lanka, Zonation of Lentic water bodies and their plant diversity, Native and introduced aquatic plants of Sri Lanka, Marine angiosperm and other angiosperms in saline and brackish waters, Aquatic weeds and Invasive Alien Species (IAS): their natural balance and governing factors in natural habitat; Menace of aquatic weeds, Major aspects in the management of aquatic weeds, Flowering and foliage ornamental aquatic plants and their important economic and ecological aspects, Methods of propagating aquatic plants, Designing aquaria, ponds, water gardens and terrariums, Legislation, Quarantine, feasibility and future prospects of ornamental aquatic plant industry in Sri Lanka. Seaweeds: their biology, introduction including history, methods of seaweed farming and harvesting, nutritional value, medicinal importance and industrial uses, Necessity, feasibility and future prospects of seaweed farming in Sri Lanka.

FAM 4204 - FISH NUTRITION AND GROWTH

Principles of nutrition, nutrient requirements of different fish species, essential nutrients and their functions, artificial and natural feed types, deficiency symptoms, nutritional bioenergetics, vitamins and mineral mixtures, nutrient sources, evaluation of ingredients, toxins in ingredients, larval feeds, grow out feeds, supplemental feeds, complete feeds, brood stock feeds, culture of different live feed types – Artemia, Daphnia, rotifers etc., feed formulation, feeding regimes and feed manufacture, problems in storage and preventive measures, diet analysis and nutritional evaluation, feed management, feeding methods, feeding rates and supplemental feeding

FAM 4205 - FISH HEALTH MANAGEMENT

Principles of fish health management; Economic importance of health management; Predisposing factors; Environmental stress; Introduction to infectious and non-infectious disease agents and processes in cultured organisms; Infectious diseases: bacteria, fungi, viruses, parasites, host pathogen and environmental relationship; Clinical signs, behavioral changes and pathology; Disease diagnosis,

microbiological and other techniques involved in diagnosis; Prevention of diseases – tracing and eliminating sources of infection, disinfection; Control-isolation, quarantine; Non-infectious diseases - dietary deficiencies, genetic abnormalities, neoplasms; Treatment methods, disease management.

FAM 4206 - POSTHARVEST TECHNIQUES IN FISHERIES

Principles of fish health management; Economic importance of health management; Predisposing factors; Environmental stress; Introduction to infectious and non-infectious disease agents and processes in cultured organisms; Infectious diseases: bacteria, fungi, viruses, parasites, host pathogen and environmental relationship; Clinical signs, behavioral changes and pathology; Disease diagnosis, microbiological and other techniques involved in diagnosis; Prevention of diseases – tracing and eliminating sources of infection, disinfection; Control-isolation, quarantine; Non-infectious diseases - dietary deficiencies, genetic abnormalities, neoplasms; Treatment methods, disease management

FAM 4207 - FISHERIES SOCIOECONOMICS

Introduction to economics; factors affecting the economics of aquaculture and fisheries in micro and macro scales; production economics and marketing socioeconomics; investment planning and economic feasibility analysis; farm income concept and productivity valuation; farm budgeting and cash flows; record keeping and accounting; profit maximization, laws, regulations and constrains; bioeconomic analytical models; current and potential markets, evaluation of the market potential, market development and entry. Sociological factors in the fisheries sector development.

FAM 4208 - CURRENT TOPICS IN FISHERIES AND AQUACULTURE MANAGEMENT

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

9.1.4.4 MICROBIOLOGY

MIB 4201 - APPLIED MYCOLOGY

Morphological, physiological and biochemical characteristics of yeast and filamentous microscopic fungi important in the food industry , their uses and undesirable effects such as deterioration of food, contamination and mycotoxin formation; fungi as agents of biodeterioration in cultural artifacts, role of fungi in medical biotechnology and biodegradation of organic matter, strategies for development of mycoherbicides, biological control of fungal diseases on crops, Symbiotic associations of fungi, types of mycorrhizae, functions of mycorrhizal fungi in forest and agricultural ecosystem, commercialization of arbuscular mycorrhizal biofertilizers, fungi as plant growth promoters and plant disease suppressors, marine and fresh water fungi and their applications, review of nutritional and medicinal value of fungi, mushroom production technology, biocontrol of mushroom pathogens, introduction to lichens, lichens as bioindicators, medicinal value of lichens and lichenin acids, modern trends in applied mycology.

MIB 4202 - MEDICAL MICROBIOLOGY

Normal microbial flora, introduction to bacterial diseases, Different groups of bacterial pathogens, medically important fungi, specimen collection and processing, isolation and identification of pathogenic bacteria, Antibiotics Susceptibility Testing (ABST), Mode of Action of Antimicrobial Drugs, Disposal of microbiological waste.

MIB 4103 - MOLECULAR MICROBIOLOGY

Quorum sensing, Bacterial two component systems, Bacterial secretion, Protein trafficking in eukaryotic microbes, Bacterial chemotaxis, Sporulation as a means of coping with environmental stresses, Bacterial DNA repair systems, Drug resistance mechanisms, Signal transduction cascades in microbes, Avoidance of host defense, New developments in the field of Molecular Microbiology.

MIB 4204 - VIROLOGY

History of virology, Structural components of viruses and their functions, Importance of viruses, Virus classification, Infection cycle emphasizing different mechanisms in replication of viral genome, other subcellular infectious agents, Sequential gene expression in phages, Molecular mechanism of lytic, lysogenic decision, Plant viruses, Retro viruses, Immerging viral diseases.

MIB 4205 - TECHNIQUES AND STRATEGIES IN MOLECULAR BIOLOGY

Concepts of throughput and resolution, Blotting and in situ hybridization, High resolution live cell imaging, DNA sequencing; Sanger sequencing, pyro-sequencing and next generation sequencing, DNA synthesis, genome editing, Directed mutagenesis & protein engineering, Tools for DNA methylation analysis, DNA libraries, Expression profiling, Proteomics, Protein sequencing, Tools for protein-protein interactions and PTM analysis.

MIB 4206 - MOLECULAR BIOTECHNOLOGY

Fundamentals: Recombinant technology, synthesis, sequencing and amplification of DNA, manipulation of gene expression, Medical biotechnology: molecular diagnostics, therapeutics, novel vaccines, MABs; introduction and applications, SABs and applications, gene therapy and stem cell therapy. Agricultural and environmental biotechnology: bioremediation and biomass utilization, transgenics and

micropesticides, Food biotechnology: commercial production of fructose and alcohol; improvements, synthesis of L- Ascorbic acid and amino acids. Intellectual property rights and patenting

MIB 4207 - MICROBIAL GENETICS

Genome vs. cell size: prokaryotes and eukaryotes, Bacterial DNA transfer; Natural transformation, Transduction & Conjugation; Extra-intrachromosomal elements: Plasmids, IS elements, Transposons, Integrons & Mu elements; Control of gene expression: Gene regulation in prokaryotes & eukaryotes, Homologous recombination; Bacterial & eukaryotic , Genetics of Differentiation: Fruiting in Myxobacteria, Heterocyst development in Cyanobacteria; Protein Phosphorylation: hexose phosphate transportation, Nitrogen & Phosphate regulation; Fungal genetics: Yeast genetics and Genomic elements, Tetrad analysis; Viral genetics: lytic cycle and lysogenic cycle; Genetics of Achaea.

MIB 4208 - CURRENT TOPICS IN MICROBIOLOGY

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

9.1.4.5 CHEMISTRY

CHE 4201 - COMPUTATIONAL CHEMISTRY

Molecular Mechanics: Force fields, potential energy functions, inter and intramolecular interactions, empirical parameters; Molecular mechanics calculations, energy minimization, conformational analysis, common force fields and their limitations Lab; CHARMM. **Molecular Dynamics:** Molecular dynamics and Monte Carlo Simulation methods - Importance sampling and Metropolis sampling, application in molecular dynamics, MD methods calculation of thermo parameters in simple system, diffusion coefficients, conductivity, pKa. **Ab initio Methods:** HF-Roothan hall equation, basic function and basic sets [up to 6-311 G, d, f], introduction to electron correlations, calculation of electron density, electrostatic potential, etc. **Semi Empirical Methods:** Introduction and need for semi-empirical methods, CNDO, NDO, MNDO, AM 1, ZDO approximation, comparison of results with ab initio methods for simple chemical systems. **Density Functional Theory:** Density functional theory *vs* Hartree-Fock methods, modelling methods in solid state, recent advances in the field of quantum mechanics, molecular mechanics methods, etc. **Practical:** Molecular mechanics, molecular dynamics, ab initio, semi empirical methods, density functional theory.

CHE 4202 - ADVANCED PHYSICAL CHEMISTRY I

Electrochemistry: Ion-solvent interaction - Expression for ΔH and ΔS and ΔG of ion-solvent interaction, experimental verification of Born Model, ion-dipole model of ion-solvent interaction and expression for heat of solvation, ion-ion interaction - true and potential electrolytes, Debye-Huckel (ion-cloud) theory of ion-ion interactions, limiting and extended forms of Debye-Huckel equation; activity coefficients and ion-ion interaction. **Electrode-Electrolyte Interface:** Thermodynamics of ideally polarizable and non-polarizable interfaces- Lippmann equation; determination of interfacial tension, charge density, surface excess and double layer capacitance by electrocapillary method - Helmholtz, Gouy-Chapman and Stern models of the double layer with discussion of potential and charge distribution inside the double layer-contact adsorption and its determination; Bockris, Devanathan and Muller model of the double-layer. **Electrode Kinetics:** Butler-Volmer equation and high field & low field approximations, charge transfer resistance and polarizability of the interface, concepts of rate determining step, determination of kinetics parameters (io, ks, α) by linear polarization methods, Tafel plots, mass transfer-controlled electrode kinetics. **Transport phenomena** - Migration, diffusion, convection and coupled transport in an electric field, Faradaic current and non-Faradaic current, electrolytic polarization, dissolution and decomposition potential, overvoltage – hydrogen and oxygen overvoltage, Applications; Cyclic voltammetry: Definition of reversibility, charging currents, chronoamperometry: cottrell equation, pulse methods, convection methods, rotating disk and ring-disk voltammetry. **Photochemistry:** Interaction of radiation with matter, photo chemical reactions and their difference with thermal reaction law of photo chemistry, Grotthuss-Drapper law, Stark Einstein law, Lambert law, Beer's law; Organic photochemistry - Selection rules for electronic excitation; Electronic states, quantum yield, excitation sources, filters, fluorescence and phosphorescence; Jablanski diagram, singlet and triplet excited states, chemiluminescence, quenching of excited state, quantum yield, lifetime of excited state, selective quenching, triplet quenchers, energy transfer, triplet sensitization, Stern-Volmer kinetics, LASER, Mechanism of photochemical reactions: Excitation, excited states, primary photolysis, reactive intermediates, secondary reactions; Study of photochemical reactions of carbonyl compounds: Norrish type I and II reactions, photooxidations, photoreductions, photocycloadditions and photorearrangements.

CHE 4203 - SURFACE AND COLLOIDAL CHEMISTRY

Surfaces and Interfaces: Introduction to surface phenomena, the definition of a surface and an interface, absorption and adsorption, surface tension, surface free energy, contact angle, effects of solutes and temperature on surface tension, surface pressure; The Kelvin equation and its applications, vapour pressure above curved surfaces, super cooling and super heating; Comparative description of physisorption and chemisorption, sticking probability and condensation coefficient, adsorption theories, the measurement of surface and interfacial tension, the Gibbs equation, surface activity and surfactants, spreading and wetting, monolayers; Adsorption isotherms, isobars and isosteres, Gibbs adsorption isotherm and its application, Langmuir adsorption isotherm and its application, introduction to multilayer adsorption; Determination of surface areas and molecular cross sections, use of Langmuir trough method, monomolecular films, equation of state for an ideal surface film and molecular areas. **Contact Angles and Wetting:** Definition of the contact angle, the phenomenon of wetting; Hydrophobicity and superhydrophobicity, Young's equation, the measurement of the contact angle; Cassie-Baxter model and Wenzel's model, the critical surface tension. **Micelles and Surfactants:** Classification and

purification, stability of colloids, zeta potential, isoelectric point, industrial applications, macromolecules and micelles, foams and emulsions; Definition of surfactants, Structures of different surfactants, the definition of the critical micelle concentration, the energetics of micelle formation, models of micelle formation, applications of surfactants - detergent formulations. Emulsions and foams. An Introduction and application to the Colloidal State.

CHE 4204 - ADVANCED INORGANIC CHEMISTRY II

Bioinorganic Chemistry: Introduction: Metals in biological systems and their role, metalloproteins & metalloenzymes, speciation and specificity of metal complexes *in vivo*; Dioxygen carriers - haemoglobin, myoglobin, haemocyanins and nature of haem dioxygen binding; Transition metals in biological redox reactions: General mechanism of electron transfer, blue copper proteins, iron sulphur proteins, photosynthesis pathway; Distribution and functions of metals in vivo - Chemistry and biochemistry of nitrogen fixation; Environmental bioinorganic chemistry: Delivery of traces of elements to human, therapeutic uses of metals, ligands & complexes, metal induced toxicity and chelation therapy. **Spectroscopic techniques:** NMR spectroscopy of spin ½ nuclei of ^{19}F,^{31}P and spin > ½ such as ^{14}N and ^{11}B, electron spin resonance (ESR), nuclear quadruple resonance (NQR), Mossbauer spectroscopy and their applications in structure elucidation of inorganic and organometallic compounds. **Inorganic polymers**: Chemistry, preparation, characterization and applications of Zeolite, silicones, fullerenes etc.

CHE 4206 - NANOCHEMISTRY

Introduction and classification: Milestone of the development of nanotechnology, Nature's Nanotechnology, lotus effect, Swans feathers etc. Nanoscale architecture; Summary of the electronic properties of atoms and solids - Isolated atom, bonding between atoms, giant molecular solids, the free electron model and energy bands, electronic conduction; Effects of the nanometre length scale - Changes to the system total energy, changes to the system structure, how nanoscale dimensions affect properties, the size dependence of optical properties and concepts of super hydrophobicity, relationship between the surface area effect and quantum mechanical effects, basic mathematics related to the properties observed in nanoparticles. **Nanochemistry:** Preparation methods: Bottom-up synthesis and top-down approach - precipitation, self-assembly and self-organization to design functional structures in 1D, 2D or 3D structures; Principles and Mechanisms of Nanoparticle Growth and Stabilization: Thermodynamics of phase transitions and fundamentals of nucleation growth. Carbon Nanostructures - Introduction; Carbon molecules - nature of the carbon bond, new carbon structures; Carbon clusters - structure of C_{60}, alkali doped C_{60}, electrical, vibrational and mechanical properties of fullerenes. Nano fabrication; Thin films; electrodeposition, physical vapour deposition, chemical vapour deposition, spray pyrolysis, lithography; optical, X-ray, electron beam. **Applications of nanomaterials:** Nanomaterials for Alternative Energy: Nanomaterials as electrocatalysts for Fuel Cells and Nanoclusters in Hydrogen Storage, solar cells, gas sensors, Nanomaterials for biotechnology; Nanomaterials for Drug delivery systems, Biosensor, Biomedical applications, Antimicrobial activity and Protein chromatography, Self-cleaning; super hydrophobicity, photocatalytic, Nanomaterials for environmental remediation and possible health impact of nanomaterials.

CHE 4307 - ADVANCED PHYSICAL CHEMISTRY II

Statistical Thermodynamics : Overview of thermodynamics and its importance and utility; Molecular energy levels from quantum mechanics; Definition of basic concepts and derivations of: Quantum mechanical picture of a system of non-interacting and interacting particles, distinguishable and indistinguishable particles, Stirling's approximation, statistical entropy, configuration and statistical weights, Boltzmann distribution, molecular partition function, Fermi-Dirac and Bose-Einsteinstatistics; Relationship between macroscopic properties of a system and its possible configurations. **Molecular Reaction Dynamics:** Introduction: Drawbacks of Arrhenius theory, the kinetic theory of collision for bimolecular gas phase reactions, relationship between critical energy and the activation energy, probability factor; Activated complex theory, vibrational mode along the reaction coordinate, thermodynamic interpretation of the overall rate constant, application of activated complex theory; **Theories of unimolecular reactions:** Lindermann theory, The [M]½ value of the unimolecular reactions, weaknesses of Lindemann theory, calculation of k value from Hinshelwood modification, the treatment of Rice-Ramsperger and Kassel, energized complex, Slater's treatment, Rice-Ramsperger-Kassel (RRK model), modification by Marcus (RRKM theory); Liquid phase reactions: Theory of diffusion-Controlled reactions, the theory of absolute reaction rates, activation controlled reactions influence of solvent in liquid phase reactions; Effect of ionic strength and pressure on reaction rates in solutions and Study of fast reactions in solutions. **Advanced Quantum Mechanics:** Theorems of quantum mechanics; Hermitian operators, expansions in terms of eigenfunctions, commuting operators and parity, measurements and superposition states, postulates of quantum mechanics (re-visit), interpretations of quantum mechanics; Many-electron atoms; Molecular Hamiltonian, Born-Oppenheimer approximation, variation principle, potential energy surface, electronic Hamiltonian, Huckel molecular orbital theory, the Hatree and Hatree-Fock methods; Self-consistency, spin-orbit interactions, Condon-Slater rules, introduction to perturbation theory; Electron correlation.

CHE 4308 - ADVANCED ENVIRONMENTAL CHEMISTRY

Pollutants in the Environment: Introduction to environmental organic and inorganic chemicals, Background thermodynamics, emphasizing phase equilibria and the use of chemical fugacity in modelling phase equilibria, Vapour pressure of organic chemicals, Aqueous solubility of organic chemicals and activity coefficients in water, Air-water partitioning, Organic solvent-water partitioning; Toxicology of Pesticides: Types of exposure, terminology used in toxicology studies, measurement of toxicity levels, classifications of pesticides according to toxicity levels. **Reaction Kinetics and modelling:** Introductions to kinetics of chemical transformation in the environment; Complex reaction kinetics; Characteristic time scales; Kinetics at interfaces; Sources of kinetics and mechanistic information; Formulation and calibration of environmental reaction kinetics; Catalysis in different environmental compartments; Linear free energy and structure activity relationships and fate of environmental chemicals; Kinetics of metal complex formation; Chemical transformations of organic pollutants in the environment; Adsorption kinetics and heterogeneous electron transfer mechanisms; Kinetics of colloid systems. **Chemical aspects of waste treatment and management:** Water Treatment: Demand

calculations and forecasting, Design of intake structures & pumping, Process design concepts on major treatment units: Aeration, Flocculation, Sedimentation, Filtration, Disinfections (Chlorination, UV, Ozonization), water softening, Application of advanced treatment methods; demineralization, Ultra filtration, Reverse osmosis, Colour & odour removal by activated carbon, Iron removal. Inter-relations between water source management, quality of raw water & choose of treatment processes. Design of transmission and distribution systems including water quality management for ensuring safe drinking water quality. Applicable water quality standards. Wastewater engineering: Preliminary & Primary Treatment: Quantity & Quality of sewage generated, Impact of Future growth & development & change in quality of life on sewage quality & quantity. **Industrial Wastewater**: Selection of appropriate unit operations for the treatment and flow chart of wastewater treatment plant for dairy pulp &paper, electroplating. Biotechnology & Waste Management: Application of biotechnology for the Treatment of Primary & secondary sludge. Different model of anaerobic digestion by combination of attached & suspended growth.

CHE 4309 - ADVANCED ORGANIC CHEMISTRY

Physical organic chemistry: Correlation of Structure with Reactivity; Quantitative treatments of the effects of structures on reactivity; the use of σ, σ, o, σ +, σ- values; reaction constant ρ and its significance. Methods of studying organic reactions: Identification of reaction products, intermediates, trapping of intermediates, isotopic labeling, nucleophilicity and solvent effects, leaving groups, steric effects, substituent effects, neighboring group participation. Addition and elimination reactions solvent polarity, review of kinetics, energetics, Arrhenius theory, Eyring transition state theory, kinetic/thermodynamic control, kinetic isotope effect, Hammett plots, Hammond's postulate, Curtin-Hammett principle, linear free energy relationships. **Pericyclic Reactions:** Introduction; Types of pericyclic reaction: Cycloaddition, electrocyclic reactions, sigmatropic reactions; Interaction diagrams: Aromaticity, antiaromaticity, Huckel systems, Mobius systems, Dewar-Huckel-Zimmerman aromatic transition state concept; Molecular orbitals, molecular orbitals of conjugated polyenes and allyl systems, correlation diagrams, concept of HOMO and LUMO - Fukui frontier orbital approach, Woodward-Hoffmann rules, selection rules and stereochemistry of electrocyclic reactions, cycloadditions and sigmatropic shifts - applications of frontier molecular orbital approach, correlation diagram approach, Huckel-Mobius approach; Sommelet-Hauser, Cope and Claisen rearrangements. **Advanced organic spectroscopy:** Non-first order spectra; simplification of complex spectra (shift reagents in INDOR); ^{13}C-NMR and signal intensities; pulse techniques; nuclear overhauser effect (NOE), Description and applications of the commonly used 2D NMR techniques: H-H correlation (COSY and TOCSY), C-H correlation (HETCOR/HMAC/HSQC), long-range correlation (COLOC/HMBC), internuclear distances (NOESY and ROESY), INADEQUATE , mass spectroscopy (MS); ionization techniques (E1, Cl, FAD, ESI, MALDI etc),mass analyzers (magnetic sector, quadrapole analyzer, FTICR, TOF etc.), interfacing of MS with GC (GCMS) and LC (LCMS), fragmentation of chemical classes of organic compounds. FTIR, CD and ORD in structure elucidation of organic compounds.

CHE 4210 - MOLECULAR AND SURFACE SPECTROSCOPY

Symmetry and Molecular structure: Importance of symmetry in chemistry, symmetry elements and symmetry operation with illustration, point group. C1, Cs, Ci, Cn, Cnv, Cnh, Dn, Dnh, Dnd, C_, D_h, Td, Oh. Multiplication tables for C_{2v}, C_{3V} and C_{2h} point groups. **Molecular spectroscopy:** Electric dipole moment of a molecule: Definition of electric dipole moment, calculation of the dipole moment of a molecule using the dipole moments of individual bonds, transition dipole moment; Absorption of radiation as a microscopic phenomenon; Origins of an absorption spectrum and positions of absorption peaks, decomposition of total energy of a molecule into components, absorption peak heights and widths, microscopic processes that determine the absorption peak height, selection rules, peak widths. **Rotational and Rotational Raman Spectroscopy**: Diatomic molecules, intensity of line spectra, the effect of isotropic substitution, non-rigid rotator and their spectra, polyatomic molecules (linear and symmetric top molecules), classical theory of Raman Effect - Pure Rotational Raman spectra (linear and symmetric top molecules). **Pure Vibrational Spectroscopy and the energy of diatomic molecules**: Simple Harmonic and, anharmonic oscillator, diatomic vibrating rotator, vibration-rotation spectrum of carbon monoxide, Born-Oppenheimer approximation, vibrations of polyatomic molecules, influence of rotation on the spectra of polyatomic molecules (linear and symmetric top molecules), Raman activity of vibrations, vibrational Raman spectra. **Surface Analytical Techniques:** UV photoelectron spectroscopy (PES), Auger electron spectroscopy (AES), Low energy electron diffraction (LEED), Flame emission microscopy (FEM), high resolution electron energy loss spectroscopy (HRELS)

CHE 4212 - PHARMACEUTICAL AND MEDICINAL CHEMISTRY

Course Capsule: History of Medicinal Chemistry, comparison of Western medicine to traditional medicine, Phamacokinetics (ADME process Absorption, Distribution, Metabolism and Excretion), Chemical and physical properties of drugs influencing the ADME. Chemical Modification of Drugs, Prodrugs, Stereochemistry and Drug molecules, Enzyme as site of drug action, Receptors and ligands, Receptor binding and dose response, Synthesis of Drugs: General anesthetics, sedatives and hypnotics, anti-histamines, Antipyretic, analgesic, anti-inflammatory, opiates, NSAIDS, Antibiotics, Clinical Trials.

CHE 4213 - CHEMICAL TOXICOLOGY

Basic Principles in Toxicology: Fundamental concepts; Dose-response and structure-activity relationships of toxicants; Absorption, distribution, metabolism, excretion; Basic concepts of the mechanisms of toxicity; action (irritation, narcosis, inhibitory substances, indicating the substance, carcinogenic, mutagenic, teratogenic and allergenic substances and their effects) Role of microorganisms in metabolizing chemicals; Studies of catabolic pathways; chemical aspects of environmental toxicology. Basic knowledge about how the communication systems of the body, the nervous system and the endocrine system is influenced by chemicals. **Chemistry of Toxicology:** Biochemical, cellular, and organ system basis of intoxication; Biotransformation of toxicants; Biochemical mechanisms underlying toxicity; Factors influencing toxic action and biomarkers of exposure; Classifications of toxicants, Effects of various classes of toxicants, including heavy metals and persistent synthetic organics, with a focus on susceptible biochemical/cellular processes of the central nervous and target organ systems; Emphasis will be placed toexamines how the chemistry of elements is played by a cell

and identifies chemical and biological factors that govern a cell's selection of certain elements for biological reactions and processes. Genetic toxicology and ionizing radiation: The part includes basic knowledge about genetic injuries and general genetic testing methods and mechanisms behind chemically induced injuries and injuries after ionizing radiation. **Toxicology in the society**: Environmental toxicology, food toxicology, clinical toxicology, epidemiology, risk assessment.

CHE 4814 - RESEARCH PROJECT AND SEMINAR

This is a compulsory course for the students who are selected for Special Degree in Chemistry at the fourth year. The course consists of research work, which should last about six months at the bench with a selected supervisor, submission of a final research report and some lectures on research methodology, literature search and how to write a final research report. The supervisor can be from the internal academic staff of Rajarata University of Sri Lanka or from a recognized research institute. Students are free to choose a research topic based on their research interests with the help of a supervisor. Some research topics will be made available by the academics. In order to approve the proposed project, it should be primarily chemically-based. At the end of the semester, the student must submit a comprehensive report of the work accomplished to the research adviser. A copy of the report also must be submitted to the Head of the department. Grade will be awarded to the comprehensive report and for the final presentation.

CHE 4215 - SOLID STATE CHEMISTRY

Types of inorganic compounds with two and three different elements: Discrete molecules, layer structures, giant structures; CsCl, NaCl (rock salt), ZnS (zinc blende &Wurtzite), CaF_2 (fluorite), Na_2O (antifluorite), TiO_2 (rutile), ilmenite, spinel, perovskite structures; The atomic, covalent, Van der Waals and ionic radii and their determinations; The radius ratio and its determinations for coordination numbers, 3, 4, 6 & 8. Thermal properties: Specific heat capacity, Einstein model, plank distribution law, Defects and Non-stochiometry: (a) Lattice defects: inherent thermodynamic defects, Schottky and Frenkel defects, equilibrium concentration of Schottky and Frenkel defects, (b) Other imperfections: Point-defects, line defects, plane defects, edge and screw dislocations, hall effect, colourcentre, (c) Non-stoichiometry: Non-stoichiometry alkali metal halides, transition metal oxides and sulphides, (d) Impurity: Foreign impurity atoms or ions, impurity in a semi-conducting elements, (e) Experimental investigation of lattice defects: Ionic conductivity and self-diffusion, density. Band theory of solids: Introduction to energy bands, metals, semiconductors, insulators, the Kronig-Penny model, the Fermi–Dirac distribution, charge carriers in semiconductors, intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors, metal-semiconductor junction. **Thermal and Microscopic Methods of Analysis.** Introduction to thermal method of analysis, thermogravimetry (TG), differential thermal analysis (DTA), derivative thermogravimetry (DTG) and differential scanning calorimetry (DSC); Some applications of thermal methods in ceramics, cements, polymers etc.; Characterization of solids by scanning electron microscopy (SEM), atomic force microscopy (AFM), transmission electron microscopy (TEM) and X-ray diffraction (XRD).

CHE 4216 – SCIENTIFIC RESEARCH AND COMMUNICATION

Introduction to Scientific Research: Nature of Scientific Explanation; Steps in conducting research, Limitation of scientific explanation, Attributes of a researcher, Modelling as a scientific research method, Real practice of science. **Research Paradigms in Brief;** Place of research in philosophy, What is a paradigm? Positivist, Interpretive, Critical social theory, Criteria for evaluating research. **Research Process;** Formulating a Research Problem, The Conceptual Phase; Intellectual process of developing a research, Literature review, The Design and Planning Phase; Research design, Sampling plan, Data collection methods, Writing a research proposal, Empirical Phase; Collection of data, Analysis of data, Interpretation of data, Presentation of data, Dissemination of knowledge, Statistical Analysis; The role of statistics in research, Statistical methods, Methods of data collection, Sampling, Data validation, Statistical hypothesis. **Scientific Writing:** Thesis, Research Papers, Abstracts; Research writing, Layout of a thesis (preliminaries, text of the thesis, notes and reference materials, use of reference managing tools), Journal Articles; Title, Abstract, Introduction, Methodology, Results and discussion, References, Supporting information, Oral, Poster and other Forms of Presentation; Procedure of developing contents for oral/ poster presentation, Preparing for an oral presentation, Delivering an oral presentation, Publication of Research**;** Significance of a research publication, Different forms of publications, Types of journals, Selection of a suitable journal, Research data bases, Predatory journals, Research communications for the; (i) academic communities, (ii) government, charity, industry etc. (iii) public forums, local and international academic forums, Funding to attend conferences, Claiming intellectual properties. **Research Ethics:** The concept of ethics, Stakeholders in research, Ethical Issues to Consider Concerning Research Participants; Collecting information, Seeking consent, Providing incentives, Seeking sensitive information, The possibility of causing harm to participants, Maintaining confidentiality, Ethical Issues to Consider Relating to the Researcher; Constituents of scientific misconduct, Avoiding bias, Inappropriate research methodology, Incorrect reporting, Inappropriate use of the information, Plagiarism, Ethical Issues Regarding the Sponsoring Organization; Restrictions imposed by the sponsoring organization.

9.1.4.6 COMPUTER SCIENCE

COM 4201 - Introduction to Mobile Computing

Introduction/Problem Motivation, OS support for small devices, Wireless technologies (CDMA, Bluetooth, etc.), Routing and transport in mobile/wireless environments, Ad hoc routing protocols, MEMS/Micro sensors, Next generation naming (IPv6, NAT), Replication/Consistency in wide-area systems, Persistent storage: Caching content (dynamic/multimedia) distribution, Resource allocation, Next generation applications “Convergence” (Computer, telephone, multimedia, home entertainment).

COM 4202 - Bioinformatics and Computational Biology

Overview of DNA and Protein Sequences, Genomics, WEB Sites and Data Banks of Proteins, DNA Sequences, and 3D Structures, Searching and Matching on String, Arrays and Trees, Computer Analysis of Sequence Data, Regularities, Statistics, Sequence Comparison and Alignment, Two and Multiple, Local and Global, Phylogeny and the Inference of Evolutionary trees, Computational

Aspects of Physical Mapping and Sequence Assembly, Computer Analysis and Prediction of Protein Structure, 3D Matching, Export Techniques to Data Mining, Compression, DNA Computing.

COM 4203 - Geographical Information System

Introduction: Definitions, applications, and elements of GIS; Hardware and software for GIS; Fundamental Concepts: Database concepts, spatial concepts; Models of geospatial information; Representation and algorithms; Structures and access methods; Architectures; Interfaces; Spatial reasoning and uncertainty; Temporal and spatiotemporal information systems; Implementing web based GIS solutions using Open Source Software.

COM 4604 - Research Project

Each fourth-year student is required to do a research project in Computer related area under the supervision of a senior academic staff member. Students are expected to apply the knowledge gained throughout the programme.

9.1.4.7 INDUSTRIAL MATHEMATICS

MAT 4301 - COMBINATORICS

Recurrence Relations and Generating Functions: Computing solutions to recurrence relations, The principle of Inclusion and Exclusion, Latin squares, System of distinct representatives, External set theory. **Steiner Triple Systems:** Direct construction, Recurrence construction, Tournaments and Kirkman's schoolgirl problem. **Hadamard Matrices:** Introduction to Hadamard matrices. **Error-Correcting Codes:** Linear Codes and Hadamard codes.

MAT 4302 - COMPUTATIONAL MATHEMATICS

Initial Value Problem for Ordinary Differential Equations (ODEs): Single-step methods: Explicit and implicit Euler methods, Runge-Kutta Methods, Error analysis, Order of error, Convergence, and stability analysis. **Multi-step Methods:** Adam-Bashforth, Adam-Moulton Methods, Predictor-corrector Methods, Stiff ODEs. **Boundary value problems (BVP) for ODEs**: Finite Difference method, Error analysis, Finite element method for 1D BVPs. Iterative Solution of Large Linear Systems: Jacobi, Gauss-Seidel and SOR methods, Residual correction, Positive-definite systems, Condition number, Conjugate Gradients, convergence. **Numerical Solution of Parabolic Partial Differential Equations (PDEs):** Euler's Method, Crank-Nicholson method, Order, convergence, stability. **Numerical solution of Elliptic PDEs:** Finite difference approximation, Introduction to Finite element method for 2D elliptic problems. **Problem Solving using MATLAB:** Compute solutions of above examples.

MAT 4203 - DATA ANALYSIS USING STATISTICAL SOFTWARE

Introduction to Statistical software, Graphical User Interfaces, Basic concepts and Data organization, Data types, Importing/Exporting/Producing data, Data pre-processing, Drawing curves and plots, Density function, Distribution function, Quantile function and generation of random data, Simple random sampling, Basic descriptive statistics, Point estimation, Confidence interval construction and hypothesis testing one sample and two sample data, Simple linear regression and correlation, Multiple linear regression, Model selection, Introduction to analysis of time series data.

MAT 4304 - STATISTICAL QUALITY CONTROL

Introduction to Quality & Quality Control: Concept of quality, Quality characteristics, Quality standards, Quality cost, Concept of quality control, Quality control methodology, Statistical methods of quality control, Quality philosophy and management strategies. **Statistical Methods useful in Quality Improvement:** Population and sample, Techniques of sampling, Simple random sample, Analysis of sample data, Representation of sample data, Practical examples. Population and sample distributions, Estimation of population parameters, statistical hypothetical test, Practical examples. **DMAIC Process:** Define, Measure, Analyze, Improve, and Control. **Statistical Process Control:** Methods and philosophy of statistical process control, Basis of control chart, Types of control chart, design of control chart, analysis of control chart, control charts for variables and attributes, Cumulative-sum and exponentially weighted moving average control charts, Other statistical process-control techniques. **Process Capability:** Concept of process capability, measures of process capability, potential process capability, actual process capability, process capability analysis. **Acceptance Sampling Schemes:** Basis of sampling schemes, types of sampling schemes, acceptance sampling schemes for variables and attributes, operating characteristic curve, producer's risk, consumer's risk, other acceptance-sampling procedures. **Six Sigma:** Concept of six sigma, methods of six sigma, DMAIC methodology, DFSS methodology, six sigma control chart, case studies.

MAT 4305 - MEASURE THEORY

Lebesgue Measure on the Real Line: Lebesgue outer measure, Lebesgue measurable sets and Lebesgue measure, Non-Lebesgue measurable subsets on the real line, Measurable functions. **The Lebesgue Integral:** The Lebesgue Integral of a simple measurable function, The Lebesgue integral of non-negative Lebesgue measurable function, Fatou's Lemma, Monotone convergence theorem, Lebesgue integral of an integrable function, Dominated convergence theorem. **Differentiation and Integration:** Differentiation of monotonic functions, Functions of bounded variation, Differentiation of an integral, Absolute continuity. **Measure and Integration:** σ - algebras, Measure spaces, Measurable functions, Integration, Signed measures, The Radon - Nikodym theorem.

MAT 4306 - OPERATIONS RESEARCH III

Theory of Games: Zero-Sum games, Games without Saddle Points-Mixed strategies, Graphical solution of $2 \times n$ and $m \times 2$ games, Dominance property, reducing the game Problem to a Linear Programming Problem (LPP). **Queuing Theory:** Introduction, Queuing system, Characteristics of Queuing systems, Poisson process and Exponential distribution, Poisson queues: The M/M/I Queuing Systems, The M/M/C Queuing Systems. **Inventory Management:** Introduction, Economic order quantity (EOQ), Problem of EOQ with shortage, Multi-item deterministic problem.

MAT 4307 - OPERATIONS RESEARCH IV

Project Management: Introduction, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT). **Simulation:** Introduction, Formulating Simulation models and solving them using a simulation software package. **Sequencing:** Introduction, Sequencing problems with n jobs and two machines, Sequencing problems with n jobs and three machines, Sequencing problems with n jobs and m machines, Graphical solution. Introduction to Dynamic programming, Solving optimization models using Dynamic Programming.

MAT 4308 - SPECIAL TOPICS IN MATHEMATICAL PROGRAMMING

Evolutionary optimization, Regression analysis, Discriminant analysis, Decision analysis, Time series forecasting, Solving mathematical models using MATLAB software and Excel solver tool.

MAT 4609 - RESEARCH PROJECT

Reading a research paper critically and creatively, Highlighting crucial facts, Taking notes and summarizing, Comparing with other works. **Research Paper Writing (in LaTeX):** Title, Abstract, Introduction, Results and discussion, Conclusions, Acknowledgement, References. **Research Project:** Conduct a research project based on a topic related to Mathematics under the supervision of a Senior Lecturer, the research project must exhibit original investigation, analysis and interpretation, the research project report is to be written according to the format stipulated by the Department of Physical Sciences.

MAT 4210 - INDUSTRIAL TRAINING

The industrial training is designed to provide an opportunity for students to learn and familiarize with the industry, observe real life practices and implementation of theoretical lessons and principles, The respective students will be able to learn ethics in the industry, To gain soft skills such as; Leadership, Group work, Communication, Organization, etc. Also, students will be able to efficiently complete given tasks and foster good relationship with the employers and employees. Students are required to maintain a field report and submit at the end of the training programme with the supervisor's authentication. Also, the students are required to make a presentation describing the training programme underwent.

9.1.4.8 PHYSICS

PHY 4201 - BIOPHYSICS

Introduction to Biophysics: Introduction to a new world, A physicist's approach to Biophysics. Water: Introduction, Structure (molecular structure, liquid and solid), unusual physical properties, Bulk vs. local structures, Diffusion and chemical reactions in water, solute and the solvent power of water. Structures (from 0.1 - 10 nm and larger): Software to display and analyze biological structures, Solvents, Small molecules, Medium-sized molecules (Components of large biomolecules), Forces and free energies, Biopolymers, Macromolecules. **Biomolecules &biomolecular assemblies**: Measuring properties of 3-D aggregates, small aggregates, large aggregates, 2-D aggregates (membranes). Putting a cell together (physical sketch): Minimal, prokaryotic, and eukaryotic cells, physiology (selective overview); reproduction, DNA, and the cell nucleus, sensors and recognition, responding to the outside world without eyes. Electrical and Magnetic Properties of cells: Electrical properties of body tissue (electrical conduction through blood and tissue), Nerve conduction (Cell membrane and Ion distributions, types of cell membrane excitations, model of electrical conduction along an axon), Ion channels, hair cells, balance, taste and smell; Electrical properties of the heart; Electrical signals in the brain; Effects of electric shock, Magnetic properties (magnetic field from an axon, magnetic sense), Electromagnetic waves. Light and life: Light (our energy source), Crucial differences between one 5 *eV* and 2.5 *eV* photons, Properties of photons, Scattering and reflection, Absorption spectra, Emission spectra; Einstein relations between absorption and emission of atoms, Intersystem crossing: singlets ($S = 0$) to triplets ($S = 1$), Energy transfer (FRET). Mechanics and Dynamics: Conservation laws, Newton's laws, forces and torques, Friction, Gravitational forces, Volume changes and compressibility, Stress and strain; Dissipation, Inertia, Disorder, Fluids and turbulence. Diffusion & polymer conformation: Review of kinetic theory of gases (Implications for biomolecular averaging), 1-D random walk (probabilities and distributions), Spreadsheet model for a 1-D random walk, 3-D random walk, Diffusion in the bulk, reprise of photosynthetic light harvesting, biopolymers—random reprise.

PHY 4302 – THE CURVED SPACE TIMES OF GENERAL RELATIVITY

Gravity as Geometry: Testing the Equality of Gravitational and Inertial Mass, The Equivalence Principle, Clocks in a Gravitational Field, The Global Positioning System, Spacetime is curved, Newtonian Gravity in Spacetime Terms, The Description of Curved Spacetime: Coordinates, Metric, The Summation Convention, Local Inertial Frames, Light Cones and World lines, Length, Area, Volume, and Four-Volume for Diagonal Metrics, Embedding Diagrams and Wormholes, Vectors in Curved Spacetime, Three-Dimensional Surfaces in Four-Dimensional Spacetimes, Geodesics: The Geodesic Equation, Solving the Geodesic Equation-Symmetrics and Conservation laws, Null Geodesics, Local Inertial Frames and Freely Falling Frames, The Geometry Outside a Spherical Star: Schwarzchild Geometry, The Gravitational Redshift, Particle orbits-precession of the Perihelion, Light Ray Orbits, The Deflection and Time Delay of Light, Solar System Tests of General Relativity: Gravitational Redshift, PPN Parameters, Measurements of PPN Parameter γ, Measurement of the

PPN Parameter β, Precession of Mercury's Perihelion, Relativistic Gravity in Action: Gravitational lensing, Accretion Disks Around Compact Objects, Binary Pulsars, Gravitational Collapse and Black Holes: The Schwartzchild Black Hole, Collapse to a Black Hole, Kruskal Szekeres Coordinates, Non-Spherical Gravitational Collapse, Astrophysical Black Holes: Black Holes in X Ray Binaries, Black Holes in Galaxy Centers, Quantum Evaporation of Black Holes-Hawking Radiation, A Little Rotation: Rotational Dragging of Inertial Frames, Gyroscopes in Curved Spacetime, Geodetic Precession, Spacetime Outside a Slowly Rotating Spherical Body, Gyroscopes in the Spacetime of a Slowly Rotating body, Gyros and Freely falling Frames. Rotating Black Holes: Cosmic Censorship, The Kerr Geometry, The Horizon of a Rotating Black Hole, Orbits in the Equatorial Plane, The Ergosphere, Gravitational Waves: Linearized Gravitational waves, Detecting Gravitational Waves, Gravitational Wave polarization, Gravitational Wave Interferometers, The Energy in Gravitational Waves. The Universe Observed: The Composition of the Universe, The Expanding Universe, Mapping the Universe. Cosmological Models: Homogeneous, Isotropic Spacetimes, The Cosmological Redshift, Matter, Radiation and Vacuum, Evolution of the Falt FRW Models, The Big Band and Age and Size of the Universe, Spatially curved Robertson-Walker Metrics, Dynamics of the Universe, Which Universe and Why? Surveying the Universe, Explaining the Universe.

PHY 4203 - CLASSICAL MECHANICS

Newtonian Mechanics: Inertial Frames, Newton's Laws of Motion, Central Forces, System of Particles, Rotating Coordinate Frames, **Rigid Body Motion:** Angular velocity and Eulerian angles, Euler's equation of motion, Centrifugal and Coriolis forces, **Lagrangian Mechanics**: Generalized coordinates and generalized forces and momentum, the Lagrangian equation of motion, constraints and method of Lagrange's undetermined multipliers, **Hamiltonian Mechanics**: Hamiltonian's equation of motion, Poisson's Bracket.

PHY 4204 - CURRENT TOPICS IN BIOPHYSICS

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area, presentation of a summary of the review.

PHY 4308 - CHARACTERIZATION TECHNIQUES

Introduction, **Thermal Analysis**: Thermo Gravimetric (TG) analysis, Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), X-**Ray Diffraction (XRD)**: Basic concepts, Bragg's law, Reciprocal lattice, The use of XRD in materials characterization and the interpretation of diffraction patterns, **Infra-Red Spectroscopy:** Vibrational spectroscopy, Identification of matrix and contaminants. **Light Microscopy**: Basic principles of light microscopy, The uses of reflected light, polarized light and confocal imaging modes, **Electron Microscopy:** Physics of the electron interaction with a material, Electrostatistic versus Magnetic lenses, **Scanning Electron Microscopy (SEM)**: Design, The electron probe size, Imaging modes, Secondary and Backscattered imaging modes, Crystallographic effects, **Transmission Electron Microscopy (TEM):** Design, Illumination system, Lenses, Apertures, Resolving power of the TEM, Electron diffraction: Kinematical theory and Dynamical theory, Kikuchi lines and Maps, Amplitude contrast from lattice defects, Phase contrast, Magnetic contrast, Sample preparation techniques, **Analytical Microscopy:** Generation, detection and analysis of X-rays, Wave Dispersive Spectrometry (WDS) and Energy Dispersive Spectrometry (EDS**),** Qualitative analysis, Point analysis, Electron Energy Loss Analysis (EELS), **Scanning Transmission Electron Microscopy, (STEM):** Design, Image contrast, **Atomic Force Microscopy (AFM)**: Basic principles of AFM, **Auger Electron Spectroscopy and Microscopy**: **Secondary Ion Mass Spectrometry (SIM)**: Sputtering processes, Basic principles of SIMS, and the static, dynamic and imaging modes. Mass spectral resolution, interpretation, quantification and matrix effects, Comparison of available instrumentation.

PHY 4209 - PHYSICS OF SEMICONDUCTOR DEVICES

Introduction to semiconductors: Electronic states and charge carriers, Drift of carriers in electric and magnetic fields, drift-diffusion equation. **Charge Devices:** Revise of p-n junctions, Bipolar transistors, Field Effect transistors, light emitting devices, photovoltaic devices, charge-transfer devices and semiconductor memories. **Mesoscopic Devices:** Quantum wires, Quantum dots, electron turnstile devices, quantum hall devices. **Spin Devices:** Spin dependent transport in metal and magnetic multilayer, Giant magnetoresistance, magnetic read heads, non-volatile memories, spin transistors.

PHY 4210 - ADVANCED QUANTUM MECHANICS

Many electron atoms, Electronic Hamiltonian, Independent particle model, spin orbital, Antisymmetric wave functions, Permutation operators, Slater determinant. Hartee – Fock theory (HF), Matrix of the HF equation, Variation principle and variation methods, Perturbation method, Molecules and Born Oppenheimer approximation, Quantum mechanical interpretation, molecular orbital. Electron – electron correlation, Post HF methods, Density Functional Theory (DFT), Advantages.

PHY 4211 - NANOMATERIALS AND NANOTECHNOLOGY

Introduction to micro and nanomaterials, Carbon Nanotubes: Fabrication and characterization, Electronic spectra, Applications, Quantum dots: Schrödinger's equation for confined systems, Electronic states and transitions, Nanoporous polymers and their applications in water purification, Photo-catalytic fluid purification, Energy conversion; Hierarchical self-assembled nano-structures for adsorption of heavy metals, risk from nanoparticles, Health and environmental issues.

PHY 4312 - STATISTICAL THERMODYNAMICS

Boltzmann, Fermi – Dirac and Bose – Einstein weight functions, relationship between the microscopic properties of a system and its possible configurations. Molecular partition functions, Canonical ensemble, Canonical partition function, Translational, rotational, vibrational and electronic partition functions data, Statistical thermodynamics to realistic systems.

PHY 4613 - RESEARCH PROJECT

Students will carry out individual projects under the supervision of senior academic staff members**.**

PHY 4314 - CURRENT TOPICS IN CHEMISTRY AND PHYSICS

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

PHY 4215 - APPLIED GEOPHYSICS

Seismic waves, Refraction of seismic waves and earth structure, Reflection of seismic waves and earth structure, Seismic surveying, Deformation of solids and seismic reflection, Data processing and interpretation, Gravity on the earth, Gravity surveying, Bouguer gravity and geology, Earth magnetism, Surveying the anomalous magnetic fields, Magnetic anomalies and their geologic sources, Application of geophysics: Geoelectric surveying, Electromagnetic surveying, Geophysics well logging.

PHY 4217 – ADVANCED ENERGY RESOURCES

Overview: general perspective, current world issues and technology trends. Fossil Fuel and Petroleum: Origin, Mining and refining, Industries based on petroleum products. Batteries and Fuel Cells: Primary and rechargeable batteries, Electrode materials, Ionically and electronically conducting polymers, Polymer composite materials, H_2-O_2 fuel cells, Methanol fuel cells etc. Solar Energy: Solar spectrum, Energy harvesting materials (semiconductors, dyes, chlorophyll etc.) Physics of Semiconductor Solar Cells: p-n junction solar cells, Hetero junction, Interface and thin film solar cells; Dye sensitized nano crystalline solar cells, Dye sensitized p-n solar cells, Solar radiation conversion efficiency, Photodecomposition of water, H_2 gas clean fuel. Nuclear Energy: Fission and fusion, Waste handling. Hydro power, Wind power, Tidal power**.** Energy efficiency: technologies and management.

9.1.5 HEALTH PROMOTION

9.1.5.1 FIRST YEAR

HPT 1201 - BASIC HUMAN PHYSIOLOGY

Introduction to Human Physiology, Physiology of selected systems: Gastrointestinal, Cardiovascular, Respiratory, Nervous, Muscular and Excretory systems. Homeostasis. Endocrine glands, hormones and functions. Body fluids and blood.

HPT 1202 - INTRODUCTION TO HUMAN DISEASES

Disease causing agents: Biological, chemical, physical, mechanical, social and economic agents. Types of diseases: Communicable diseases, Non-communicable diseases (NCD), Genetic disorders, endocrine disorders, immune disorders, mental health disorders and others. Body's defense mechanisms: Non-Specific and specific defense mechanisms, humoral and cell-mediated immune systems, natural and acquired immunity, immune disorders.

HPT 1103 - CONCEPTS OF HEALTH

Concepts of health in different cultures. History of the evolution of ideas about health. World Health Organization and its definition. Strengths and weaknesses of the WHO conception of health. Operationalizing WHO's definition. The Ottawa charter. Differing definitions and their implications. Practical applications to day to day lives of individuals and communities. Health and development, Holistic conceptions. Components of health and their interactions - physical, mental and social health. Problems of defining an optimum in characteristics on a continuum.

HPT 1104 - HISTORY AND EVOLUTION OF HEALTH PROMOTION

Health promotion practice: Detailed examination of the theoretical underpinnings, Evolution of health promotion concepts: Reasons behind the evolution. In depth analysis of the various stages of understanding health promotion. Global political influences. Local issues. Different aspects or approaches to health promotion: "Health educational" approach. "Healthy life styles" approach. Advantages and disadvantages of each approach. Learnings from global health promotion review conferences.

HPT 1205 - COMMUNICATION IN PUBLIC HEALTH

Aims and functions of communication, classification of communication, mass communication, interpersonal and group communication, public opinion and mass media, theories in communication, origin of news and news reporting, counteracting the negative effects of social media and use of social media in promoting wellbeing of people. Foundational theories: societal-

level/individual- level explanations for media effects on health, Planned uses (health campaigns) of communication for health, Unplanned uses (News media coverage) of communication for health, New media and public health.

HPT 1306 - NUTRITION AND METABOLISM

Principal components of diet: Dietary Requirement, Measurement of Energy values in foods, Sources and functions principle vitamins. Regulations of food intake: digestion, absorption, transport and metabolism of proteins, lipids and fats, Nutrition in relation to: age, Cancer, Stress, cholesterol, heart diseases, hypertension and diabetes. Nutritional needs: during pregnancy and lactation. Nutritional needs of infants, pre-school children, adolescents, Micronutrients deficiency: problems and remedial measures. Strategies to promote healthy foods in different groups. Assess the national and international best practices in promoting the nutrition among different communities. Transferring the nutritional knowledge and skills to different communities.

HPT 1207 – SEXUAL HEALTH AND REPRODUCTIVE PHYSIOLOGY

Physiology of reproductive system. Origin of germ cells, Gametogenesis, Reproductive cycles, Oestrous cycle, Hormonal control of the menstrual cycle, Egg transport, regulation in pregnancy, parturition and lactation, Semen evaluation, Artificial insemination, Embryo transfer, Methods of control of fertility, In-vitro fertilization, Anomalous babies, Sexual health and behavior. Sexuality. Gender.

HPT 1208 - PRINCIPLES, STRATEGIES AND PRACTICES IN HEALTH PROMOTION

Understanding real life application of issues related to health as a positive attribute, not just the absence of disease or distress. “Positive indices” and “negative indices”. Analysing impact, on mortality morbidity and wellbeing, of activities that set out to improve wellbeing. Practical examples and operationalizing the concept of wellbeing. Defining indicators of progress or improvement. The artificial, but theoretically useful, separation into physical, psychological (including spiritual) and social wellbeing; the interconnectedness of these aspects, key elements of each; difficulties, in some instances, of defining an optimal state on a continuum where both extremes are decidedly unhealthy. Application of the theoretical principles of health promotion by each individual to his or her own health. Improvements in understanding the factors that determine the individual’s own health. Assessment of changes of one’s health status. Influences of one’s group and other structural determinants. Simple measures to improve one’s health and the health of one’s group. The influence of monitoring. Facilitators and inhibitors of improvement. Personal influences, group influences and external influences. Improvement of the health status in individuals and groups of students through practical measures. Applications of health promotion with different groups: Determination of a group’s or community’s understanding of health and health improvement. Locally grounded knowledge, attitudes and values and ‘normative’ knowledge and attitudes. Processes in determining or eliciting locally grounded understanding. Ethical ways of facilitating development. Group processes in determining goals for health improvement. Universally or widely accepted goals versus less widely accepted goals. Healthy processes in determining health or development goals. Collective decisions and the influence of controlling, dominating or exploiting individuals and influences. Group decisions on indicators of progress of individuals’ and collective wellbeing. Processes in initiating and maintaining impetus for progress. Facilitators and inhibitors to initiating change: Externally versus internally driven progress. Recognizing and valuing progress. Quantifying costs and benefits.

HPT 1209 - MEASURES OF HEALTH

Traditional indices of health and their usefulness. Skewing of conceptions of health based on what is measured and what is not measured. Aspects of wellbeing that are more difficult to measure than others. Defining measures, measurement, and measurement tool. Reliability and validity of measures. Analysis of wellbeing on the basis of measurability. Improving the validity of measures of wellbeing. Improving the sensitivity of measures of wellbeing. Measurement as a tool in improving the health of individuals and groups or communities. Making measurement appropriate to need and to level of sophistication. Practical applications of measurement of wellbeing. Limitations of different measures. Indicators of changes in health status. Use of measures for evaluating interventions for improving health. Comparisons of health states of different populations. Local, national and international indicators of health. Meaningful and spurious differences.

HPT 1210 - RESEARCH METHODS

Research process, methodologies and research proposals. Critiquing research reports, Use of evaluation checklists and the appraisal of quantitative and qualitative data. Data collection methods: Interviewing: Types of interviewing, advantages and disadvantages, processes and skills. Practical work related to recording and analyzing data from interviewing and focus group discussions. Questionnaire: Design of self-completion, interviewer administered questionnaires: Advantages and disadvantages of these in research. Survey designs. Sampling: Issues surrounding sampling and sample sizes in health education and health promotion. Data processing: Introduction of simple statistical techniques and examination of the basic principles of experimentation and evaluation related to the students own work practice. Qualitative research: design and implementation, data collection & analysis. Presentation of qualitative data. Research ethics. Special topics: Health promotion research, action research, participatory action research, implementation research.

FIELD PRACTICAL PLACEMENT

HPF 1101 - DEVISING APPLICABLE MEASURES OF INDIVIDUAL AND GROUP HEALTH

Identification of measures of individual and group health/ wellbeing. Describing the most appropriate measures of individual/group health/wellbeing. Creating measures to assess individual and group health/wellbeing and assessing the level of applicability and appropriateness of devised measures. Recognizing qualitative and quantitative measures. Analysis of health status of individuals and groups. Developing objectives to improve individual and group health/wellbeing.

HPF 1102 - MEASURING HEALTH STATUS OF A STUDENT GROUP

Determine measures and use those measures to assess individual and group wellbeing. Recognizing objective and subjective changes. Recognizing sensitive indicators of progress. Recognizing less visible gains. Assess and interpret individual and group health. Record keeping and retrieval.

HPF 1203 - ACTIVITIES TO IMPROVE HEALTH OF A STUDENT GROUP

Identifying factors that influence individual and group health. Developing indicators to measure the process and outcomes. Designing activities to address identified factors that influence health/wellbeing negatively. Implementing activities as a group. Assessing effectiveness of implemented activities. Identification of impediments in applying activities. Reflecting on and assessing the value system of the group and its implications.

9.1.5.2 SECOND YEAR

HPT 2301 - PSYCHOLOGY & HUMAN BEHAVIOUR

Introduction to psychology. Specific branches of psychology which have influenced the development of health education and health promotion. Health psychology - introduction to health psychology and approaches of Health Psychology, Health risk behavior and theories of change. Health behaviour and its modifications: Locus of control (Rotter), Learned Helplessness (Seligman), Deferred Gratification, Attribution Theory. Socio-psychological models which help to interpret health behavior. The Health Belief Model (Rosenstock/Becker), Theory of Reasoned action (Fishbein and Ajzen), The Preventive Health Action Model (Tones), Self Efficacy (Bandura), Protection Motivation Theory (Rogers and Prentice-Dunn), Consensus Model: key ingredients of (based on Martin Fishbein's 1997 summary Stages of Change Model (Prochaska and DiClemente). Social psychology for health promotion attitudes, formation, changing and methods to measure attitudes, social thinking, social influence (social influences on shaping conformity, obedience, group behavior, social relations – prejudice, attraction, aggression, altruism conflict and peace-making). Theories and moderators of stress (physiological reaction to stress, theories and management). Principles of basic counselling as a method of psychosocial support.

HPT 2202 - WORKING WITH COMMUNITIES

Concept of community work: Principles of working with 'target' populations. Creating a milieu that facilitates health development of all members of a group or community. Dealing with practical realities. Ethics of influencing decisions: Influences socially accepted without questioning (eg. commercial, political and religious influence) versus other influences (eg. health promotion). Reasons for different treatment of different influences (or attempts to influence). Acceptance of different opinions. Respect. Judgmental attitudes and bases of each attitude. Dealing with opinion leaders: 'Democratic' versus authoritarian leaders in communities and groups. Respect for existing structures and respect for rights and privileges of all individuals. Facilitating self-examination and questioning. Listening. Understanding verbal and non-verbal communications. Recognizing readily achievable and less readily achievable goals within given circumstances and time frames. Participatory methods. Assessment, analysis and action. Recognizing sensitive indicators of progress. Helping others recognize small gains. Record keeping and retrieval. Assessment of long term progress. Keeping records on community: Community consent and control of information and records.

HPT 2103 - PRINCIPLES OF EVALUATION

Purpose of evaluation. Monitoring vs. evaluation. Types of evaluation, strength and limitations. Planning and implementing process. Effectiveness and cost effectiveness of interventions. Expected and unexpected impacts. Dilemmas of evaluation.

HPT 2104 - INTRODUCTION TO EPIDEMIOLOGY

Importance of the population perspective in epidemiology. Awareness that the causes of disease are socially constructed and complex. Strengths and weaknesses of the various methods of epidemiological data collection; Measurement of health and disease – disease frequency, prevalence, incidence rates, risks and odds and the effects of confounders, relative and absolute risk: Routine sources of epidemiological data, expected rates vs observed rates and the usefulness of different data sources in influencing policy; Interpretation of epidemiological studies in order to recognize possible explanations for an observed association between an exposure and a disease, identify whether bias, confounders or chance are distorting the estimates of associations.

HPT 2205 - DETERMINANTS OF HEALTH

Social and other structural determinants: Structural determinants of individual. Group and community wellbeing. Overt and covert determinants. Determining causality. Analysis of structural determinants: Levels of factors that influence wellbeing. Commercial influences, Political and other power structures, Sectarian forces, social norms and other influences. National and global influences. Cost effectiveness and immediacy of interventions to address such factors. Analysis of 'positive' versus 'negative' influences. Criteria for assessing relative benefit and harm from external influences. Principles of prioritizing among different determinants: Control over life circumstances as an element of wellbeing. Bringing different determinants of wellbeing within our control or scope to influence. Addressing determinants. Dealing with structural factors outside our usual scope of influence. Minimizing harm. Health equity and equality.

HPT 2206 - INDICATORS AND MEASUREMENTS OF COMMUNITY HEALTH

Indicators for assessment of needs and current level of functioning. Indicators for assessing progress or impact of interventions. Process, outcome and impact indicators. Applications to day to day examples of health promotional efforts. Formal and informal interventions to promote health. Deliberate and 'unconscious' attempts to improve health. Measures of progress relevant to each of these. Healthy processes in developing indices of health for a community or individual. Development of indices as a tool in health promotion. Community or individual ownership of process of health promotion and its measurement. Ethics of intervention and measurement.

HPT 2207 - HEALTH IMPROVEMENT

Obstacles to health improvement: Evident and hidden obstacles. Recognizing personal or individual impediments to improving wellbeing. Recognizing external impediments to improving wellbeing. Social conformity, behavior and wellbeing. Addressing obstacles to health improvement: Dealing with individual or internal impediments to promotion of wellbeing. Dealing with external impediments. Individual and shared insights.

HPT 2108 - EARLY CHILDHOOD CARE AND DEVELOPMENT (ECCD)

Needs of children: Basic needs and their health requirements, Child survival: child morbidity and mortality, determinants of child morbidity and mortality, Growth: growth monitoring, child malnutrition. Child development: concepts of early brain development, the golden thousand days initiative, brain development during early childhood period, developmental domains and standards, milestones. Determinants of child health: identifying determinants that impact on early childhood. Improving ECCD: role of family and community in improving child ECCD, child health care services.

HPT 2109 - MATERNAL AND CHILD HEALTH (MCH)

Concepts in maternal and child health. Recognizing aspects of development relevant to under five years, 5-12-year age group and 12-18 year age group; needs of young children and their health requirements. Determinants of child health; identification determinants that impact on child health; overview of the rights of the child, role of family and community in improving child and maternal health, maternal mortality. Child and maternal health care services.

HPT 2210 - STATISTICAL METHODS IN HEALTH RESEARCH

Introduction to the nature and scope of statistics. Data collection and preparing data for analysis. Types of data. Theoretical distribution of data. Normal distribution and its applications. Confidence intervals. Summary and descriptive statistics. Concept of hypothesis testing. Frequency tables and Chi square test of goodness of fit. Categorical data analysis for associations. Scatter plot and correlation. Introduction to non-nonparametric hypothesis testing. Sample size calculation for health research. Data management. Introduction to statistical software (SPSS).

FIELD PRACTICAL PLACEMENT

HPF 2201 - APPLYING MEASURES TO IMPROVE HEALTH STATUS OF A STUDENT GROUP

Identification of an applicable group/s to promote wellbeing. Engaging and developing a mutual partnership with the selected group/s. Recognition of applicable measures to improve health of groups. Develop objectives in partnership with selected group/s. Designing activities and application of measures to improve health status of selected group/s. Monitoring the process. Assessing and addressing negative value systems of the members of groups. Modification of measures based on the achieved progress with the selected group/s.

HPF 2102 - INTRODUCTION TO FIELD SETTINGS

Identifying structures and key functions of different settings and communities. Recognizing key persons in communities to link up with. Describing socio-economic and behavioural characteristics of a given community. Recognizing the need to work with both formal and informal settings. Working across different disciplines and sectors using different approaches.

HPF 2103 - ENGAGEMENT OF COMMUNITIES

Building mutually beneficial relationships with the community. Use of existing links and use of new links to develop partnerships. Developing skills within the field practical group to develop dialogues with people and assessing their own skills in engaging with community. Mechanism of initiating a health promotion process. Working in mutually respectful partnerships with varied groups. Explaining successful engagement with different community groups. Applying different strategies to engage with settings in the community and to initiate health promotion process. Modifying strategies and actions that are used to engage with community and its' groups when needed. Explaining why some mechanisms are successful in engagement with community. Comparing potential of different community groups.

HPF 2204- CLARIFYING HEALTH ISSUES WITH ASSIGNED COMMUNITIES

Identification of health needs, issues and concerns of the community. Assessing current status and needs of individuals and communities. Recognizing both felt and normative needs of a given community. Clarifying health needs and issues with the community. Transforming. Prioritizing goals, needs and health issues in participation with the community by using appropriate strategies.

HPF 2105 - DEVISING MEASURES OF HEALTH IN PARTNERSHIP WITH COMMUNITIES

Developing objectives together with the community. Identification of measures applicable to assess community health. Recognizing qualitative and quantitative measures. Explaining measures of health and changes in health using non-technical language and demonstrating the benefits of developing measures to improve well-being. Modifying measures when it is needed and designing applicable measures with the partnership of communities relevant to selected health issues. Evaluating relative benefits of different measures.

HPF 2106 - ASSESSING CHANGES IN HEALTH STATUS OF STUDENTS GROUPS

Continuation of effective activities to improve health status of student group/s. Developing suitable designs to assess the changes in own group and selected group/s. Measuring health changes of groups by applying predetermined measures. Describing changes in their own and target group. Combining deferent measurements to measure overall wellbeing. Modifying activities according to feedback. Analyzing the changes. Interpreting the changes.

HPF 2207- CLARIFYING STRUCTURAL DETERMINANTS OF HEALTH WITH COMMUNITIES

Identifying and prioritizing determinants of prioritized health issues with the community. Planning and applying methods to identify and prioritize determinants with the community. Recognizing different methods to clarify structural determinants. Analysing the determinants identified in partnership with the community. Readily discoverable determinants and covert determinants. Different levels of determinants. Social norms and other influences operating in the community.

HPF 2208- ADDRESSING STRUCTURAL DETERMINANTS OF HEALTH OF COMMUNITIES

Designing and modification of approaches together with community to address prioritized determinants. Carrying out activities to address identified determinants using health promotion principles. Analysis of the quality of selected health promotion interventions in making improvements in people's health. Identifying and addressing unseen determinants that are recognized during the process. Developing indicators to monitor the progress and outcome in participation with the community. Assess the progress in taking control over the determinants of health by community.

HPF 2109 - MONITORING PROGRESS OF COMMUNITIES

Identifying and developing suitable indicators to monitor the progress of communities they work with. Assuring community ownership of monitoring progress. Proposing and applying different approaches for monitoring changes with the community. Analyzing changes. Assessing changes in selected determinants in partnership with the community.

HPF 2110 - CLARIFYING OBSTACLES TO PROGRESS WITH COMMUNITIES

Identification of obstacles arising when working with communities. Clarifying obstacles with the participation of community members. Internal and external obstacles. Visible and hidden obstacles. Recognizing the impact of obstacles to the process and analysing obstacles and impact with communities. Demonstrating the ability to deal with obstacles and revise the process if it is needed in order to overcome obstacles.

9.1.5.3 THIRD YEAR

HPT 3201 - FAMILY AND COMMUNITY HEALTH PROMOTION

Family as a special unit. Healthy families. Common patterns of dysfunction. Understanding how a system operates. Analysis in terms of system, and principles of improving wellbeing of system. Measures of improvements in functioning. Community processes and community health. Analysis of how community functions as a system. Foci of power and foci of influence. Healthy relating and dysfunctional relating. Improving community processes for health promotion. Community interventions to improve shared understanding of determinants of wellbeing. Dealing with change. Understanding the seven "Waste". Shared ownership of community health and shared efforts at health improvement. Assessing progress. Community level prevention strategies for drug related problems, violence. (e.g., gender based; child abuse) and HIV and other sexually transmitted diseases. Indicators of impact of intervention. Sustainable Development Goals (SDG). Health and wellbeing across the life span including adolescent health and health of elderly. Physiological and psychological changes in adolescence. Issues related to the "girl child". Substance use and addiction, unwanted pregnancies, suicide. Behaviour change communication, Communication for Behaviour Impact (COMBI), Communication for Development (C4D) Role of health promotion in family and community health.

HPT 3202 - COMMERCIAL INFLUENCES ON HEALTH

Advertising and marketing and the influence: influence on tastes, values and perceptions of what is desirable or undesirable. Subtle influences of commercial interests – intended and unintended. Recognizing the less visible influences: How lifestyle choices are influenced by commercial interests. Advertising and other strategies used. Public health impact of commercial influences. Terms: "industrial epidemics", "profit-driven diseases". Dynamics that constitute commercial determinants of health: demand for growth, increasing market coverage, internationalization of trade and investment; marketing, which enhances the desirability and acceptability of unhealthy commodities; lobbying, which can impede policy barriers; corporate social responsibility strategies including deflecting attention from negative reputations; extensive supply chains and their impact. Dealing with or handling the beneficial and detrimental influence of commercial influences.

HPT 3203 - SOCIAL STRUCTURES AND SOCIAL INFLUENCE

General introduction: sociology, its perspectives, concepts and theories, with particular reference to social order, social change, social inequalities and social stratification. Factors governing social influence. Visible and invisible influences. Power structures. Conformity, Fear of being different. Settings where pressure to conform is more powerful or less powerful. Individual wellbeing in relation to conformity versus independence or autonomy. Specific issues related to rural vs urban settings, closed and open institutions, affluent and impoverished communities. Family and social dynamics: Groups and how they function. Family and other groups. 'Systems' approaches to understanding and change. Common forms of dysfunction and problems. Approaches to improving dysfunctional groups or families.

HPT 3104 - PHILOSOPHICAL AND ETHICAL ISSUES IN HEALTH EDUCATION AND PROMOTION

Discussion and application of key philosophical and ethical principles such as moral law, self-empowerment, autonomy, equity, justice, duty, pragmatism, utilitarianism and rationality. Brief introduction to the philosophy ethics, history of ethics. Research ethics, ethics in health and social care research (qualitative and quantitative). Ethics and vulnerable populations. Procedural ethics: essential components of a proposal submitted to ethic review committee, information leaflet and consent forms. Ethics in health promotion. Bases of 'ethical' decisions. Ethics of influencing existing norms and values. Acceptable and unacceptable interventions. Criteria for determining potential benefit and harm. Continuing evolution. (Philosophical and ethical issues related to health promotion will be incorporated in all the teaching and practical work throughout the course.)

HPT 3205 - HEALTHY PUBLIC POLICY & LEGISLATION

Health as a commodity. Health as a right. Financing and economics of health care. Legislations in relation to health and health care worker. Medication and drugs. Food, sanitation and living conditions. National and International health policy development. Levels of policymaking. Control by public of policymaking processes. Accountability of policymakers. Principles of social justice and equity. Priorities for health policy. National and global influences policy development. Service provider priorities and client population priorities. Consultation. Evaluation of policies. Monitoring the implementation of policies. When policies are influenced by commercial influences. Health sector's role in promoting health. Other sectors in promoting wellbeing. Unstated and interpret policies and legislation. Assumptions and beliefs underlying policy decisions. Influence of commercial entities on governments. Relative authority and autonomy of poor and wealthy nations. Forums for addressing international policy concerns. Structures and methods of influence. 'Covert' operations. Pathways to progress. Role of WHO, UN, UNICEF and other international agencies, NGOs and Civil Society Organizations in promoting health. Be an effective member of a multidisciplinary health team and demonstrate qualities of leadership and mentorship.

HPT 3206 - REPORT WRITING AND ASSESSMENT

Purpose or purposes of a report. Standard structures. Differing formats for differing audiences or recipients. Recommended format for reporting field intervention and evaluation findings. Criteria for assessing reports. Peer evaluation of reports and staff evaluations. Learning from assessments. Assessment of reports by peers. Quality of reporting, assessment of field activity and impact achieved in the assigned field area. Verification of reported results. Responses to assessments. Bias and integrity.

HPT 3107 - FUTURE DIRECTIONS IN HEALTH PROMOTION

Continued contact with, and concern for, the communities or other groups linked with during field practical placement. Long term verses short term gains. Attrition or maintenance of gains. Relative persistence of processes versus products. Both local and international future directions; working across settings, integrated policy approach in health promotion, 'health promoting settings' and 'healthy settings', Sustainable development goals (SDGs) and aligning Health Promotion with SDGs.

HPT 3108 - ENVIRONMENT AND HEALTH

Introduction to the natural environment: dynamics of biotic components, characteristics of ecosystems, habits and niches, appreciation of nature, flora and fauna as a part of health and wellbeing. Threats to the environment: direct and indirect causes; Habitat loss, pollution, over population. Effects of climatic changes and settlement patterns on health: changing patterns of infectious diseases, global warming and spread of diseases, ozone depletion and health, chemicals and health. Mitigatory measures: Legal aspects, community participation activities and sustainable development approaches.

HPT 3309 - THE SRI LANKAN SITUATION OF MAJOR HEALTH ISSUES

Influences of social structure: current influences on perceptions of others based on religion and ethnicity. Caste, financial status and "power" influences on personal judgments. Influences of these on persons considered "lower" and 'higher', in a hierarchy of power and assigned value. Disadvantaged communities: socio-economic implications of families living in tea plantations, coastal communities, urban 'slums', welfare camps, conflict areas. Stigma: treatment of differences, labelling and stigmatization. Tobacco, alcohol and other drug use: Nature of tobacco, alcohol and other related drug problems, harm reduction, demand reduction and supply reduction strategies. Epidemiology of alcohol, tobacco and other drug use (both licit and illicit), aetiology and prevention. Alcohol use and social sanction for certain behaviours after alcohol use, acceptance and non-acceptance of aggressive behaviour and violence after alcohol use. Violence: types of violence. Extent of different types of violence. Factors affecting violence. Prevention of violence. Self-directed violence: suicide, deliberate self-harm, extent of social sanction of 'attempted suicide' as a means of relating to or influencing others. Perceptions of suicide. Inter-personal violence: extent of violence or dominance permitted in other relationships – eg men and women, 'raggers' and 'ragged', 'sane' and the 'mentally ill'. Child abuse, youth violence. Collective violence: physical aggression, bombs, explosives and firearms. Human Rights: incarceration in institutions, expulsion from communities, deprivation of rights. Perceived

rights of children, women, the poor, the 'insane'. Healing systems: Western, traditional and alternative healing systems – for example: Ayurveda, Siddha, Unani, Homeopathy, Acupuncture. Health care services: existing health resources. Levels of care. Primary care. Family medicine. Infrastructure of the delivery of health care services.

FIELD PRACTICAL PLACEMENT

HPF 3101 - REPORTING HEALTH CHANGES IN STUDENT GROUPS

Reporting the process, activities and changes assessed. Reporting according to standard formats. Appropriate methods to communicate health changes. Interpreting and analysing the changes. Sustaining gains and continued follow up with the applying group/s. Justification of claimed results and communication of findings.

HPF 3302 - ADDRESSING OBSTACLES TO PROGRESS WITH COMMUNITIES

Recognizing obstacles to progress. Identifying different methods to address obstacles. Devising suitable strategies to address obstacles. Designing activities to address identified obstacles following developed strategies. Implementing designed activities. Community participation to address obstacles. Assessing the changes in obstacles.

HPF 3103 - REVIEWING PROGRESS WITH COMMUNITIES AND REDIRECTING EFFORTS

Reviewing progress of the community by applying process and outcome measures. Preparing strategies to review the progress of the communities. Analyzing progress using appropriate measurements. Identification of incorrect directions. Designing activities to redirect the process to convert ineffective activities by revising logical framework and activity framework. Assessing the progress.

HPF 3204 - PROGRESS EVALUATION

Comparison of baseline level and the ongoing process. Preparing and applying of process, output & Outcome indicators to evaluate with partnership with communities. Describing qualitative and quantitative measures to assess. Analyzing data by combine indicators of process, outcomes and impacts. Writing a progress report.

HPF 3205 - FINAL EVALUATION OF FIELD SETTINGS

Selecting an appropriate evaluation design from available designs. Developing an evaluation plan to evaluate the degree of achievement of objectives. How to do this in partnership with communities. Internal and external evaluation. Implementation of evaluation. Assessing effectiveness and costs. Analysing data and interpretation of the results. Justifying the achievements. Writing an evaluation report.

HPF 3206 - PROJECT REPORT WRITING

Reporting the process, activities and changes assessed. Reporting according to standard formats. Summarizing, interpreting and critically discussing the findings. Writing a final report. Communication and dissemination of findings of health promotion approach.

HPF 3207 - FOLLOW UP AND CONTINUING CONTACT WITH COMMUNITIES

Planning methods to follow up the activities. Continued follow up through various approaches. Determining factors for sustainability. Identifying mechanisms to sustain gains. Effectiveness of different methods for continuing health promotion process.

9.1.5.4 FOURTH YEAR

HPT 4501 - CHILD WELLBEING AND DEVELOPMENT

Definition of child health in positive terms (i.e. not as just the absence of disease or distress). Operationalizing the concept of wellbeing as applied to children. Defining indicators of progress or improvement. The impact, on mortality and morbidity of children, of activities which are designed primarily to improve wellbeing. (Other relevant contents of that covered in the first three semesters will be expanded and put in the perspective of child wellbeing). The 'development' perspective as a special issue in child health. Understanding the range of needs for optimal development. Optimizing the provision of needs. Constraints to the provision of the range of needs for healthy growth and development. Overcoming constraints. Assessing the level of provision of needs. Perceived rights of children. Improving family functioning as a key means of improving child wellbeing. Community processes and community health as a contributor to child health and wellbeing. Improving community processes through and for child health promotion. Biological and social factors influencing child health. Promotion of maternal and child health. Determinants of child and maternal morbidity and mortality. Children with special needs and services needed for such children. Early Childhood Care and Development (ECCD) practices, mainly the home based practices that can be applied in different community settings, especially for disadvantaged, under-served or economically underprivileged settings. Empowering communities, especially high-risk or deprived communities by improving their skills, understanding and enthusiasm to enhance the quality of physical and psychosocial environments within homes and communities to strengthen ECCD. National and global level research on successful ECCD interventions that fulfil the needs of children in low income and most deprived families, communities and populations. National, regional and global policies on ECCD.

HPT 4202 - PREVENTION OF SEXUALLY TRANSMITTED INFECTIONS

Range of diseases and their modes of transmission. Range of measures that will minimize or prevent transmission of these diseases. Measures effective for individual protection and those required for population–wide reduction in transmission. Evidence available

from experiences of other nations and the applicability of these experiences to Sri Lanka. Barriers to individual protective measures. Underlying influences that maintain such barriers. Overcoming barriers to individual protection. Issues related to power and authority within sexual relationships. Helplessness and victimization. Victimization of women and children. Counteracting helplessness and victimization. Planning, implementing and assessing the effectiveness of interventions. Skills required for effective interventions. Population measures for reducing transmission. Social norms and attitudes that need to be addressed. Examples of successful national strategies and unsuccessful ones. Structural factors that need to be addressed in effective national responses. Overcoming social and cultural barriers and possible conflict with respect for traditional cultural values. Addressing difficulties of decision making in situations of conflicting priorities. Initiating change – facilitators and inhibitors. Externally versus internally driven progress. Working with "target" populations. Ethics of influencing decisions. Acceptance of different opinions. Respect. Judgmental attitudes and bases of such attitudes. Reaching the correct mix of preventive strategies. Skills required for implementing effective interventions. Initiating and maintaining impetus for progress. Recognizing progress and seeking sensitive indicators of progress. Helping others recognize small gains. Indicators of progress. Evaluation, and difficulties in evaluation. Programme evaluation. Difficulties in evaluating national strategies. Assessing trends in the spread of sexually transmitted infections. Record keeping and retrieval. Assessment of longer term progress. Quantifying costs and benefits.

HPT 4503 - REDUCTION AND CONTROL OF TOBACCO, ALCOHOL AND OTHER DRUG RELATED HARM

Range of harm produced by the use of these different substances. Visible and less visible kinds of harm. Quantifying the extent of harm and comparison with other causes of mortality, morbidity, impairment of individual and social wellbeing and economic and social harm. Benefits attributed to the use of these substances. Problems in assigning 'causality' in associations. Misconceptions about causes versus associations. Factors that influence initiation of use, and progression to occasional and regular use. Determining underlying or structural influences behind the proffered causes. Strategies used in promoting use of these substances. Commercial interests and influences. Advertising and marketing and their influence on tastes, values and perceptions of what is desirable or undesirable. Recognizing less visible strategies. Dealing with or handling commercial influences. Other influences in promoting the initiation and continued use of these substances. Social roles played by these substances. Symbolic or social meanings and values attached to use. Self and social identity and use of tobacco, alcohol or other drugs. Power relationships and acquiescence in or imitation of substance use. Alcohol use and social sanction for certain behaviour after alcohol use. Influence of social acceptance and non-acceptance of aggressive behaviour and violence after alcohol or other drug use. Interventions claimed to ameliorate problems related to substance use versus those demonstrated to do so. Global, national and other macro level policies. Local action to reduce harm. Complementarity of these approaches. Theoretical underpinnings of social and community interventions. Targeting interventions to different segments of the population. Mobilizing groups and communities. Addressing the underlying determinants of substance use and problems. The range of interventions required for a comprehensive approach. Skills and attitudes needed for different interventions. Measurement of progress. Early and later indicators of progress. Tailoring tempo of interventions to suit varying conditions. Building on success and sustaining progress.

HPT 4204 - REDUCTION OF SUICIDE

"Understanding" suicide. Completed and attempted suicides. Patterns of suicidal behaviour. Deliberate self-harm: social sanction and responses to "attempted suicide". Perceptions of suicide. Analysis of data available within Sri Lanka and outside. Challenges in getting accurate information on suicide. Comparisons of variations of suicidal behaviour within localities of Sri Lanka and between other nations and Sri Lanka. Comparison of trends over time. Individual–centred psychological explanations of causes. Recognized or demonstrated individual vulnerability factors. Proffered "causes" of suicide and the applicability of these as explanations of temporal and national variations in rates of suicide. Reasons for the popularity of certain explanations of suicide and unpopularity of others. Evidence based explanations of "causality". Problems in attributing causation. Suicide rate: Recorded changes in suicide rates with specific interventions. Theoretical basis of different interventions. Usefulness of these in prevention work. Weaknesses and strengths of individually focussed approaches. Socially based explanations. Impact of emerging social trends and phenomena (eg: use of social media and technology, new finance schemes, illicit drug trends). Successes and failures of socially based interventions. The role of the mass media in preventing and promoting suicide. Factors to be addressed in implementing a broad–based suicide prevention programme. Assessing effectiveness of a national programme. Community based interventions and the potential for paradoxical results. Desired normative social changes and early indicators of success or failure of interventions. Group decisions on direction and indicators of progress of a "suicide prevention" initiatives. Processes in initiating and maintaining impetus for progress. Initiating change: facilitators and inhibitors. Skills required in implementing a community-based suicide prevention activity. Dealing with opinion leaders. "Democratic" versus authoritarian leaders in communities and groups. Respect for existing structures and respect for rights and privileges of all individuals. Creating a milieu that facilitates development of all members of a group or community. Helping survivours: Facilitating self-examination and questioning. Listening. Understanding verbal and non- verbal communications. Recognizing readily achievable and less readily achievable goals within given circumstances and time frames. Quantifying costs and benefits.

HPP 4801 – PROJECT (PART I)

The project part 01, totaling 8 Credits (800 notional hours) is assigned to students who qualified for the fourth year under the supervision of a senior academic staff member. There are two components in this phase of the project. The first component focusses on writing a project proposal. The second component is taking initiating the implementation. The project will be for the application of a specified health promotional intervention in a small community or several households. The area, in which the intervention will focus will be selected form a list of options that is made available to students. A tentative list of subject areas from which students shall choose are given below.

i. Improving child wellbeing and development

ii. Reduction of the spread of sexually transmitted infections (Mainly HIV/AIDS)
iii. Reduction of tobacco, alcohol and other drug related harm
iv. Reduction of suicides and accidents

Any subjects outside this list will also be considered. Provided that the student justifies his /her choice of subject in terms of public wellbeing, significance of the issue and the potential to create an impact during the project period. Students must discuss with the supervisor to select his/her project topic. Before commencement of the research work, a proposal should be submitted including the planned methodology and expected outcomes and presented at a seminar before a panel of examiners.

i. **Project proposal** (2 credits)
The first stage will include preparatory study and the formulation of a proposal.
ii. **Project implementation I** (6 credits)

HPP 4802 – PROJECT (PART II)

During the second phase of the project (Part II), the focus is on continuing the research initiated during fourth year first semester. After making necessary amendments to the overall research process based on the feedback received at the proposal presentation, the student is expected to continue implementation according to an agreed time line. Health promotion intervention of the research which is the core of this this phase should be carried out under supervision. The supervisor should be informed regularly on the progression and challenges faced during implementation. A dissertation should be submitted before the end of the academic year on or before an agreed date by following the given thesis guidelines. Finally, the findings of the project should be presented before a panel of examiners.

i. Project implementation II (4 credits)
The implementation of the project will be monitored through periodic supervision. The project will spread over a period of at least twenty weeks. Regular monitoring meetings will be held with the supervising staff.

ii. Dissertation (3 credits)
Preparation and submission of the dissertation, reporting the work carried out and the results obtained will be done in the third stage. The report will have to be presented in a standard format that will be prescribed.

iii. Seminar (1 credit)
A student shall present a seminar on any topic related to health promotion.

Details of fourth year research project is given in the *'Guideline for fourth year research project'.*

FACULTY WEB > ACADEMICS > DEPARTMENTS > HEALTH PROMOTION > STUDY PROGRAMME > GUIDELINES OF THE STUDY PROGRAMME

9.1.6 INFORMATION TECHNOLOGY

9.1.6.1 FIRST YEAR

ICT 1201 – FUNDAMENTALS OF COMPUTER SYSTEMS

Introduction: Early history of computing, Computer generations, Characterization, Classification of computers, Basic components and organization of a computer, Representation of information in a computer, Concept of programming and programming languages, Language translation. Application Software: Basic features of application software. Tools for work and study: Desktop Accessories, Word Processing, Spreadsheets, Database Management Systems, Graphics, Communications, Software Suites, etc. Operating Systems and its functions: The need for an operating system, the types of operating systems, the features of the MS-DOS/Windows XP operating system, Linux. Utility programmes, Utility packages. Peripherals: Input devices and its functions, Output devices and its functions, Processing and memory hardware, Secondary storage and communication devices, Introduction to device ports, assembling a computer. Computers and communication: Revolution in computers and communication. The digital future: Role of IT in society, Distinguish between data and information, Properties of information and basic IT tools, e-learning, e-banking. Social issues: Ethics and standards in computing, Copyright, Intellectual property right, Piracy.

ICT1402 – PRINCIPLES OF PROGRAMME DESIGN AND PROGRAMMING

Concept of programming and programming languages, Language translation. Techniques of Problem Solving: Problem analysis, Algorithms, Flowcharts, Pseudo Codes, Paper Simulations. Fundamentals of C Programming: Structure of a C Programme, Input/Output, Types of Variables, Arithmetic Operations, Relational Operations, Logical Operations. Control Structures: If/Else, While repetition, For repetition, Switch multiple selection, Do/While, Break and Continue, Functions, Scope of Variables, Parameters, Recursion, Arrays, Records, Comparison of structure and class, Pointers, Dynamic memory allocation, Pointers to functions, File Handling.

ICT 1303 – BASIC ELECTRONICS AND DIGITAL LOGIC DESIGN

Introduction to electronics and electronic systems, introduction to semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, introduction to transistor biasing. Small signal transistor amplifiers, Digital concepts: basic logic operations, logic functions, introduction to ICs. Combinational logic: adders, comparators, decoders, encoders, multiplexers, de-multiplexers. Sequential logic: flip-flops, timers, counters, shift registers, memories, ALU.

ICT 1404 - MATHEMATICS AND STATISTICS FOR COMPUTING

Matrices and Determinants: Introduction to determinants, Properties of determinants, Evaluation of 2nd order and 3rd order determinants, Cramer's rule and its use of solving linear equations, Introduction and types of matrices, Scalar product, Addition, Subtraction, Multiplication, Inverse of a matrix and applications (solving linear equations). Mathematics and Logic: Set theory, Combinatorics, Propositional logic, Relations and Functions, Theory of series, Tailor's Theorem. Basic Statistics: Probability concepts, Analysis and presentation data, Probability Distribution: Normal, Binomial, Poisson, Exponential, Regression, Correlation, Random Numbers.

ICT 1305 - DATA STRUCTURES

Data structures: Random Access and Sequential access, Performance Analysis, Big O notation, Arrays, Array based Lists, Linked Lists: Array Based, Singly Linked, Doubly Linked, Circular, Sorted. Stacks using Arrays and Linked Lists, Queues using Arrays and Linked Lists, Hash Tables using Arrays and Linked Lists, Trees using Arrays and Linked Lists, Graphs: Depth First Search, Breadth First Search. Simple Sorting & Searching Algorithms: Selection sort, Bubble sort, Merge sort, Binary search.

ICT 1306 - OBJECT ORIENTED PROGRAMMING

Object Oriented Concepts: Objects, Classes, Instances, Methods and Attributes, Inheritance, Encapsulation, Polymorphism, Abstraction, Dynamic Binding, Defining Member Functions, Constructors and Destructors, Copy Constructors, Access modifiers, Static Data Members, Static Member Functions, Type conversions, Extending Classes, Defining Derived Classes, Single Inheritance, Multilevel Inheritance, Multiple Inheritance. Object Oriented Programme Designing: Language APIs, Instance Creation, Event Handling, Input/Output, Threads, Concurrent Processes.

ICT 1407 - DATABASE SYSTEMS

Introduction: Definition as a centralized storage of database, File based Systems, Prevention of redundancy and inconsistency, Data independence, Data abstraction, Data models, Database System Architecture, Entity-Relationship Model and Extended Entity-Relationship Model: Entities, Relationships, Entity sets, Relationship sets, Attributes, Mapping constraints, Keys, E-R diagrams, Map E-R diagrams to relations, Design of an E-R database scheme. Relational Model: Structure of relational database, Relational algebra. Normalization and Relational Database Design: Relational database design and its pitfalls, Normalization (First, Second, Third and BCNF), using functional dependencies and multivalued functional dependencies. Overall system structure: Indexing and hashing, SQL (DML, DDL), Awareness of advanced topics. Integration and Application Design: Introduction to database integration techniques.

ICT 1308 - OPERATING SYSTEMS

Introduction: Advanced Hardware Features, Operating Systems Design and Architecture

Concurrent Processing: Process Scheduling and Deadlocks, Inter process Communication and Synchronisation, Interrupt Handling, Memory allocation and deallocation, File Systems and Disk Management. Introduction to Distributed Computing: Virtualisation, Process Distribution, Distributed File Systems

9.1.6.2 SECOND YEAR

ICT 2301 – DESIGN AND ANALYSIS OF ALGORITHMS

Introduction: What is an algorithm, Characteristics of algorithms, Time and Space complexities, Asymptotic notations, Devising and expressing algorithms. Algorithmic techniques: use and removal of recursion; validation, analysis, Greedy Method, Divide and conquer, Backtracking, Dynamic Programming, Branch and Bound, Symbol Table Algorithm, Job sequencing. Searching and sorting techniques: Bubble sort, Merge sort, Quick sort, Insertion sort, Selection sort. Binary search, N-queen problem, optimal binary search trees, Hashing algorithms, Huffman code, Convex hull. Knapsack problem: sum of subsets knapsack problem, O/I knapsack problem. Tree Algorithms: binary trees, Breadth-first and Depth-first search in tree traversal, threaded AVL.

ICT 2402 – SOFTWARE ENGINEERING

Introduction to Software Engineering: Software crisis, Software engineering objectives, Software Development Life Cycle. Software Process Models: Waterfall model, component-based Software Engineering, Spiral Model and Prototyping, Extreme Programming, Rational Unified Process, and Agile Technology. Non-functional Requirements: Software Systems, Properties of Software Systems, socio-technical systems, Reusability, Portability, Interoperability, Maintainability, Usability, Safety, Security and Efficiency. Functional Requirements, Requirement Specification: Requirement analysis, Specification documents. Design Techniques and software architectures: Cohesion, Coupling, Sequence diagram, Collaboration diagram and detailed class diagram, software design frameworks, Computer Aided Software Engineering (CASE), introduction to web services and service-oriented architecture. Software Implementation: software engineering best practices, Testing: White Box testing, Black Box testing, test case generation, Software Inspection, Unit, Integration and Acceptance testing, Regression testing. Software Quality: Software matrices and Measurements, Structured and Object-Oriented Approaches. Current topics: emerging software engineering concepts.

ICT 2403 – GRAPHICS AND IMAGE PROCESSING

Overview of Graphics Systems: Video Display Devices, Raster-Scan Systems, Vector Systems, Graphics Monitors and Workstations, Input Devices, Hard-copy Devices. Output Primitives: Points and Lines, Line-Drawing Algorithms, Circle- Generating Algorithms, Filled-Area Primitives. Geometric Transformations: Basic Transformations (Translation, Rotation, Scaling, Reflection, Shear), Matrix Representations and Homogeneous Coordinates, Composite Transformations (General Pivot-Point Rotation, General Fixed-Point Rotation, General Scaling Directions), Transformations between Coordinate Systems, colour/gray-scale transformations, Introduction

to Three-Dimensional Geometric Transformations. Two-Dimensional Viewing: The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Clipping Operations: Point Clipping, Line Clipping, Polygon Clipping.

Image Processing: Elements of a digital image processing system: Digitizers, Display and Recording devices. Digital image fundamentals: Sampling and quantization, Transformation between raster & vector systems, Image compression, Relationships between pixels, Connectivity. Image Enhancement: Histogram equalization, Smoothing, Sharpening, Noise removal, Projection. Image Segmentation: Edge detection, Boundary detection, Thresholding, Representation and description. Image Matching.

ICT 2204 – WEB TECHNOLOGY

Web Development: HTML, XML, database connectivity, client side scripting using JavaScript, server side scripting using PHP, Ajax, session handling, and cookies.

ICT 2305 – COMPUTER NETWORKS

Introduction to Computer Networks, Classification of Computer Networks, ISO-OSI and TCP/IP Architecture. Data Communication and Transmission: Introduction to data transmission, Properties of signals, Time and frequency modulation techniques, Asynchronous and synchronous transmission. Transmission Media: Twisted pair, Coaxial cable, Optical fiber, Terrestrial microwave, Satellite microwave, Radio wave. Transmission and Switching: Frequency division and time division multiplexing, Circuit switching, Packet switching. Error Detection and Correction Techniques: Parity checks, Cyclic Redundancy Checks (CRC), Hamming code. Framing: Character count, Character stuffing, and bit stuffing. Protocols: Stop and wait protocols, Sliding window protocols, Network topologies and standards, Internetworking, Connectionless and Connection-oriented services, Datagram delivery, CSMA/CD, Token Ring, Token Bus, VLANs, Wi-fi, Wi-Max, Bluetooth. Network components: Switches, Routers, servers, structured cabling. Internet Protocols: IP, ICMP, TCP, UDP, Routing and Routing algorithms, ARP and RARP Building routing tables, CIDR, DNS.

ICT 2406 – INTERNET PROGRAMMING

An introduction to Internet: IPv4/IPv6. Internet Applications, World Wide Web, VoIP, VPN concept, HTTP, FTP and TELNET. Electronic Mail: SMTP, Mail Access Protocols (POP3, IMAP), Web based e-mail; Internet Programming: An introduction to Sockets, Socket Programming with TCP, Java, Client/Server computing, RMI and distributed computing. Streaming: video and audio streaming.

ICT 2207 – MANAGEMENT INFORMATION SYSTEMS

Organizations, Management, and the Networked Enterprise: Information Systems in Global Business Today, Global E-Business, How Businesses Use Information Systems, Information Systems, Organizations, and Strategy, Ethical and Social Issues in Information Systems; Information Technology Infrastructure: IT Infrastructure and Emerging Technologies, Foundations of Business Intelligence: Databases and Information Management, Telecommunications, the Internet, and Wireless Technology Securing Information Systems; Key System Applications for the Digital Age: Achieving Operational Excellence through Enterprise Applications-Commerce: Digital Markets, Digital Goods, Managing Knowledge, Enhancing Decision Making.

ICT 2408 – COMPUTER ORGANIZATION AND ARCHITECTURE

Introduction: Organization and Architecture, Structure and Function, Von Neumann Architecture and Harvard Architecture. The Computer System: Computer Components, Interconnection Structures, Bus Interconnection. Processor Organization and Function: CPU registers, Instruction fetch and execute, Instruction format, Instruction execution, Interrupts, Interrupts and the instruction cycle, Control Unit, Microprogrammed Control. Computer Memory System: Characteristics of memory systems, The memory hierarchy, Cache memory, Internal memory, External memory. Input/Output System: I/O modules, Programmed I/O, Interrupt-driven I/O, Direct memory access, storage systems, RAID. Overview of Advanced Architecture: Pipelining, RISC architecture, Superscalar/VLIW architectures. Assembly Language Programming: instruction sets of different microprocessors, writing assembly programmes.

ICT 2209 – COMMUNICATION SKILLS

Introduction to communication skills: Importance of communication skills, Communication process, Downward communication, Upward communication, Horizontal communication, One-way communication, Two-way communication, Multi-directional communication, Effective communication and barriers for communication, Forms of communication: Oral communication, Written communication, Non-verbal communication, Para-language code, Signals, Symbols, Gestures, Sign language, Levels of communication: Inter personal communication, Public communication, Public speaking, Major components of communication, Communication for coordination and management, formal letters, notices, memos, fax messages, email etc., Motivation: Intrinsic motivation and extrinsic motivation, Leadership & personality development: Leadership: Supportive leadership, Directive leadership, Achievement oriented leadership & participative leadership, Conversations: Face to Face Conversation - Telephone techniques – Role play activities (Students take on roles and engage in conversation) Group discussions, Language skills: Receptive skills (Listening and reading), Productive skills (Speaking and writing), Grammar (Language structure), Use of language effectively & accurately, Skimming & scanning, Presentation skills: Power point presentation, Body language, Visual aids, Pronunciation, Eye contact, Facial expression, Clarity, Audibility, Fluency, Relevance, Voice control, Accuracy, Meeting management: Developing meeting goals, make agendas, minutes, notices, selecting office bearers, conducting meetings, seminars, workshops, conferences, Interview skills: Preparing for interviews, Facing interviews, Resume preparation, covering letter, letter of recommendation, service certificates, testimonials, Note taking (reference), summary, editing, academic writing, publishing, writing articles to newspapers, magazines and journals, report writing, project proposals & research proposals, newsletters, Use of communication technology appropriately and effectively (Computer, internet, web sites, multimedia, e-learning, electronic library).

ICT 2210 – Multimedia Technologies

Introduction to Multimedia, Fundamentals of Multimedia: Hardware that enables multimedia, multimedia file types, their features and usage, Media Composition: Text (font) editors, Graphic and Image editors, Audio editors, Video editors, Multimedia Compression: Basic data compression techniques, Graphic compression, Audio compression, Video compression, Media Integration: Interactive audio, Interactive video, authoring multimedia, multimedia on the Internet, streaming, webcasting, Multimedia for Social Media.

9.1.6.3 THIRD YEAR

ICT 3301 – HUMAN COMPUTER INTERACTION

Foundations of human-computer interaction: The human (input, output, storage and memory, information processing, emotion influences for human capabilities), The computer, Interactions, Paradigms. Human-centered software development: Input design concepts and guidelines, Input implementation methods, form design guidelines, GUI controls, tools for prototyping input design; Graphical user-interface design; Human-centered software evaluation; HCI aspects of collaboration and communication

ICT 3303 – INFORMATION SYSTEMS SECURITY

Principles and practices of cryptography and network security: public key cryptography, digital signatures, confidentiality, authenticity, web security, email security, firewalls, e-commerce, The principles and practices of cryptographic techniques: Generic security threats and vulnerabilities, The design of security protocols, Security controls: Access control, Physical and Environmental Protection, Encryption/Decryption, Malicious Code Prevention, Personnel Security and Data Security, Security monitoring: Activity Monitoring and Condition Monitoring, Analysis and Response.

ICT 3304 – EMBEDDED SYSTEMS

Introduction: Embedded systems overview, Design challenge – optimizing design metrics, Embedded system technologies: Processor technologies, IC technologies, Design Technologies; General Purpose Processors and special purpose processors; Embedded system programming: MIPS/SPIM Assembly Programming, Embedded Programming in C, Designing embedded systems: Designing Custom Single Purpose Processors, Using Standard Single Purpose Processors, Embedded system development life Cycle, Peripheral interfacing: Industry Standard Buses: RS232, I2C, SPI,CAN, Microcontroller architecture: RISC, CISC, Intel 8052, PIC, ARM, IO, Memory, Microcontroller applications: Introduction to Microcontrollers & PIC Microcontroller based interfacing.

ICT 3205 - INFORMATION TECHNOLOGY PROJECT MANAGEMENT

Introduction to Project Management, Proposal writing, Project planning and scheduling, Information Technology Context and Process Groups in Project Management, Project Integration Management, IT Project Scope Management, Project Time Management, IT Project Cost Management, IT Project Quality Management, Project monitoring and reviews, IT Project Human Resource Management, Project Communications Management, IT Project Risk Management, IT Project Procurement Management, Report writing and presentation.

ICT3207 – PROFESSIONAL PRACTICE AND ETHICS

Introduction to Legal Concepts, Intellectual property, copyright and patents, Contracts, Liability, Introduction to ethics, Professional ethics, Privacy and the freedom of information, Computer misuse and computer crime, IT and the quality, quantity and organization of work, The need of social responsibility, Social responsibilities/ethics of a manager, Professional skills, Attitude, Professional development: Social etiquette, Dress, Habits, Respect to others/ other professions etc., Compliance to Standards (ISO etc.).

ICT3208 – ENTREPRENEURSHIP

What is a business, Options for Entering into business, The Marketing Plan, Market Research and Product Strategy, Promotional and Pricing Strategies, Distribution Channels, Sources of Financing, How to select people for the Management Team and for the Organization, Selecting a Location, Planning Facilities and Managing Human Resources.

ICT3209 – PRINCIPLES OF ACCOUNTING

Concepts of financial accounting, Practice of book keeping including books of Prime Entry, Ledgers and Trial Balance, Preparation of Trading Profit & Loss and Balance Sheet, Cash flow statement, Bank reconciliation.

ICT3310 – PRINCIPLES AND PRACTICES OF MARKETING

Marketing as an organizational function, Evolution of marketing concepts, Marketing goals and strategies, Consumer behavior, Marketing mix and targeting, Strategies for products, pricing, channeling and promoting products, Brand strategies and brand management, Preparation of a marketing plan.

ICT 3202 – OPERATIONAL RESEARCH

Simplex Method-Theory and Computational Procedure: Efficient Computational Techniques. Simplex and Revised Simplex Method, Decomposition Algorithm and the Bound Variables Algorithm. Duality theorem and Post Optimality Analysis. Transportation Assignment and Allocation Problems: Inventory model, Decision theory, Project and Scheduling by PERT-CPM (Critical Path Method). Network Analysis, Applications.

ICT 3212 – INTRODUCTION TO INTELLIGENT SYSTEMS

Introduction to Intelligent Agents; introduction to problem solving algorithms used in intelligent systems, knowledge representation, introduction to logic concepts, introduction to Prolog, making decisions, Fuzzy Logic; Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, introduction to Artificial Neural Networks; introduction to Natural Language Processing.

ICT 3213 – ADVANCED OPERATING SYSTEMS

Operating system principles; process scheduling and dispatching; memory management and virtual memory; I/O device management, disk scheduling algorithms, process and file system security, reliability and fault tolerance, RIAD and file system reliability; concurrency, deadlock detection and prevention, virtualization, real time processing, distributed processing.

ICT 3411 – GROUP PROJECT

Project identification and proposal preparation, requirement analysis and specification, domain specific and technology specific research and literature review, concept development, software development life-cycle selection, system design and specification, selection of technologies and CASE tools for implementation, use of software engineering best practices, system implementation and testing, system deployment, report writing, research paper writing and publication, project demonstration, project marketing.

9.1.6.4 FOURTH YEAR

ICT 4201 – FUNDAMENTALS OF E-LEARNING

Principals and application of e-Learning: Introduction to E-Learning, Learning Management Systems, Moocs, Compatibility Standards in E-Learning, E-Learning Technologies. **Introduction to Instructional Design**: Theories and models of instructional design, Theories and Models of Instructional design, Main phases in instructional design (Need Analysis, Design, Implementation, and Evaluation), **Trends in e-learning**: Adaptive learning, interactive learning, Gamification, AR/VR/MR

ICT 4302 – INTELLIGENT SYSTEMS

Artificial Intelligence: Introduction, Intelligent Agents; **Problem Solving:** Solving Problems by Searching, Beyond Classical Search, Adversarial Search, Genetic Algorithms, Constraint Satisfaction Problems; **Knowledge and Reasoning:** Logical Agents, First-Order Logic, Inference in First-Order Logic, Prolog, Classical Planning, Planning and Acting in the Real World, Knowledge Representation; **Uncertain Knowledge and Reasoning:** Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions, Fuzzy Logic; **Learning:** Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning , Artificial Neural Networks; Communicating, Perceiving, and Acting; **Natural Language Processing:** Natural Language for Communication, Perception, Robotics.

ICT 4303 – ADVANCED COMPUTER NETWORKS

Scaling IP Addresses: Scaling networks with RFC 1918 IP addresses, NAT and PAT, DHCP, **WAN Technologies:** WAN technologies overview, WAN technologies, WAN design, PPP: Serial Point-to-Point links, PPP, PPP configuration, **Routing**: Routing concepts, Routing algorithms, Routing strategies, **Mobile Communications**: Mobile / Wireless communication standards, data transmission systems, MANETs, Routing in mobile environments, Ad-hoc routing protocols, **ISDN and DDR**: ISDN concepts, ISDN configuration, DDR configuration, **Frame Relay**: Frame relay concepts, Basic frame relay configuration, High-Bandwidth Leased Circuits, **Introduction to Network Management**: Workstations and servers, Network Management Architecture, **Emerging Technologies**: Basics of optical networks, Optical transmission and multiplexing, Software-Defined Networks.

ICT 4204 – MOBILE APPLICATION DEVELOPMENT

Introduction to mobile computing: Software distributions systems for mobile devices, Preparatory programming tools for a mobile application developer, Importance of mobile applications for businesses, Technology trends impacting mobile application, Factors in developing mobile applications, Difference between mobile applications and other software applications, limitations in the mobile environment, **Introduction to Mobile Development Platforms**: Tools and techniques in mobile application development, Generic UI Development for mobile applications, Mobile Software Engineering, Cross-platform App Development, Storing and retrieving data, distributed file handling, Location Based services, SMS based services, Bluetooth integration, Wi-Fi based services, Mobile ready application development frameworks, Android Studio, Xamarin, Xcode, **Mobile Operating Systems**: The Android Software Stack, IOS Environment, Runtime Systems and their features.

ICT 4305 – PARALLEL AND CLUSTER COMPUTING

Parallel architectures (SIMD, MIMD etc.), Parallel algorithm design, Scalability, Communication techniques, Speed and efficiency of parallel algorithms, Introduction to MPI/PVM, General introduction to the concept of cluster based distributed computing, Hardware technologies for cluster computing, including a survey of the possible node hardware and high-speed networking hardware and software, Software for cluster computing, Configuring and Tuning Clusters: This will involve evaluation of the performance of various nodes and networking hardware such as Gigabit Ethernet, Myrinet, Infiniband, Quadrics etc. and special purpose driver software such as VIA, Setting up Clusters: OSCAR, NPCAI Rocks, Score etc., Software and software architectures for cluster computing, including both shared memory (OpenMP) and message-passing (MPI/PVM) models, Programming, features and performance of standard MPI variants (LAM/MPICH/ Vendor specific MPI versions) and variants based on new low level protocols (MVICH), evaluation and tuning of system and software performance, Managing cluster resources: Single system images, system level middleware, distributed task

scheduling, monitoring and administering system resources and possibly some of the following topics: Parallel I/O and Parallel Virtual File System, Scheduling: Condor, Maui Scheduler, Portable Batch System (PBS), Application steering and visualization: Cumulvs, GUIs for visualization and debugging, Brief overview of meta-clustering: the Computational Grid, Globus, Grid Portals, Java RMI Jini.

ICT 4306 – E-COMMERCE

Setting the context to EC, Related terminologies – E markets, E business, Web-Commerce, The ever Widening impact of EC, Types of EC – B2B, B2C, C2B, Government participation in EC, The EC bandwagon, Work-flow management, Customization of products and services, Supply chain management, Inter–organizational applications of EC, An Electronic Commerce Framework, EC requirements and services, Policy and regulatory issues in EC, Components of EC, EDI, Intranets and extranets, Digital Currency and Electronic Catalogues, Workflow management, EC business models, developing and EC business case, EC implementation strategies, Key lessons to remember in EC implementation, Change Management and EC implementation, Information based Marketing, Advertising on the net, Approach to Interactive Marketing on the net, Security Issues and solutions.

ICT 4307 – BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

Overview of DNA and Protein Sequences, Genomics, WEB Sites and Data Banks of Proteins, DNA Sequences, and 3D Structures,

Searching and Matching on String, Arrays and Trees, Computer Analysis of Sequence Data, Regularities, Statistics, Sequence Comparison and Alignment, Two and Multiple, Local and Global, Phylogeny and the Inference of Evolutionary trees, Computational Aspects of Physical Mapping and Sequence Assembly, Computer Analysis and Prediction of Protein Structure, 3D Matching, Export Techniques to Data Mining, Compression, DNA Computing.

ICT 4208 – GEOGRAPHIC INFORMATION SYSTEMS

Introduction: Definitions, applications, and elements of GIS; Hardware and software for GIS; Fundamental Concepts: Database concepts, spatial concepts; Models of geospatial information; Representation and algorithms; Structures and access methods; Architectures; Interfaces; Spatial reasoning and uncertainty; Temporal and spatiotemporal information systems; Implementing web based GIS solutions using Open Source Software.

ICT 4609 – INDIVIDUAL RESEARCH PROJECT

Each fourth-year student is required to do a research project in information technology related area under the supervision of a senior academic staff member. Students are expected to apply the knowledge gained throughout the programme.

ICT 4410 – INDUSTRIAL TRAINING

Students are required to undergo an industrial training for a period not less than six months. The training should cover one or more subject areas that they have learned during their degree programme. The student undergoing the training should demonstrate her/his technical capabilities to the satisfaction of the supervisor so as to get her/his comment confirming the adequacy of the knowledge gained during the training. Students undergoing the training should pay their special attention to the organizational structure, teamwork, leadership qualities, and technical aspects of the work done, applicability of the knowledge gained from the degree programme and general etiquette of the organizational environment. The student shall record his day-to- day functions and summary of the work done for each week and each month. This will serve as the basis for her/his evaluation. Two confidential reports (mid-term and end-term) will be requested from the on-site supervisor. Additionally, staff members will visit the training site for direct observation during the first half of the training. A bound copy of the final report together with a soft copy is required for assessment of your work. All copies of final report are NOT returned to students. **The final bound copy of the industrial training report for examination should include the following components:** A write-up on the learning experience and application of theory, which include some information about the company, Appendices that include weekly and monthly reports, and where possible include samples of work done. A final report from the supervisor on a prescribed standard form.

10 GUIDELINES FOR THE SELECTION OF COURSES

The courses available for fields of study of Health Promotion & Information Technology are given in Tables 8.9.2.1, 8.9.2.2, 8.9.2.3 & Tables 8.9.3.1, 8.9.3.2, 8.9.3.3 respectively in Section 8.9.

The available courses for different subject combinations in Applied Sciences are given in Tables below.

Upon request, a student may be allowed to transfer from a three-subject combination to a two-subject combination in Applied Sciences will be permitted up to the second year first semester within the add/drop period. In that case, the specified courses in the three-subject combinations may be considered as optional courses in the two-subject combinations as and when necessary. However, this option is not available for three subject combinations with Botany and Zoology.

If a minimum number of 10 students have not registered for a subject combination, that subject combination may not be offered on the recommendation of the faculty board for that particular batch.

ABBREVIATIONS OF SUBJECT COMBINATIONS

C – Chemistry, **Cs** – Computer Science, **P** – Physics, **M** – Mathematics, **S** – Statistics, **Bo** – Botany**, Zo** – Zoology, **Bi** – Biology, O – Optional, **C** – Compulsory, Blank cage – Not offered

	Subjects	Abbreviation
Three subject combinations	Chemistry, Computer Science, Physics	**CCsP**
	Chemistry, Computer Science, Mathematics	**CCsM**
	Chemistry, Computer Science, Statistics	**CCsS**
	Chemistry, Mathematics, Physics	**CMP**
	Chemistry, Mathematics, Statistics	**CMS**
	Chemistry, Physics, Statistics	**CPS**
	Computer Science, Mathematics, Physics	**CsMP**
	Computer Science, Physics, Statistics	**CsPS**
	Computer Science, Mathematics, Statistics	**CsMS**
	Physics, Mathematics, Statistics	**PMS**
	Chemistry, Botany, Zoology*	**CBoZo**
	Physics, Botany, Zoology*	**PBoZo**
	Computer Science, Botany, Zoology*	**CsBoZo**
	Statistics, Botany, Zoology*	**SBoZo**
Two subject combinations	Chemistry, Computer Science	**CCs**
	Chemistry, Mathematics	**CM**
	Chemistry, Physics	**CP**
	Chemistry, Statistics	**CS**
	Computer Science, Mathematics	**CsM**
	Computer Science, Physics	**CsP**
	Computer Science, Statistics	**CsS**
	Mathematics, Physics	**MP**
	Physics, Statistics	**PS**
	Chemistry, Biology	**CBi**
	Physics, Biology	**PBi**
	Computer Science, Biology	**CsBi**
	Statistics, Biology	**SBi**

* Not able to change the combination to two subject combinations

10.1 GUIDELINES FOR THE SELECTION OF COURSES FOR BSc IN APPLIED SCIENCES

10.1.1 THREE SUBJECT COMBINATIONS

Table 10.1.1.1. AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (THREE SUBJECT COMBINATIONS) – YEAR 1

Compulsory credits for subjects	Courses	CCsP	CCsM	CCsS	CMP	CMS	CPS	CsMP	CsPS	CsMS	PMS	CBoZo	PBoZo	CsBoZo	SBoZo
02	FDN 1201	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	FDN 1202	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	FDN 1203	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*				
	FDN 1204	C**		C**			C**		C**			C	C	C	C
	IDC 1201	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	IDC 1202	C	C	C	C	C	C	C	C	C	C	C	C	C	C
09	CHE 1201	C	C	C	C	C	C					C	O	O	O
	CHE 1302	C	C	C	C	C	C					C			
	CHE 1203	C	C	C	C	C	C					C	O	O	O
	CHE 1104	C	C	C	C	C	C					C			
	CHE 1105	C	C	C	C	C	C					C			
09	COM1201	C	C	C	O	O	O	C	C	C	O	O	O	C	
	COM 1302	C	C	C				C	C	C		O	O	C	
	COM 1308	O	O	O				O	O	O				O	
	COM 1407	C	C	C				C	C	C				C	
	COM 1305	O	O	O	O	O	O	O	O	O			O	O	
08	MAT 1201	O	O	O	O	O	O	O	O	O	O		O		
	MAT 1202		C		C	C		C		C	C				
	MAT 1203		O		O	O		O		O	O				
	MAT 1204	O	C	O	C	C	O	C	O	C	C		O		
	MAT 1205		C		C	C		C		C	C				
	MAT 1206		O		O	O		O		O	O				
	MAT 1207		C		C	C		C		C	C				
08	PHY 1201	C			C		C	C	C		C	O	C	O	O
	PHY 1102	C			C		C	C	C		C	O	C	O	O
	PHY 1203	C			C		C	C	C		C		C		
	PHY 1104	C			C		C	C	C		C		C		
	PHY 1205	C			C		C	C	C		C		C		
04	BOT 1201											C	C	C	C
	BOT 1202											C	C	C	C
05	ZOO 1201											C	C	C	C
	ZOO 1302											C	C	C	
	ZOO 1203											O***	O***	O***	O***
06	BIO 1201											C	C	C	C
	BIO 1202											C	C	C	C
	BIO 1203											C	C	C	C
08	STA 1301			C		C	C		C	C	C	O	O	O	C
	STA 1202			C		C	C		C	C	C				C
	STA 1303			O			O		O						O
	STA 1304			C		C	C		C	C	C				C
Compulsory credits	Subject	9,9,8	9,9,8	9,9,8	9,8,8	9,8,8	9,8,8	9,8,8	9,8,8	9,8,8	8,8,8	9,8,7	8,8,7	9,8,7	8,8,7
	IDC	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Total	28	28	28	27	27	27	27	27	27	26	26	25	26	25
		CCsP	CCsM	CCsS	CMP	CMS	CPS	CsMP	CsPS	CsMS	PMS	CBoZo	PBoZo	CsBoZo	SBoZo

N.B.: BIO 1201 shall be counted as a Zoology course and BIO 1202 & BIO 1203 as Botany courses when both Botany and Zoology subjects are offered

**** Not available for students who have followed Biology for G.C.E. (A/L)***

***** Not available for students who have followed Combined Mathematics for G.C.E. (A/L)***

****** Compulsory for BSc Honours in Applied Biology in Biodiversity Conservation and Prerequisite for ZOO 3201, ZOO 3203***

TABLE 10.1.1.2. AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (THREE SUBJECT COMBINATIONS) – YEAR 2

Compulsory credits for subjects	Courses	CCsP	CCsM	CCsS	CMP	CMS	CPS	CsMP	CsPS	CsMS	PMS	CBoZo	PBoZo	CsBoZo	SBoZo
00	IDC 2201	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 2203	O	O	O	O	O	O	O	O	O	O	O	O	O	O
10	CHE 2201	**C**	**C**	**C**	**C**	**C**	**C**					**C**	O	O	O
	CHE 2202	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
	CHE 2103	**C**	**C**	**C**	**C**	**C**	**C**					**C**	O	O	O
	CHE 2104	O*	O*	O*	O*	O*	O*					O*			
	CHE 2205	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
	CHE 2106	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
	CHE 2107	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
	CHE 2108	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
09	COM 2301	**C**	**C**	**C**	O	O	O	**C**	**C**	**C**	O	O	O	**C**	
	COM 2303	**C**	**C**	**C**				**C**	**C**	**C**		O	O	**C**	
	COM 2304	O	O	O				O	O	O				O	
	COM 2307	**C**	**C**	**C**				**C**	**C**	**C**				**C**	
	COM 2308	O	O	O	O		O	O	O	O			O	O	
09	MAT 2201	O	O	O	O	O	O	O	O	O	O		O		
	MAT 2302		**C**		**C**	**C**		**C**		**C**	**C**				
	MAT 2203		O		O	O		O		O	O				
	MAT 2204	O	O	O	O	O	O	O	O	O	O		O	O	
	MAT 2305		**C**		**C**	**C**		**C**		**C**	**C**				
	MAT 2306		**C**		**C**	**C**		**C**		**C**	**C**				
	MAT 2207		O		O	O		O		O	O				
09	PHY 2101	**C**			**C**		**C**	**C**	**C**		**C**	O	**C**	O	O
	PHY 2102	**C**			**C**		**C**	**C**	**C**		**C**		**C**		
	PHY 2103	**C**			**C**		**C**	**C**	**C**		**C**	O	**C**	O	O
	PHY 2204	**C**			**C**		**C**	**C**	**C**		**C**		**C**		
	PHY 2105	**C**			**C**		**C**	**C**	**C**		**C**	O	**C**	O	O
	PHY 2106	**C**			**C**		**C**	**C**	**C**		**C**		**C**		
	PHY 2207	**C**			**C**		**C**	**C**	**C**		**C**		**C**	O	O
	PHY 2208	O			O		O	O	O		O		O		O
	PHY 2109	O			O		O	O	O		O		O		
	PHY 2210	O			O		O	O	O		O		O		
	PHY 2211	O			O		O	O	O		O	O	O	O	O
06	BOT 2201											**C**	**C**	**C**	**C**
	BOT 2202											**C**	**C**	**C**	**C**
	BOT 2204											**C**	**C**	**C**	**C**
08	ZOO 2201											**C**	**C**	**C**	**C**
	ZOO 2203											**C**	**C**	**C**	**C**
	ZOO 2204											O**	O**	O**	O**
	ZOO 2205											**C**	**C**	**C**	**C**
07	BIO 2201											**C**	**C**	**C**	**C**
	BIO 2302											**C**	**C**	**C**	**C**
	BIO 2203											**C**	**C**	**C**	**C**
08	STA 2301			O		O	O		O	O	O				O
	STA 2302			**C**		**C**	**C**		**C**	**C**	**C**				**C**
	STA 2303			O		O	O		O	O	O				O
	STA 2304			**C**		**C**	**C**		**C**	**C**	**C**				**C**
	STA 2305			O		O	O		O	O	O				O
	STA 2306			O		O	O		O	O	O				O
	STA 2207			**C**		**C**	**C**		**C**	**C**	**C**	O	O	O	**C**
Compulsory Credits	Subjects	10,9,9	10,9,9	10,9,8	10,9,9	10,9,8	10,9,8	9,9,9	9,9,8	9,9,8	9,9,8	10,9,10	9,9,10	9,9,10	8,9,10
	IDC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	28	28	27	28	27	27	27	26	26	26	29	28	28	27
		CCsP	**CCsM**	**CCsS**	**CMP**	**CMS**	**CPS**	**CsMP**	**CsPS**	**CsMS**	**PMS**	**CBoZo**	**PBoZo**	**CsBoZo**	**SBoZo**

N.B.*: *BIO 2302 shall be counted as a Botany course whereas BIO 2201 and BIO 2203 shall be counted as Zoology courses when both Botany and Zoology are offered as subjects.

**** Compulsory for BSc Honours in Chemistry and Prerequisite for CHE 3202***

***** Compulsory for BSc Honours in Applied Biology in Biodiversity Conservation and Fisheries and Aquaculture Management, and Prerequisite for FAM 3201***

TABLE 10.1.1.3. AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (THREE SUBJECT COMBINATION) – YEAR 3

Compulsory credits for subjects	Courses	CCsP	CCsM	CCsS	CMP	CMS	CPS	CsMP	CsPS	CsMS	PMS	CBoZo	PBoZo	CsBoZo	SBoZo
00	IDC 3201	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 3202	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 3203	O	O*	O	O*	O*	O	O*	O	O*	O*	O	O	O	O
02	CHE 3201	O	O	O	O	O	O					O			O
	CHE 3203	O	O	O	O	O	O					O			
	CHE 3204	O	O	O	O	O	O					O			O
	CHE 3206	O	O	O	O	O	O					O			
	CHE 3207	O	O	O	O	O	O					O			
	CHE 3208	O	O	O	O	O	O					O			
	CHE 3209	O	O	O	O	O	O					O			
	CHE 3210	O	O	O	O	O	O					O			
	CHE 3311	O	O	O	O	O	O					O			
	CHE 3213	O	O	O	O	O	O					O			
	CHE 3214	**C**	**C**	**C**	**C**	**C**	**C**					**C**			
07	COM 3401	O	O	O				O	O	O				O	
	COM 3303	O	O	O				O	O	O				O	
	COM 3204	O	O	O				O	O	O				O	
	COM 3405	**C**	**C**	**C**				**C**	**C**	**C**				**C**	
	COM 3306	**C**	**C**	**C**				**C**	**C**	**C**				**C**	
	COM 3307	O	O	O				O	O	O				O	
08 / 05	MAT 3201	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	MAT 3202		**C**		**C**	**C**		**C**		**C**	**C**				
	MAT 3303		**C**		**C**			**C**							
	MAT 3204	O	O		O	O	O	O	O	O	O		O		
	MAT 3305		O		O			O							
	MAT 3206		**C**		**C**	**C**		**C**		**C**	**C**				
	MAT 3207		O		O	O		O		O	O				
	MAT 3308		O		O	O		O		O	O				
	MAT 3309		O		O	O		O		O	O				
	MAT 3110		**C**		**C**	**C**		**C**		**C**	**C**				
04	PHY 3302	O			O		O	O	O		O		O		
	PHY 3203	O			O		O	O	O		O	O	O	O	O
	PHY 3207	O			O		O	O	O		O		O		O
	PHY 3208	O			O		O	O	O		O		O		
	PHY 3209	**C**			**C**		**C**	**C**	**C**		**C**		**C**		O
	PHY 3210	**C**			**C**		**C**	**C**	**C**		**C**		**C**		
	PHY 3211	O			O		O	O	O		O	O	O		
	PHY 3212	O			O		O	O	O		O		O	O	
	PHY 3215	O			O		O	O	O		O		O		O
00	BOT 3201											O	O	O	O
	BOT 3202											O	O	O	O
	BOT 3203											O	O	O	O
	BOT 3204											O	O	O	O
00	ZOO 3201											O	O	O	O
	ZOO 3202											O	O	O	O
	ZOO 3203											O	O	O	O
	ZOO 3104											O	O	O	O
04	BIO 3201											**C**	**C**	**C**	**C**
	BIO 3102											O	O	O	O
	BIO 3203											O	O	O	O

	BIO 3206											**C**	**C**	**C**	**C**
	BIO 3207											O	O	O	O
00	BDC 3301											O	O	O	O
	BDC 3202											O	O	O	O
	BDC 3204											O	O	O	O
00	FAM 3201											O	O	O	O
	FAM 3202											O	O	O	O
00	MIB 3201											O	O	O	O
	MIB 3204											O	O	O	O
03	STA 3401			O		O	O		O	O	O				O
	STA 3402			O		O	O		O	O	O				O
	STA 3303			**C**		**C**	**C**		**C**	**C**	**C**				**C**
Compulsory credits	Subj.	2,7,4	2,7,8	2,7,3	2,8,4	2,5,3	2,4,3	7,8,4	7,4,3	7,5,3	4,5,3	2,2,2	4,2,2	7,2,2	3,2,2
	IDC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	13	17	12	14	10	09	19	14	15	12	06	08	11	07
		CCsP	**CCsM**	**CCsS**	**CMP**	**CMS**	**CPS**	**CsMP**	**CsPS**	**CsMS**	**PMS**	**CBoZo**	**PBoZo**	**CsBoZo**	**SBoZo**

N.B.*: *ZOO and FAM courses shall be counted as Zoology courses whereas BOT and MIB courses shall be counted as Botany courses, when both subjects are offered. BIO 3201 compulsory course shall be counted as a Botany course. BIO 3206 compulsory course shall be counted as a Zoology course.
The credits earned by optional BIO and BDC courses shall be divided equally among Botany and Zoology

**** Compulsory for BSc Honours in Industrial Mathematics students***

Guide to complete credit requirements

Subject combination	**CCsP**	**CCsM**	**CCsS**	**CMP**	**CMS**	**CPS**	**CsMP**	**CsPS**	**CsMS**	**PMS**	**CBoZo**	**PBoZo**	**CsBoZo**	**SBoZo**
Requirement for a subject	3,0,3	3,0,0	3,0,5	3,0,3	3,0,5	3,3,5	0,0,3	0,3,5	0,0,5	3,0,5	3,5,3	3,5,3	0,5,3	5,5,3
To complete 90 credits including the subject requirement	21	17	23	21	23	27	19	23	17	24	31	31	30	28

10.1.2 TWO SUBJECT COMBINATIONS

TABLE 10.1.2.1 AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (TWO SUBJECT COMBINATION) – YEAR 1

Compulsory credits for subjects	Courses	CCs	CM	CP	CS	CsM	PCs	CsS	MP	SP	CBi	PBi	CsBi	SBi
02	FDN 1201	C	C	C	C	C	C	C	C	C	C	C	C	C
	FDN 1202	C	C	C	C	C	C	C	C	C	C	C	C	C
	FDN 1203	C*	C*	C*	C*	C*	C*	C*	C*	C*				
	FDN 1204	C**		C**	C**		C**	C**		C**	C**	C**	C**	C**
	IDC 1201	C	C	C	C	C	C	C	C	C	C	C	C	C
	IDC 1202	C	C	C	C	C	C	C	C	C	C	C	C	C
09	CHE 1201	C	C	C	C	O	O	O	O	O	C	O	O	O
	CHE 1302	C	C	C	C						C			
	CHE 1203	C	C	C	C	O	O	O	O	O	C	O	O	O
	CHE 1104	C	C	C	C						C			
	CHE 1105	C	C	C	C						C			
09	COM 1201	C	O	O	O	C	C	C	O	O	O	O	C	O
	COM 1302	C	O	O	O	C	C	C	O	O	O	O	C	O
	COM 1305	O				O	O	O					O	
	COM 1407	C				C	C	C					C	
	COM 1308	O	O	O	O	O	O	O	O	O			O	O
08	MAT 1201	O	O	O	O	O	O	O	O	O				
	MAT 1202	O	C	O	O	C	O	O	C	O				
	MAT 1203		O			O			O					
	MAT 1204	O	C	O	O	C	O	O	C	O				
	MAT 1205		C	O	O	C	O	O	C	O				
	MAT 1206	O	O	O	O	O	O	O	O	O		O		O
	MAT 1207	O	C	O	O	C	O	O	C	O				
08	PHY 1201	O	O	C	O	O	C	O	C	C	O	C	O	O
	PHY 1102	O	O	C	O	O	C	O	C	C	O	C	O	O
	PHY 1203	O	O	C	O	O	C	O	C	C		C		
	PHY 1104	O	O	C	O	O	C	O	C	C		C		
	PHY 1205			C			C		C	C		C		
04	BOT 1201										C	C	C	C
	BOT 1202										C	C	C	C
05	ZOO 1202										C	C	C	C
	ZOO 1302										C	C	C	C
	ZOO 1203										O***	O***	O***	O***
06	BIO 1201										C	C	C	C
	BIO 1202										C	C	C	C
	BIO 1203										C	C	C	C
08	STA 1301				C			C		C	O	O	O	C
	STA 1202				C			C		C				C
	STA 1303				O			O		O				O
	STA 1304				C			C		C				C
Compulsory credits	Subj.	9,9	9,8	9,8	9,8	9,8	8,9	9,8	8,8	8,8	9,15	8,15	9,15	8,15
	IDC	2	2	2	2	2	2	2	2	2	2	2	2	2
	Total	20	19	19	19	19	19	19	18	18	26	25	26	25
	Courses	**CCs**	**CM**	**CP**	**CS**	**CsM**	**PCs**	**CsS**	**MP**	**SP**	**CBi**	**PBi**	**CsBi**	**SBi**

**** FDN 1203 - Compulsory for those who followed Combined Mathematics for G.C.E. (A/L) and not available for others.***

***** FDN 1204 - Compulsory for those who followed Biology for G.C.E. (A/L) and not available for others.***

****** Compulsory for BSc Honours in Applied Biology and Prerequisite for ZOO 3201, ZOO 3203***

TABLE 10.1.2.2. AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (TWO SUBJECT COMBINATIONS) – YEAR 2

Compulsory credits for subjects	Courses	CCs	CM	CP	CS	CsM	PCs	CsS	MP	SP	CBi	PBi	CsBi	SBi
00	IDC 2201	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 2203	O	O	O	O	O	O	O	O	O	O	O	O	O
10	CHE 2201	**C**	**C**	**C**	**C**						**C**			
	CHE 2202	**C**	**C**	**C**	**C**						**C**			
	CHE 2103	**C**	**C**	**C**	**C**	O	O		O	O	**C**	O	O	
	CHE 2104	O*	O*	O*	O*						O*	O	O	
	CHE 2205	**C**	**C**	**C**	**C**						**C**			
	CHE 2106	**C**	**C**	**C**	**C**	O	O		O	O	**C**	O	O	
	CHE 2107	**C**	**C**	**C**	**C**						**C**			
	CHE 2108	**C**	**C**	**C**	**C**						**C**			
06	COM 2301	**C**				**C**	**C**	**C**					**C**	
	COM 2303	O	O	O	O	O	O	O	O	O	O	O	O	O
	COM 2304	O	O	O	O	O	O	O	O	O	O	O	O	O
	COM 2307	**C**				**C**	**C**	**C**					**C**	
	COM 2308	O				O	O	O					O	
09	MAT 2201	O	O	O	O	O	O	O	O	O				
	MAT 2302	O	**C**	O	O	**C**	O	O	**C**	O				
	MAT 2203		O			O			O					
	MAT 2204	O	O	O	O	O	O	O	O	O				
	MAT 2305		**C**			**C**			**C**					
	MAT 2306	O	**C**	O	O	**C**	O	O	**C**	O				
	MAT 2207	O	O	O	O	O	O	O	O	O				
09	PHY 2101	O	O	**C**	O	O	**C**	O	**C**	**C**	O	**C**	O	O
	PHY 2102	O	O	**C**	O	O	**C**	O	**C**	**C**	O	**C**	O	O
	PHY 2103			**C**			**C**		**C**	**C**		**C**		
	PHY 2204			**C**			**C**		**C**	**C**		**C**		
	PHY 2105	O	O	**C**	O	O	**C**	O	**C**	**C**	O	**C**	O	O
	PHY 2106			**C**			**C**		**C**	**C**		**C**		
	PHY 2207			**C**			**C**		**C**	**C**		**C**		
	PHY 2208	O	O	O	O	O	O	O	O	O	O	O	O	O
	PHY 2109			O			O		O	O		O		
	PHY 2210			O			O		O	O		O		
	PHY 2211	O	O	O	O	O	O	O	O	O	O	O	O	O
02	BOT 2201										**C**	**C**	**C**	**C**
	BOT 2202										O	O	O	O
	BOT 2204										O	O	O	O
04	ZOO 2201										**C**	**C**	**C**	**C**
	ZOO 2203										O	O	O	O
	ZOO 2204										O**	O**	O**	O**
	ZOO 2205										**C**	**C**	**C**	**C**
07	BIO 2201										**C**	**C**	**C**	**C**
	BIO 2302										**C**	**C**	**C**	**C**
	BIO 2203										**C**	**C**	**C**	**C**
08	STA 2301				O			O		O				O
	STA 2302				**C**			**C**		**C**				**C**
	STA 2303				O			O		O				O
	STA 2304				**C**			**C**		**C**				**C**
	STA 2305				O			O		O				O
	STA 2306				O			O		O				O
	STA 2207				**C**			**C**		**C**	O	O	O	**C**
Compulsory credits	Subj.	10,6	10,9	10,9	10,8	6,9	9,6	6,8	9,9	8,9	10,13	9,13	6,13	8,13
	IDC	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	16	19	19	18	15	15	14	18	17	23	22	19	21
		CCs	**CM**	**CP**	**CS**	**CsM**	**PCs**	**CsS**	**MP**	**SP**	**CBi**	**PBi**	**CsBi**	**SBi**

**** Compulsory for BSc Honours in Chemistry and Prerequisite for CHE 3202***

***** Compulsory for BSc Honours in Applied Biology and Prerequisite for FAM 3201***

TABLE 10.1.2.3 AVAILABLE COMBINATIONS OF COURSES FOR BSc IN APPLIED SCIENCES (TWO SUBJECT COMBINATIONS) – YEAR 3

Compulsory credits for subjects	Courses	CCs	CM	CP	CS	CsM	PCs	CsS	MP	SP	CBi	PBi	CsBi	SBi
0 0	IDC 3201	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 3202	O	O	O	O	O	O	O	O	O	O	O	O	O
	IDC 3203	O	O*	O	O	O*	O	O	O*	O	O	O	O	O
02	CHE 3201	O	O	O	O					O	O			
	CHE 3203	O	O	O	O					O	O			
	CHE 3204	O	O	O	O					O	O			
	CHE 3206	O	O	O	O					O	O			
	CHE 3207	O	O	O	O					O	O			
	CHE 3208	O	O	O	O					O	O			
	CHE 3209	O	O	O	O					O	O			
	CHE 3210	O	O	O	O					O	O			
	CHE 3311	O	O	O	O					O	O			
	CHE 3213	O	O	O	O					O	O			
	CHE 3214	**C**	**C**	**C**	**C**					O	**C**			
07	COM 3401	O				O	O	O					O	
	COM 3303	O				O	O	O					O	
	COM 3204	O				O	O	O					O	
	COM 3405	**C**				**C**	**C**	**C**					**C**	
	COM 3306	**C**				**C**	**C**	**C**					**C**	
	COM 3307	O				O	O	O					O	
08	MAT 3201	O	O	O	O	O	O	O	O	O	O	O	O	O
	MAT 3202		**C**			**C**			**C**					
	MAT 3303		**C**			**C**			**C**					
	MAT 3204		O	O	O	O	O		O	O		O		
	MAT 3305		O			O			O					
	MAT 3206		**C**			**C**			**C**					
	MAT 3207	O	O	O	O	O	O	O	O	O				
	MAT 3308		O			O			O					
	MAT 3309		O			O			O					
	MAT 3110		**C**			**C**			**C**					
04	PHY 3302			O			O		O	O		O		
	PHY 3203	O	O	O	O	O	O	O	O	O	O	O	O	O
	PHY 3207			O			O		O	?		O		
	PHY 3208			O			O		O	O		O		
	PHY 3209			**C**			**C**		**C**	?		**C**		
	PHY 3210			**C**			**C**		**C**	**C**		**C**		
	PHY 3211	O	O	O	O	O	O	O	O	O	O	O	O	O
	PHY 3212	O	O	O		O	O	O	O	O	O	O	O	O
	PHY 3215			O			O		O	O		O		
00	BOT 3201										O	O	O	O
	BOT 3202										O	O	O	O
	BOT 3203										O	O	O	O
	BOT 3204										O	O	O	O
00	ZOO 3201										O	O	O	O
	ZOO 3202										O	O	O	O
	ZOO 3203										O	O	O	O
	ZOO 3104										O	O	O	O
04	BIO 3201										**C**	**C**	**C**	**C**
	BIO 3102										O	O	O	O
	BIO 3203										O	O	O	O
	BIO 3206										**C**	**C**	**C**	**C**

	BIO 3207										O	O	O	O
00	BDC 3301										O	O	O	O
	BDC 3202										O	O	O	O
	BDC 3204										O	O	O	O
00	FAM 3201										O	O	O	O
	FAM 3202										O	O	O	O
00	MIB 3201										O	O	O	O
	MIB 3204										O	O	O	O
03	STA 3401				O			O		O				O
	STA 3402				O			O		O				O
	STA 3303				**C**			**C**		**C**				**C**
Compulsory credits	Subj.	2,7	2,8	2,4	2,3	7,8	4,7	7,3	8,4	3,4	2,4	4,4	7,4	3,4
	IDC	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	09	10	06	05	15	11	10	12	07	06	08	11	07
		CCs	**CM**	**CP**	**CS**	**CsM**	**PCs**	**CsS**	**MP**	**SP**	**CBi**	**PBi**	**CsBi**	**SBi**

N.B.: BIO 2302 shall be counted as a Botany course whereas BIO 2201 and BIO 2203 shall be counted as Zoology courses when bothBotany and Zoology are offered as subjects.

**** Compulsory for BSc Honours in Industrial Mathematics students***

Guide to complete credit requirements

Subject combination	**CCs**	**CM**	**CP**	**CS**	**CsM**	**PCs**	**CsS**	**MP**	**SP**	**CBi**	**PBi**	**CsBi**	**SBi**
Requirement for a subject	3,2	3,0	3,4	3,6	2,0	4,2	2,6	0,4	6,4	3,0	4,0	3,0	6,0
To complete 90 credits including the subject requirement	45	42	46	48	41	45	47	42	48	33	33	32	35

10.2 GUIDELINES FOR THE SELECTION OF COURSES FOR BSc HONOURS PROGRAMMES

10.2.1 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN APPLIED SCIENCES

TABLE 10.2.1.1 FOURTH YEAR COURSES FOR BSc HONOURS IN APPLIED SCIENCES

ASM - Applied Sciences Mathematics **ASP** - Applied Sciences Physics

ASCs - Applied Sciences Computer Sciences **ASC** - Applied Sciences Chemistry

Courses	ASM	ASP	ASCs	ASC
IDC 4201	**C**	**C**	**C**	**C**
PHY 4201		O	O	O
PHY 4203	O	O	O	
PHY 4308	O	**C**	O	O
PHY 4209		O	O	O
PHY 4210	O	**C**	O	O
PHY 4211		O	O	O
PHY 4312	O	O	O	O
PHY 4613*		**C**		
PHY 4215		O		
PHY 4320		O		
CHE 4201	O	O	O	O
CHE 4202	O	O	O	O
CHE 4203	O	O	O	O
CHE 4206	O	O	O	**C**
CHE 4308		O		O
CHE 4210				O
CHE 4212	O	O	O	**C**
CHE 4213	O	O	O	**C**
CHE 4605*				**C**
COM 4201			O	
COM 4202	O	O	O	O
COM 4203	O	O	O	
COM 4604*			**C**	
ICT 4201			O	
ICT 4302	O		O	
ICT 4303			O	
ICT 4305			**C**	
ICT 4306	O	O	O	O
MAT 4301	**C**	O	O	O
MAT 4302	O			
MAT 4203	**C****			
MAT 4305	O			
MAT 4306	O	O	O	O
MAT 4309	O	O	O	O
MAT 4610*	**C**			
MIB 4202		O	O	O
MIB 4205		O	O	O
FAM 3303		O	O	O
BDC 4201		O	O	O
BDC 4202		O	O	O
BDC 4206		O	O	O

****Research project of one discipline shall be offered***

***** Not available for those who have followed Statistics as a subject in First and Second years***

10.2.2 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN INDUSTRIAL MATHEMATICS

Please refer to relevant Columns of Tables 10.1.1.1, 10.1.2.1 for Year 1, Tables 10.1.1.2 and 10.1.2.2 for Year 2, and Tables 10.1.1.3 and 10.1.2.3 for Year 3 non Mathematics Courses.

TABLE 10.2.2.1 AVAILABLE COMBINATIONS TO SELECT COURSES IN YEAR 4 FOR BSc HONOURS IN INDUSTRIAL MATHEMATICS

Eligible Three Subjects combination:

CCsM, CMP, CMS, CsMP, PMS, CsMS

Eligible Two Subject Combination:

CM, MP, CsM

Compulsory Credits	Courses	Status
2	IDC 3203	**C**
19 / 13	MAT 3201	**C**
	MAT 3202	**C**
	MAT 3303*	**C**
	MAT 3204	O
	MAT 3305*	**C**
	MAT 3206	**C**
	MAT 3207	O
	MAT 3308	**C**
	MAT 3309	**C**
	MAT 3110	**C**
2	IDC 4201	**C**
26	MAT 4301	**C**
	MAT 4302	**C**
	MAT 4203	**C**
	MAT 4305	O
	MAT 4306	**C**
	MAT 4307	**C**
	MAT 4308	**C**
	MAT 4304	**C**
	MAT 4609	**C**
	MAT 4210	O

*** Not offered for the students follow Statistic as a subject**

N.B.: IDC 3203 - Human Resource Management course is compulsory for BSc Honours in Industrial Mathematics and will be included in final 120 credit for GPA calculation

Table 10.2.2.2 Available optional courses in other subjects:

Third Year	Chemistry	CHE 3201, CHE 3203, CHE 3208, CHE 3213, CHE 3214
	Computer Sciences	COM 3303, COM 3204, COM 3405, COM 3306
	Physics	PHY 3203, PHY 3207, PHY 3209, PHY 3202, PHY 3210
	Statistics	STA 3401, STA 3402

BSc Honours in Industrial Mathematics – Guide to complete credit requirements

	CCsM	**CMP**	**CsMP**	**CMS**	**PMS**	**CsMS**	**CM**	**CsM**	**MP**
Credits from Subject Area (Y1 - Y2)	31	31	31	31	31	31	31	31	31
Credits from Subject Area (Y3 - Y4)	54	54	54	48	48	48	54	54	54
Total Compulsory Credits for Subject Area (Y1 – Y4)	62	62	62	56	56	56	62	62	62
To complete **72** Credits for Mathematics	10	10	10	16	16	16	10	10	10
Total Compulsory IDC Credits	06	06	06	06	06	06	06	06	06
Compulsory Credits from Other Subject Area (Y1 - Y2)	37	36	35	35	33	34	19	15	17
Total Credits as per Combination	115	114	113	113	111	112	97	93	95
Credits Required to Complete **120** Credits	05	06	07	07	09	08	23	27	25

10.2.3 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN BIOLOGY AND PHYSICS

Eligible Subject Combination: PBi PBoZo

Please refer to relevant Columns of Table 10.1.2.1 for Year 1, Table 10.1.2.2 for Year 2 and Table 10.1.2.3 for Year 3 Courses.

TABLE 10.2.3.1. AVAILABLE COMBINATIONS TO SELECT COURSES IN YEAR 4 FOR BSc HONOURS IN BIOLOGY AND PHYSICS

Credits	Course	Status
0	IDC 3201	O
	IDC 3202	O
	IDC 3203	O
04	BIO 3201	C
	BIO 3102	O
	BIO 3203	O
	BIO 3206	C
	BIO 3207	O
	BDC 3301	O
	BDC 3202	O
	BDC 3204	O
	FAM 3201	O
	FAM 3202	O
	FAM 3303	O
	MIB 3201	O
	MIB 3204	O
9	PHY 3302	**C**
	PHY 3203	O
	PHY 3207	O
	PHY 3209	**C**
	PHY 3210	**C**
	PHY 3211	O
	PHY 3212	O
	PHY 3215	**C**

Credits	Course	Status
2	BIO 4204	**C**
6+6	BDC 4201	**C**
	BDC 4202	**C**
	BDC 4206	**C**
	MIB 4202	O
	MIB 4204	O
	MIB 4205	O
	BIO 4603*	**C**
	FAM 4203	O
	FAM 4305	O
7+6	PHY 4201	**C**
	PHY 4203	O
	PHY 4304	**C**
	PHY 4208	**C**
	PHY 4209	O
	PHY 4210	O
	PHY 4211	**O**
	PHY 4312	O
	PHY 4613*	**C**
	PHY 4217**	**C**

	Physics	Biology	Bo & Zo
Compulsory Credits from Subject Area (Year 1 & Year 2)	17	30	38
Compulsory Credits from Subject Area (Year 3 & Year 4)			
with project	20	16	16
without project	14	10	10
Total Compulsory Credits earned for field of Specialization with the project (without project in brackets)	37 (31)	46 (40)	54 (48)
Required to complete 45 Credits	14 (08)	0 (05)	0 (0)
Total Compulsory IDC Credits	04	04	04

Credits Required to Complete 120 Credits for the Joint Major Programme

PBi	25
PBoZo	17

* Either BIO 4603 or PHY 4613 can be offered

** Offered only for who have not followed PHY 3207

10.2.4 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN CHEMISTRY AND PHYSICS

Possible Subject Combinations: CCsP CMP CPS CP

Please refer to relevant Columns of Tables 10.1.1.1, 10.1.2.1 for Year 1, Tables 10.1.1.2 and 10.1.2.2 for Year 2 and Tables 10.1.1.3 and 10.1.2.3 for Year 3 Courses.

TABLE 10.2.4.1 AVAILABLE COMBINATIONS TO SELECT COURSES IN BSc HONOURS IN CHEMISTRY AND PHYSICS

Credits	Course	Status
0	IDC 3201	O
	IDC 3202	O
	IDC 3203	O
12	CHE 3201	O
	CHE 3202	O
	CHE 3203	**C**
	CHE 3204	O
	CHE 3206	**C**
	CHE 3207	**C**
	CHE 3208	O
	CHE 3209	O
	CHE 3211	**C**
	CHE 3213	O
	CHE 3214	**C**
	CHE 3220	**C**
	CHE 3222	O
9	PHY 3302	**C**
	PHY 3203	O
	PHY 3207	O
	PHY 3209	**C**
	PHY 3210	**C**
	PHY 3211	O
	PHY 3212	O
	PHY 3215	**C**

Credits	Course	Status
2	IDC 4201	**C**
4+6	CHE 4201	O
	CHE 4202	O
	CHE 4203	**C**
	CHE 4605*	**C**
	CHE 4206	O
	CHE 4308	O
	CHE 4210	**C**
	CHE 4212	O
	CHE 4213	O
	CHE 4215	O
5+6	PHY 4201	O
	PHY 4203	O
	PHY 4308	**C**
	PHY 4209	O
	PHY 4210	O
	PHY 4211	**C**
	PHY 4312	O
	PHY 4613*	**C**
	PHY 4214	**C**
	PHY 4215	O

	Chemistry	Physics
Compulsory Credits from Subject Area (Year 1 & Year 2)	19	17
Compulsory Credits from Subject Area (Year 3 & Year 4)		
with project	22	20
without project	16	14
Total Compulsory Credits earned for field of Specialization with the project (without project in brackets)	41 (35)	37 (31)
Required credits to complete 45 Credits	04 (10)	08 (14)
Total Compulsory IDC Credits	04	
Credits Required to Complete 120 Credits for the Honours in Chemistry and Physics	26	

* Either CHE 4605 or PHY 4613 can be offered.

10.2.5 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN APPLIED BIOLOGY / BSc HONOURS IN MICROBIOLOGY

TABLE 10.2.5.1 COURSES OFFERED IN THIRD YEAR AND FOURTH YEAR FOR THE HONOURS PROGRAMMES IN APPLIED BIOLOGY

Eligible Subject Combinations: CBoZo CsBoZo PBoZo SBoZo CBi PBi CsBi SBi

BDC – Biodiversity Conservation, **FAM –** Fisheries and Aquaculture Management, **MIB -** Microbiology

Specialization Area	**Applied Biology**		**Microbiology**
Course	**BDC**	**FAM**	**MIB**
Third Year			
IDC 3201	O	O	O
IDC 3202	O	O	O
IDC 3203	O	O	O
BOT 3201	**C**	**C**	O
BOT 3202		O	
BOT 3203			**C**
BOT 3204	**C**		
ZOO 3201	O		
ZOO 3202	O	**C**	O
ZOO 3203	**C**	O	
ZOO 3104	**C**	**C**	
BIO 3201	**C**	**C**	**C**
BIO 3102	**C**	O	
BIO 3203	**C**	**C**	**C**
BIO 3204	**C**	O	**C**
BIO 3205	**C**	**C**	**C**
BIO 3206	**C**	**C**	**C**
BDC 3301	**C**	O	
BDC 3202	**C**	**C**	
BDC 3203	**C**	**C**	O
BDC 3204	**C**	**O**	
FAM 3201		**C**	
FAM 3202		**C**	
FAM 3303		**C**	
MIB 3201			**C**
MIB 3202			**C**
MIB 3203			**C**
MIB 3204		O	**C**
MIB 3205			**C**
MIB 3206			**C**
MIB 3207			**C**
Fourth Year			
BIO 4204	**C**	**C**	**C**
BDC 4201	**C**		
BDC 4202	**C**		
BDC 4203	**C**		
BDC 4204	**C**		
BDC 4205	**C**	O	
BDC 4206	**C**	O	
BDC 4207	**C**		
BDC 4208	**C**		

BDC 4209	**C**		
BDC 4810	**C**		
FAM 4201		**C**	
FAM 4202		**C**	
FAM 4203		**C**	
FAM 4204		**C**	
FAM 4205		**C**	
FAM 4206		**C**	
FAM 4207		**C**	
FAM 4208		**C**	
FAM 4209		**C**	
FAM 4810		**C**	
MIB 4201			**C**
MIB 4202			**C**
MIB 4103			**C**
MIB 4204			**C**
MIB 4205			**C**
MIB 4206			**C**
MIB 4207			**C**
MIB 4208			**C**
MIB 4209			**C**
MIB 4810			**C**

Compulsory Courses in First Year and Second Year:

BDC: IDC 1201, BOT 1201, BOT 1202, ZOO 1201, ZOO 1302, ZOO 1203, BIO 1201, BIO 1202, BIO 1203, BOT 2201, BOT 2202, BOT 2204, ZOO 2201, ZOO 2203, ZOO 2204, ZOO 2205, BIO 2201, BIO 2302, BIO 2203

FAM: IDC 1201, BOT 1201, BOT 1202, ZOO 1201, ZOO 1302, BIO 1201, BIO 1202, BIO 1203, BOT 2201, BOT 2202, BOT 2204, ZOO 2201, ZOO 2203, ZOO 2204, ZOO 2205, BIO 2201, BIO 2302, BIO 2203

MIB: IDC 1201, BOT 1201, BOT 1202, ZOO 1201, ZOO 1302, BIO 1201, BIO 1202, BIO 1203, BOT 2201, BOT 2202, BOT 2204, ZOO 2201, ZOO 2203, ZOO 2205, BIO 2201, BIO 2302, BIO 2203

	BDC	**FAM**	**MIB**
Compulsory credits from Subject Area (Year 1 and Year 2)	40	38	36
Compulsory credits from Subject Area (Year 3 and Year 4)	52	53	53
Total Compulsory Credits for field of Specialization	92	91	89
Total Compulsory IDC Credits	04	04	04
Credits Required to Complete 120 Credits	24	25	27

TABLE 10.2.1.2 RECOMMENDED OPTIONAL COURSES FROM OTHER SUBJECTS

Year	Course	**BDC**	**FAM**	**MIB**
Year 1	COM 1302	O	O	O
Year 2	PHY 2101	O		
	PHY 2211		O	O
	STA 2207	O	O	O
Year 3	CHE 3208	O	O	O
	CHE 3209	O		O
	PHY 3203	O	O	

10.2.6 GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR BSc HONOURS IN CHEMISTRY

Eligible Subject Combinations: CCsP CCsM CCsS CMP CMS CPS CBoZo CCs CM CP CBi

Please refer to relevant Columns of Tables 8.9.1.3. and Tables 8.9.1.7.

10.2.6.1 COURSES OFFERED IN THIRD AND FOURTH YEAR FOR THE BSc HONOURS IN DEGREE PROGRAMME IN CHEMISTRY

Year	Course	Status	Year	Course	Status
Third Year	IDC 3201 IDC 3202 IDC 3203	O O O	Fourth Year	IDC 4201	**C**
	CHE 3201	O		CHE 4201	O
	CHE 3202	**C**		CHE 4202	**C**
	CHE 3203	O		CHE 4203	**C**
	CHE 3204	O		CHE 4204	**C**
	CHE 3205	**C**		CHE 4206	O
	CHE 3206	O		CHE 4307	**C**
	CHE 3207	**C**		CHE 4308	**C**
	CHE 3208	**C**		CHE 4309	**C**
	CHE 3209	**C**		CHE 4210	**C**
	CHE 3311	**C**		CHE 4212	O
	CHE 3213	O		CHE 4213	O
	CHE 3215	**C**		CHE 4814	**C**
	CHE 3216	**C**		CHE 4215	**C**
	CHE 3217	**C**		CHE 4216	**C**
	CHE 3218	**C**			
	CHE 3219	**C**			
	CHE 3120	**C**			
	CHE 3121	**C**			
	CHE 3222	O			
	CHE 3223	**C**			

Compulsory Courses

First Year:
CHE 1201, CHE 1302, CHE 1203, CHE 1104, CHE 1105

Second Year:
CHE 2201, CHE 2202, CHE 2103, CHE 2104, CHE 2205, CHE 2106, CHE 2107, CHE 2108

BSc Honours In Chemistry – Guide to complete credit requirements

Compulsory credits from Subject Area (Year 1 and Year 2)	20
Compulsory credits from Subject Area (Year 3 and Year 4)	52
Total Compulsory Credits for field of Specialization	72
Total Compulsory IDC Credits	04
Credits Required to Complete 120 Credits	44

11 SCHOLARSHIPS AND GOLD MEDALS

Eligible students can get "Mahapola" and bursaries. There are several other scholarships available for students which are offered through different channels such as by Faculty, University, Alumni etc.

Students can earn a number of gold medals depending on their academic performance.

11.1 SCHOLARSHIPS

11.1.1 Mahapola Scholarship

Mahapola Scholarships are awarded by the Mahapola Trust Fund and the number of scholarships to be awarded in a particular year is determined by the Fund. All successful candidates will be sent an application form for a Mahapola Scholarship by the University Grants Commission (UGC). Duly filled application forms along with required documents should be submitted to the UGC through the Grama Niladari and the Divisional Secretary of the respective area of residence on or before the closing date specified in the Application form.

Selections are done by the UGC and the list of selected candidates will be sent by the UGC to the Mahapola Trust Fund and Candidates selected for Mahapola Scholarships will be informed by the Trust Fund. Selected students are requested to mandate a bank account at any Bank and to submit the details of the account to the Students' Registration and Welfare Branch for payment arrangements.

11.2 Bursary

University at which the Student is registered will call for applications for University Bursaries. Needy students should make an application to the Student Welfare Branch of the University. The University will select students for Bursaries according to criteria approved by the UGC. Students can ask further information regarding University Bursaries from the University help desk after registration. Selected students are requested to mandate a bank account at any Bank and to submit the details of the account to the Students' Registration and Welfare Branch for payment arrangements.

11.2.1 Hand in Hand Scholarship

The scholarship given by the FAS.

Target Group	Students with financial constraints and performing good academic performance
Criteria	- Extreme Poverty/serious financial difficulties - Fulfil the minimum GPA requirement of programme - Good discipline
Selection	Scholarship committee appointed by Faculty Board
Awarding	The amount each student shall receive monthly will be decided by scholarship committee, taking into consideration all aspects related to the student's financial status.

11.2.2 Other Scholarships

There are some other scholarships available such as "Kalyana Mithra Society" scholarship and RUSL Alumni scholarship for students in need.

11.3 GOLD MEDALS

All the Gold medals comprise a medal and a certificate.

11.3.1 Guidelines for awarding Dr. Chamila Mannapperuma Memorial Gold Medal for most outstanding student in B. Sc Honours in Applied Sciences in Microbiology Guidelines for awarding Dr. Chamila Mannapperuma Memorial Gold Medal for the Most Outstanding Student in Bachelor of Science Honours in Microbiology.

The award shall be made to the student who

(i) obtains the highest cumulative Grade Point Average at the end of the BSc (Hons) Degree in Microbiology.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the compulsory courses aggregating to 120 credits in the first attempt within four academic years.

11.3.2 Guidelines for awarding Dr. Shirani Nathaneal Memorial Gold Medal for the most outstanding student in Bachelor of Science Honours in Applied Biology – Specialization Area: Fisheries and Aquaculture Management

The award shall be made to the student who;

(i) obtains the highest cumulative Grade Point Average at the end of the BSc (Hons) Degree in Applied Biology Degree program; Specialization area: Fisheries and Aquaculture Management.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the compulsory courses aggregating to 120 credits in the first attempt within four academic years.

11.3.3 Guidelines for awarding Dr. Charles Santiapillai Memorial Gold Medal for the Most Outstanding Student in Bachelor of Science Honours in Applied Biology – Specialization Area: Biodiversity Conservation.

The award shall be made to the student who;

(i) obtains the highest cumulative Grade Point Average at the end of the BSc (Hons) Degree in Applied Biology – Specialization Area: Biodiversity Conservation

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the compulsory courses aggregating to 120 credits in the first attempt within four academic years.

11.3.4 Guidelines for awarding Department of Physical Sciences Gold Medal for Most Outstanding Student in BSc Honours in Chemistry and Physics / or Bachelor of Science Honours in Applied Sciences.

The award shall be made to the student who;

(i) obtains the highest cumulative Grade Point Average (GPA) at the end of the degree programs either BSc (Joint Major) Degree in Chemistry and Physics or Bachelor of Science Honours in Applied Sciences with Physical Sciences subject combination.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 120 credits.

11.3.5 Guidelines for awarding of Prof. Ajith Chandrasekara Herath Gold Medal for most outstanding student in B. Sc Honours in Chemistry

The award shall be made to the student who;

(i) Obtains the highest cumulative Grade Point Average at the end of the B. Sc (Honours) Degree Programme in Chemistry.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 120 credits.

11.3.6 Guidelines for awarding Department of Physical Sciences Gold Medal for Most Outstanding Student in Bachelor of Science Honours in Industrial Mathematics.

The award shall be made to the student who;

(i) obtains the highest cumulative Grade Point Average (GPA) at the end of the degree program Bachelor of Science Honours in Industrial Mathematics.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 120 credits.

11.3.7 Guidelines for awarding Dr. Gamini Wickramasinghe Gold Medal for Most Outstanding Student in Physical Sciences.

The award/s shall be made to the student/s who,

(i) obtains the highest cumulative Grade Point Average (GPA) at the end of any of the degree programs with Physical Sciences subject combination.

(ii) reaches the standard of either First Class or Second Class upper division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 90 credits in a three-year duration degree program or 120 credits in a four-year duration degree program.

11.3.8 Guidelines for awarding Dr. Sena Yaddehige Gold Medal for the most outstanding student in Bachelor of Science Honours in Information Technology

The award/s shall be made to the student/s who,

(i) obtains the highest Cumulative Grade Point Average at the end of the Bachelor of Science Honours in Information Technology.

(ii) reaches the standard of either First Class or Second Class Upper Division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 120 credits in the first attempt within four academic years.

11.3.9 Guidelines for awarding Department of Health Promotion Gold Medal for the most outstanding student in BSc Honours in Health Promotion.

The award shall be made to the student who

(i) obtains the highest cumulative GPA at the end of the BSc Honours in Health Promotion

(ii) reaches the standard of either First Class or Second Class Upper Division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 120 credits in the first attempt within 4 academic years.

11.3.10 Guidelines for awarding of Prof. Diyanath Samarasinghe Gold Medal for the most outstanding student in BSc in Health Promotion

The award shall be made to the student who

(i) obtains the highest cumulative GPA at the end of the BSc in Health Promotion

(ii) reaches the standard of either First Class or Second Class Upper Division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 90 credits in the first attempt within 3 academic years.

11.3.11 Guidelines for awarding of Dr. Alam Yoosuff Gold Medal for the most outstanding student in field practical component of BSc in Health Promotion

The award shall be made to the student who

(i) obtains the highest cumulative GPA in health promotion field practical component at the end of the BSc in Health Promotion.

(ii) reaches the standard of either First Class or Second Class Upper Division pass with a GPA of 3.50 or above, as determined by the Board of Examiners.

(iii) obtains grades of C or better in the specified course units aggregating to 90 credits in the first attempt within 3 academic years.

12 ANNEX

Important Links

UNIVERSITY WEBSITE: http://www.rjt.ac.lk/

FACULTY WEBSITE: https://aps.rjt.ac.lk/

Student Registration

Application for Course Units Registration

Application for changing Courses (add/drop form)

FACULTY WEB > STUDENTS > EIS

Learning Management System (LMS)

FACULTY WEB > LMS@APS

Examination information system (EIS)

FACULTY WEB > STUDENTS > EIS

Library Facilities

FACULTY WEB > FAS LIBRARY

Student Requests

FACULTY WEB > STUDENTS > STUDENT'S RQUEST

The Department of English Language Teaching (DELT)

FACULTY WEB > ACADEMICS>CENTERS> DELT – FAS CENTRE

Hostel Rules and Regulations

FACULTY WEBSITE > ACCOMMODATION > HOSTEL RULES AND REGULATIONS

Medical Center

UNIVERSITY WEB > CENTERS & UNITS> MEDICAL CENTER

IT Center

UNVERSITY WEB>CENTERS & UNTS>IT CENTER

University Career Guidance Unit

UNIVERSITY WEB > CENTERS & UNITS>CAREER GUIDANCE UNIT

Faculty Career Guidance Unit

FACULTY WEB > STUDENTS >CAREER GUIDANCE

Cultural center

UNIVERSITY WEB >CENTERS & UNITS> CULTURAL CENTER

Rajarata University of Sri Lanka
Faculty of Applied Sciences

MEDICAL CERTIFICATE SUBMISSION FORM

For Office use only

01. Name of the student :Mr./Miss……
02. Registration No :……
03. Index No :……
04. Contact Number/s :……
05. Name of the Examination:……

Date of the Examination	Course Code	Course Title

06. Total number of course units that you have submitted medical certificates in this examination……..
07. Total number of course units that you have submitted medical certificates in the last semester examination. ……
08. Are you a recipient of hostel facilities provided by RUSL?……
09. Mention the venue/s you stayed during the examination period.

Period	From	To
1……	……..	……
……		
2……	……..	……
……		

10. State wheather the medical report/s attached have been issued by medical officer of Rajarata University of Sri Lanka?
11. If not give reasons.

……
……

I state the information given in this form is correct and accurate to the best of my knowledge.

…….. ……

Signature of the Student Date

*Please submit this form to the Dean's office along with the medical certificate/s and the request letter (Separate forms should be used for separate years).

FACULTY OF APPLIED SCIENCES – RAJARATA UNIVERSITY OF SRI LANKA
APPLICATION FOR DEAN'S AWARD

1) Personal Information
   I. Name of the Student : ……
   II. Registration Number :……
   III. Index Number :……..
   IV. Address :…….
   .....
   V. T.P. Number :……
   VI. E-mail address :……
2) Select under which Degree programme you are applying for Dean's award
   I. BSc in Information Technology ……
   II. BSc in Heath Promotion ……
   III. BSc in Applied Sciences ……
   IV. BSc Honours ……
3) Academic Achievement:
   Final Grade Point Average (GPA) ……..

4) Leadership of a Recognized Body (Maximum 60 marks)

Leadership (office bearer) of a recognized national body

Recognition of a national Body (e.g. Young Zoologist)

President/Chairperson General Secretary Treasure Committee Member

Leadership post of University/Faculty Organization

President of Student Union

President of Kala Sangamaya/General secretary of student Union

Treasure of student Union/Secretary of Kala Sangamaya

Treasure Kala Sangamaya

Committee member Student Union

Committee member Kala Sangamaya

5) Community Service and Good Citizenship (Maximum 40 marks)

Ideals of Community Service and Good Citizenship

e.g. Assisting a victim of an accident, Serving as a volunteer in a natural disaster, Assisting fellow citizen in an exceptional way

6) Outstanding Talents in Sports (Maximum 125 marks)

World University Games/National Games

First Place Second Place Third place Participation in an event

International Sports event representing the University

First Place Second Place Third place Participation in an event

Inter University Events

First Place Second Place Third place Participation in an event

Inter Faculty events

First Place Second Place Third place

University Colors/Best Athlete/Player of the Year

Post of president, Vice president, secretary, Junior treasure and editor of Sport Council

7) Creativity and Exceptional Ability in Aesthetic or Technical Fields (Maximum 125 marks)

Esthetics Competition

International aesthetic awards/accolades

National aesthetic awards/accolades

Completion of examinations or graduating performance in aesthetic fields

Visharada in oriental music

Royal/Trinty College Examination in Western Music

Arangetaram in Bharatanatyam

Public/ Mass media performance in aesthetic fields(Outside the University)

Stage drama

Movie

Place in a TV reality show

Performance in aesthetic fields at a University approved event

University level First, Second or Third Place

Faculty level First, Second or Third Place

Invention in Technological field or taking part in project of technological advancement (depending on the scale and degree of creativity committee can decide maximum up to 10 marks)

8) Research or Pursuing new knowledge (Maximum 50 marks)

Peer Reviewed publication

Author of a paper in a peer reviewed indexed scientific journal,

Author of a paper in a peer reviewed non-indexed scientific journal

Presentation at a scientific Forum

International Conference, Local Conference

Author of a book/Chapter

Author of a book, Author of a book chapter

Active contribution to outstanding research project

Notable contribution to a national project, Notable contribution to an institutional level project

9) Any Other Information

……
……

The above information is correct and accurate to the best of my knowledge

…… ……..

Signature of the applicant Date

(Attach certified copies of supportive documents)

ELIGIBILITY CRITERIA FOR A GRACE CHANCE

1. The grace chance is avail to the candidates those who have lapse their proper and two other repeat attempts for a given subject and the grace chance is only allowed once for a given subject.

2. A student shall make a request for grace chance to complete his/her degree programme before the eighth week of the semester.

3. The student registration should be within the time period of six years for general degree programmes and eight years for special degree programmes as to make a request for a grace chance (double the period of the degree programme).

4. However additional two years time period will be given for further request in case of lapse specified period.

5. Number of credits award for a grace chance is equivalent to fifteen percent of the total credits of the degree programme excluding research project, industrial training programme and non credit courses.

6. The students must have at least grade "C" for two third of the credits of a particular semester to apply for a grace chance for a subject in that particular semester.

7. The student will abide by all the common terms and conditions of a normal examination attempt in the grace chance also.

8. Candidates who have not fulfilled their requirements for the degree after the due grace chances will be able to sit for a common examination conducted once in ten years at the discrete of the faculty.

The Rajarata University of Sri Lanka

Grace Chance Application Form

01 i. Registration No :.....

ii. Date of Registration : .....

02 Index No :.....

03 Name of the Candidate :.....

04 Address for Communication :.....

05 Contact Phone / Mobile No :.....

06 Faculty :.....

07 a. Total No Credits In Degree Programme :……

b. No of Credits for : i. Internship :……....

ii. Research :……....

iii. Industrial Training :……

c. No of Credits for the Total Courses : (a-b) = ……..

d. Details of the Subject request for grace Chance

Incomplete Subjects	1 ST Attempt		2 nd Attempt		3 rd Attempt		Assigned No. of Credits for the Subject
	Year	Semester	Year	Semester	Year	Semester	

e. Total No of incomplete Credits : .....

f. Credit Percentage for the incomplets Subjects : .....

I hereby declare that,

1 The information furnished in this application is true, correct and complete.

2 I am appearing for all failed Subjects.

3 I am fully aware that this is a special grace chance for the examination to candidates (who have exhausted their legitimate chances to complete the degree in the final attempts)

4 I will do **NOT** claim any more chances for writing the examination in this semester.

....

signature of the student Date

Official Use Only

01 Checked by subject Clerk of the Faculty

....

Signature of the Subject Clerk Date

02 Certified by DR/ SAR/AR of the Faculty

.....

Signature of the DR/ SAR/ AR of the faculty

03 Recommended/ Not recommended

.....

Head of the Department

04 Recommended/ Not recommended by the Faculty Board

Faculty Board No .....

Faculty Board Date .....

.....

Signature of Dean

PROHIBITION OF RAGGING AND OTHER FORMS OF VIOLENCE IN EDUCATIONAL INSTITUTIONS

An act to eliminate ragging and other forms of violence, and cruel, inhuman and degrading treatment, from educational institutions BE it enacted by the Parliament of the Democratic, Socialist Republic of Sri Lanka as follows:

29th April, 1998

Short title. 1. This Act may be cited as the Prohibition of Ragging and Other Forms of Violence

in Educational Institutions Act, No. 20 of 1998.

Ragging

(1) Any person who commits, or participates in; ragging, within or outside an educational institution, shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate be liable, to rigorous imprisonment for a term not exceeding two years and may also be ordered to pay

compensation of an amount determined by court, to the person in respect of whom the offence was committed for the injuries caused to such person.

(2) A person who, whilst committing ragging causes sexual harassment or grievous hurt to any student or a member of the staff, of an educational institution shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate be liable to imprisonment for a term not exceeding ten years and may -also be ordered to pay compensation of an amount determined by court, to the person in respect of whom the offence was committed for the injuries caused to such person.

Criminal intimidation,

3. Any person who, within or outside an educational institution, threatens, verbally or in writing, to cause injury to the person, reputation or property of any student or a member of the staff, of all educational institution (in this section referred to as “the victim”) or to the person, reputation or property of some other person in whom the victim is interested, with the intention of causing fear in the victim or of compelling the victim to do any act which the victim is not legally required to do, or to omit to do any act which the victim is entitled to do, shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate be liable to rigorous imprisonment for a term not exceeding five years.

Hostage taking.

4. Any person who does any act by which the personal liberty and the freedom of movement of any student or a member of the staff of an educational institution or other person within such educational institution or any premises under the management and control of such educational institution, is restrained without lawful justification and for the purpose of forcing such student, member of the staff or person to take a particular course of action, shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate, be liable to rigorous imprisonment for a term not exceeding seven years.

Wrongful restraint.

5. Any person who unlawfully obstructs any student or a member of the staff of an educational institution, in such a manner as to prevent such student or member of the staff from proceeding in any direction in which such student or member of the staff, has a right to proceed, shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate be liable to rigorous imprisonment for a term not exceeding seven years.

Unlawful confinement.

6. Any person who unlawfully restrains any student or a member of the staff of an educational institution in such a manner as to prevent such student or member of the staff from proceeding beyond certain circumscribing limits, shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate be liable to imprisonment for a term not exceeding seven years.

Forcible occupation and damage to property of an educational institution.

7.

(1) Any person who, without lawful excuse, occupies, by force, any premises of, or under the management or control of, an educational institution shall be guilty of an offence under this Act, and shall on conviction after summary trial before a Magistrate be liable to imprisonment for a term not exceeding ten years or to a fine not exceeding ten thousand rupees or to both such imprisonment and fine.

(2) Any person who causes mischief in respect of any property of, or under the management or control of, an educational institution shall be guilty of an offence under this Act and shall on conviction after summary trial before a Magistrate he liable to imprisonment for a term to not exceeding twenty years and a fine of five

thousand rupees or three times the amount of the loss or damage caused to such property, which ever amount is higher.

Orders of expulsion or dismissal.

8. Where a person is convicted of an offence under this Act, the court may, having regard to the gravity of the offence"'

(a) in any case where the person convicted is a student of an educational institution, order that such person be expelled from such institution ;

(b) in any case where the person convicted is a member of the staff of an educational institution, order that such person be dismissed from such educational institution.

Bail.

9.

(1) A person suspected or accused of committing an offence under subsection (2) of section 2 or section 4 of this Act shall not be released on bail except by the judge of a High Court established by Article 154P of the Constitution. In exercising his discretion to grant bail such Judge shall have regard to the provisions of section 14 of the Bail Act, No. 30 of 1997.

(2) Where a person is convicted of an offence under subsection (2) of section 2 or section 4 of this Act, and an appeal is preferred against such conviction, the Court convicting such person may, taking into consideration the gravity of the offence and the antecedents of the person convicted, either release or refuse to release, such person on bail.

Certain Provisions of the Code of Criminal Procedure Act not to apply to persons convicted or found guilty of an offence under this Act. 10. Notwithstanding anything in the Code of Criminal Procedure Act, No, 15

of 1979"

(a) the provisions of section 303 of that Act shall not apply in the case of any person who is convicted,

(b) the provisions of section 306 of that Act shall not apply in the case of any person who pleads or is found guilty, by or before any court of any offence under subsection (2) of section 2 or section 4 of this Act.

Offences under this Act deemed to be cognizable offences.

11. All offences under this Act shall be deemed to be cognizable Offences for the purposes of the application of the provisions of the Code of Criminal Procedure Act, No. 15 of 1979, notwithstanding anything contained in the First Schedule to that Act.

Certificate.

12. Where in any prosecution for an offence under this Act, a question arises whether any person is a student or a member of the staff of an educational institution or whether any premises or property is the property of, or is under the management and control of, an educational institution a certificate purporting to be under the hand of the head or other officer of such educational institution to the effect that the person named therein is a student or a member of the staff of such educational institution, or that the premises or property specified therein is the property of, or is under the management and control of, such educational institution, shall be admissible in evidence without proof of signature and shall be prima facie evidence of the facts stated therein.

Admissibility of statement in evidence.

13.

(1) If in the course, of a trial for an offence under this Act, any witness shall on any material point contradict either expressly or by necessary implication a statement previously given by him in the course of any investigation into such offence, it shall be lawful for the Magistrate if, after due inquiry into the circumstances in which the statement was inside, he considers it safe and just

(a) to act upon the statement given by the witness in the course of the investigation, if such statement is corroborated in material particulars by evidence from an independent source; and (b) to have such witness at the conclusion of such trial, tried before such court upon a charge for intentionally giving false evidence in a stage of a judicial proceeding,

(2) At any trial under paragraph (b) of subsection (1) it shall be sufficient to prove that the accused made the contradictory statements alleged in the charge and it shall not by necessary to prove which of such statements is false.

Provisions of this Act to be in addition to and not in derogation of the provisions of the Penal Code & c.

14. The provisions of this Act shall be in addition to and not in derogation of, the provisions of the Penal Code, the Convention Against Torture and Oilier Cruel, Inhuman or Degrading Treatment or Punishment Act, No. 22

of 1994 or any other law.

Priority for trials and appeals under this Act.

15. Every Court shall give priority to the trial of any person charged with any offence under this Act and to the bearing of any appeal from the conviction of any person for appeals under any such offence and any sentence imposed on such conviction.

Sinhala text to Prevail in case of inconsistency

17. In this Act unless the context otherwise requires" "criminal force", "fear", "force", "grievous hurt", "hurt" and "mischief shall have the respective meanings assigned to them in the Penal Code;

"educational institution" means –

(a) a Higher Educational Institution;

(b) any other Institution recognized under Chapter IV of the Universities Act, No, 16 of 1978;

(c) the Buddhist and Pali University established by the Buddhist and Pali University of Sri Lanka Act, No. 74 of 1981;

(d) the Buddha Sravaka Bhikku University, established by the Buddha Sravaka Bhikku University Act, No. 26 of 1996;

(e) any Institute registered under section 14 of the Tertiary and Vocational Education Act, No. 20 of 1990;

(f) any Advanced Technical Institute established under the Sri Lanka Institute of Technical Education Act, No. 29 of 1995;

(g) a Pirivena registered under the Pirivena Education Act, No. 64 of 1979 and receiving grants from State funds and includes a Pirivena Training Institute established under that Act;

(h) the Sri Lanka Law College;

(i) the National Institute of Education established; by the National Institute of Education Act, No.

(j) the College of Education established by the: Colleges of Education Act, No. 30 of 1986, or a Training College;

(k) a Government school or an assisted school or an unaided school, within the meaning of the Education Ordinance (Chapter 185);

and includes any other institution established for the purpose of providing education, instruction or training;

"head of an educational institution" means the Vice- Canceller, Mahopadyaya, Director, President, Principal or any other person howsoever designated charged with the administration and management of the affairs of such educational institution;

"Higher Educational institution" has the meaning assigned to it in the Universities Act, No. 16 of 1978;

"ragging" means any act which causes or is likely to cause physical or psychological injury or mental pain or : fear to a student or a member of the staff of an educational institution;

"student" means a student of an educational institution;

"sexual harassment" means the use of criminal force, words or actions to cause

sexual annoyance or harassment to a student or a member of the staff, of an educational institution

Degree programme flowchart

(A basic plan of degree programmes. Please refer the contents of handbook for a complete description)