2023/2024

HANDBOOK

Faculty of Technological Studies
University of Vavuniya
Sri Lanka

University of Vavuniya,
Sri Lanka

HandBook

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Vice Chancellor's Message

Welcome to University of Vavuniya!

At University of Vavuniya, we're passionate about enabling you to make the most of your learning journey and equipping you with the knowledge, skills and confidence sought after by employers to ensure you thrive after completing your degree. We take your success seriously. University of Vavuniya will open up opportunities for you, help you build your future and make your mark in the world.

If you choose to join our undergraduate community, you will go on to become one of our graduates who are renowned for their academic achievements, their ability to shape society and contribute to the economy. You will be taught by our dedicated lecturers who are actively involved in teaching and learning, many of whom are undertaking leading research. We will help you to achieve your career goals by putting your academic knowledge into practice, gaining the problem-solving skills and agility you need to adapt and flourish in a changing world.

Alongside our strong academic credentials, we've been transforming our available facilities for all its students. Our supportive, multicultural and inclusive community is one of our greatest strengths. We believe that no matter who you are or where you come from, given the right tools and support, you can reach your full potential and be successful in whatever career you choose. Our graduates have an unrivalled reputation for starting their own businesses.

I wish to appreciate the Dean and Staffs of Faculty of Technological Studies who devoted their time and effort in the preparation of this prospectus.

I wish to appreciate the Dean and the staff of Faculty of Applied Science who devoted their time and effort in the preparation of this prospectus.

Supporting you is central to our mission at University. We are here to guide you as you become the best version of yourself.

Snr. Prof. A. Atputharajah
Vice Chancellor
University of Vavuniya

Dean's Message

My Dear Students,

I warmly welcome you all to the Faculty of Technological Studies,University of Vavuniya. This student handbook comprises valuable information to assist navigate your journey through the Faculty of Technological Studies. Make use of it, become familiar with your responsibilities as a student, and make the time to take advantage of the many opportunities to get involved. In that way, you will truly make the most of your life here at the Faculty of Technological Studies.

The Faculty of Technological Studies is committed to providing all of its students with an education that balances in-depth study with a breadth of experience that form the core of human knowledge with research competence. The organizational structure and curriculum of the degree programme have been designed to match contemporary global trends of technological outcome based education. In addition, the programme seeks to enhance student knowledge and critical thinking skills and to develop those practices of the heart and mind intrinsic to lifelong and independent learning. Further, you will take advantage of modern facilities with the latest technology. The Faculty offers students a variety of choices and a plethora of opportunities to advance their education. As a youngest faculty, the Faculty of Technological Studies has young and energetic staff who are ready to provide knowledge and ideas to achieve your goals. The team spirit among them too is noteworthy. We are prepared to deal with problems through exchange of ideas.

I wish you a successful academic year and I look forward to participating with you in the academic events that make Faculty of Technological Studies a uniquely special learning community with ethnic cohesion and social harmony.

Thank you.

Mr. V. Senthooran
Dean
Faculty of Technological Studies

Contents

1. Introduction

The Northern Province Affiliated University College (NPAUC) was established in 1991. Subsequently, by an order made under Section 22 of the Universities Act No. 16 of 1978, the Vavuniya Campus of the University of Jaffna was established on 1st April 1997 with two faculties, namely the Faculty of Applied Science and the Faculty of Business Studies. In 2020, by the Extraordinary Gazette No. 2160/43 dated 30.01.2020, the Faculty of Technological Studies was also established. All three faculties offer twelve degree programs of three and four year duration at present.

The Vavuniya Campus of the University of Jaffna has been elevated to a separate state University and established as the "University of Vavuniya, Sri Lanka" by the extraordinary gazette issued on 08th June 2021. Accordingly, the University of Vavuniya became the 17th state university in Sri Lanka effective from 01st August 2021. The University of Vavuniya expects to increase the student intake through introducing new study programs along with the establishment of the proposed faculties, namely, Faculty of Medicine, Faculty of Tourism and Hotel Management, Faculty of Health Sciences, Faculty of Aquaculture, Fisheries and Marine Studies, Faculty of Environmental Science, Faculty of Livestock, Faculty of Humanities and Social Sciences, and Faculty of Graduate Studies.

The permanent site of the University of Vavuniya is located about ten kilometers away from Vavuniya town along the Vavuniya Mannar Road at Sopalapuliyankulam, Pampaimadu. The university owns one hundred and ninety five (195) acres of land, and it is a residential university. The university maintains a forest pocket and two minor tanks within this land area. The iconic landscape contributes to the university's signature to keep generations connected to the University of Vavuniya. It paves the way to get a new collegiate experience for our existing and prospective students.

Figure 1.1: The University of Vavuniya, Sri Lanka

The Faculty of Technological Studies of the University of Vavuniya consists of one Department, namely Department of Information and Communication Technology.

1.1 Faculty of Technological Studies

The Faculty of Technological Studies was established in January, 2020 upon the approval of the University Grant Commission and the publication of Gazette Extraordinary (No. 2160/43 order under section 27(1), The University Act, No. 16 of 1978) by the Ministry of Higher Education, Technology and Innovation of Sri Lanka. The Faculty of Technological studies located in the Pampaimadu, Vavuniya (Northern Province).

The Faculty of Technological Studies will produce the graduates with the understanding of the fundamental knowledge and skill to perform the role as an efficient Technological professional with positive attitude and ethics necessary in fulfilling the responsibilities towards the clients and the society. They will have intellectual openings to engage in research and be innovative through independent learning to develop the required skills. Graduates with appropriate disciplines of technology could face the development challenges and meet the development goals of the Nation. Ministry of Higher Education foresee the present status of the Nation and decided to provide the required facilities to commence the Bachelors' Degree programmes in different disciplines of Technology in some selected universities.

The Faculty of Technological studies consists of one academic department offering highly theory and practical oriented bachelor degree programme of Bachelor of Information and Communication Technology Honours degree for the undergraduates.

Figure 1.2: Faculty of Technological Studies, University of Vavuniya

1.2 Department of Information and Communication Technology

The Information and Communication Technology Stream was established in April 2016 in the Faculty of Applied Science of the Vavuniya Campus of the University of Jaffna by the Ministry of Higher Education on the recommendation of the UGC for the purpose of designing and offering a degree programme in Information and Communication Technology to those students who follow the Technology Stream at the advanced level. Currently, around 150 students are enrolled to the Department of Information and Communication Technology, Faculty of Technological Studies, University of Vavuniya by the UGC per an academic year. Early, the BICT Honours degree programme is conducted under Department of Physical Science, Faculty of Applied Science, University of vavuniya. Then gradually a department is initiated as Department of Information and Communication Technology under Faculty of Technological Studies in 2020. Its offering of academic programme namely Bachelor of Information and Communication Technology Honours, with the revisions of the syllabi in regular intervals, improvements of the laboratory facilities and strengthened human resources.

The major commitment of the department is to provide up-to-date knowledge in Information and Communication Technology to undergraduate students through coursework, practical classes and research projects. The department takes great pride in preparing the students for the industrial demands of software and hardware that is required for various sectors with a curriculum covering the topics and concepts that are required to design, implement, and manage a variety of computer-based solutions.

The prospective undergraduates who will be enrolling in this study program are selected through the newly introduced Technology Stream of the G.C.E. Advanced Level (A/L) examination. Bachelor of Information and Communication Technology Honours (BICT Honours) degree pro-

gram is a full time four years, 120 credit professional degree program, and students get an opportunity to work in the industry for one semester through the internship/ industry training in the Level 4. The medium of instruction and examinations is English.

As in the case of any institution, the Faculty has developed a clear-cut vision as an academic entity to actively compete in the dynamic market of higher educational service providers in the local, national and international arenas.

The **Vision** of the Faculty of Technological Studies is:

> Create a world-class Technical Education system; incorporates continuous improvement, student-centred engagement, applied research and technological innovation.

The **Mission** of the Faculty of Technological Studies is:

> To offer programmes that promote strong partnerships with industries in learning, disseminating knowledge and meeting international standards in research and teaching at the highest level of excellence.

Objectives of the Faculty of Technological Studies are:

1. To offer a quality degree programme for students who enter the university through Advanced Level Technology stream.
2. To engage the students in creative and inspiring learning that enables them to build strong professional identity, future focussed graduate capabilities and global citizenship through creative and unpinning learning culture.
3. To provide qualified manpower to enhance the productivity, quality, efficiency and sustainability of local and national industries by providing industry relevant applied education in application development.
4. To produce graduates in Technological Studies and to enable their research performance in the respective disciplines in order to satisfy the industrial needs with innovative capacity.
5. To produce graduates qualified to teach in Technology Streams in secondary, tertiary and in higher level educational institutions to disseminate knowledge to society.

As such, the Faculty of Technological Studies strives to provide the best possible means of education to its students to enable them to develop with both academic and professional skills so that they can be successful individuals in their personal and professional lives.

1.3 Officials of the University of Vavuniya

Chancellor	Dr. S. Mohanadas
Vice Chancellor	Snr Prof. A. Atputharajah
Dean, Faculty of Applied Science	Dr. M. Kayanan
Dean, Faculty of Business Studies	Prof. Y. Nanthagopan
Dean, Faculty of Technological Studies	Mr. V. Senthooran
Registrar	Mr. N. Rajavisahan
Bursar	Mr. L. Ramramanan
Librarian (Acting)	Dr. S. Shanmugathasan
Proctor	Dr. K. Arjunan
Senior Student Counsellor	Mrs. R. Yasotha
Deputy Registrar, Establishments	Mr. M. Arunshankar
Senior Assistant Registrar, Examination & Student Admission	Ms. Anojah Vasitharan
Deputy Registrar, Student & Welfare	Mr. R. Jeyakumar
Assistant Registrar, Administration	Ms. T. Pranavamalar
Senior Assistant Registrar, Academic Affairs & Publication	Mr. P. Krishnanathan
Deputy Registrar, Capital Works & Planning	Mr.M.Nanthakumar
Assistant Bursar, Payments	Mr. A. E. M. Venesious
Assistant Bursar, Store & Supply	Mr. B. Balathas
Assistant Bursar, Accounts	Ms. J. Sivarubini
Engineer, Maintenance Unit	Eng. G. Thanushan
Assistant Registrar, Faculty of Applied Science	Ms. K. Anusiga
Assistant Registrar, Faculty of Business Studies	Ms. D. Pathmakanth
Assistant Registrar, Faculty of Technological Studies	Ms. E. Pavithra

1.3.1 Faculty of Technological Studies

The Faculty of Technological Studies as an academic organization has a flexible, friendly and conducive internal environment that allows for effective teaching, learning and research. This is due to the fact that the faculty has a unique signatured culture where the student and staff interactions are at an optimum sustainable high, where one-to-one attention is administered to the students by the teachers. Further, the Faculty has very strong ties with the community of Vavuniya and, it is seen as a key and prominent player in the advisory capacities of all development endeavors taking place in the locality.

Office of the Dean

Dean **Mr. V. Senthooran**

	B.Sc.[Hons] in Computer Science (Jaffna) M.Phil.(Moratuwa)
Assistant Registrar	**Ms. E. Pavithra**
Deputy Proctor	**Mr. R. Sakuntharaj**

Department of Information and Communication Technology (DICT)

The Department of Information and Communication Technology offers course units including Information Technology, Computer Science, IT laws, Basic Mathematics, Fundamental Statistics, Basic management principles and Computerized Accountancy. The course units cover wide range of Information and Communication Technology topics. The course units are designed in such a way to impart theoretical as well as practical knowledge.

Head

Mr. V. Vinoharan, B.Sc.[Hons] in Computer Science, M.Sc., M.Phil.

Academic Staff

Mr. R. Sakuntharaj, B.Sc.[Hons] in Computer Science, M.Phil.

Mr. V. Senthooran, B.Sc.[Hons] in Computer Science, M.Phil.

Mr. V. Vinoharan, B.Sc.[Hons] in Computer Science, M.Sc., M.Phil.

Ms. N. Lojenaa, B.Sc.[Hons] in ICT, M.Sc., Reading PhD

Ms. W.A.S.C. Perera, B.Sc.[Hons] in ICT, M.Sc., Reading MPhil

Ms. P. Rukshani, B.Sc.[Hons] in ICT, M.Sc., Reading MPhil

Ms. N. Venuja, B.Sc.[Hons] in Computer Science, MCS., Reading PhD

Ms. P. Amrithaa, B.Sc.[Hons] in ICT, Reading M.Sc.

Ms. W. Pirunthavi, B.Sc.[Hons] in Computer Systems and Technology, MCS.

Mr. P. Mayuran, B.Tech in Electronics and Computer Engineering, Reading M.Sc.

Mr. R. Ravichandran, BICT [Hons] in Games and Animation

Ms. J. Tuvensha, B.Sc.[Hons] in Computer Science

Ms. S. Janany, B.Sc.[Hons] in Computer Science

Ms. P. Vithuckshiha, B.Sc.[Hons] in Computer Science

Ms. K. Keerththana, B.Sc.[Hons] in Information Technology

Mr. T. Nusky Ahamed, BICT [Hons] in Network Security Technologies

Technical Officers

Mr. S. Shyrajan

Department of English Language Teaching (DELT)

The DELT has been functioning from its inception in 1992 (earlier it was called as English Language Teaching Unit). There are three permanent academic staff, two senior lecturer, and one lecturer probationary and two permanent academic support staff. Its services for the last ten years have been well-acknowledged and recorded. It provides English Language Teaching services at the undergraduate level and is engaged in English Language research. The main objectives are to broaden and expand the students' proficiency and knowledge in General English, English Linguistics, English Literature and Teaching English as a Second Language (TESL); to develop the students' English Language reading, writing, speaking and listening skills; to train the internal and external students in using English for Academic Purposes (EAP) and Specific Purposes (ESP); and to develop the students' general capacity to a level that enables them to use English in their professional and academic environment granted that they are provided with the specific notions and vocabulary in the respective career domain they belong to or will belong to in future. The functions at the Faculty of Technological Studies are as follows: it conducts courses (teaching, testing and evaluation) such as English Language I & II (two semesters) and Communication Skills (one semester) to the students of the faculty.

Academic Staff

Prof. G. Jeyaseelan, BA, PGD, MA, MSc, PhD

Ms. S. Jeyaseelan, BA, MA, MPhil

Ms. P. Sarmatha, BA, MA

Academic Supportive Staff

Mr. A. Sebarajah, BA, MA

Mr. S. Douglas, BA, MA

Mr. S. Anithra, BA, MA

2. Degree Program's Structure

2.1 Programme Overview

Academic programme of the Department of Information and Communication Technology, University of Vavuniya shall operate on a modularized credit valued and semester based course unit system.

2.2 Name of the Degree programme

The Designator of the Degree shall be "**Bachelor of Information and Communication Technology Honours Degree**" - BICT Honours.

BICT Honours is a professional degree programme which aims to produce ICT professionals meeting the requirements of Sri Lanka Qualification Framework (SLQF) level 6 and Computer Society of Sri Lanka (CSSL) accreditation standard. Duration of the degree programme is **four** years. BICT Honours degree programme is specifically designed to impart the knowledge and skills in information and communication technology and application programming.

2.3 Admission, Academic Year and Medium of Instruction

- ☆ Students are admitted annually by the University Grants Commission from the GCE (A/L) Technology Stream.
- ☆ An academic year consists of two semesters: Semester 1 and Semester 2. Duration of a semester is 15 weeks with one-week mid-semester vacation.
- ☆ Medium of the instruction shall be English.

2.4 BICT Honours Curriculum Layout

2.4.1 Credit valued course unit system

A *course unit* is a subject module that has a *credit* value. A credit is a time based quantitative measure assigned to course units on the basis of number of contact hours. The performance of students in the course units is divided into a sequence of sub-ranges designated by symbols called Grades and each Grade is assigned a *Grade Point Value* (GPV). The credit rating of course units offered by the Department may vary from two credits (minimum) to six credits (maximum).

2.4.2 Core Course Units

Information and Communication Technology Subject Areas: Core course units in this subject area covers Information Technology, Computing and Communication related course units, Mathematics, Management, Accounting, Statistics, Law and Professional Ethics related course units according to the guidelines and policies.

- ☆ For course units consisting of **Theory**, fifty (50) notional hours for a credit including lectures, carrying out assignments and assessments, time spent in self-learning, preparation for assignments, and tutorials is equivalent to one credit.
- ☆ For course units involving **Practical**, fifty (50) notional hours for a credit including laboratory studies, carrying out assignments and assessments, time spent in self-learning, preparation for assignments and tutorials for practical is equivalent to one credit.
- ☆ The credit values of courses that have both theory and practical components are calculated by giving appropriate weight to the components accordingly, as stipulated above.

Industrial Training: This course unit is designed to provide hand-on real-time industrial experience. It is assigned a credit value and taken for the GPA calculation.

- ☆ For **Industrial Training** of one-semester duration, the assigned credit value is six, hundred notional hours for a credit including time allocated for assessments, industrial training, maintenance of weekly diary, presentation and evaluation is equivalent to one credit.

Group Research Project: This course unit is designed to provide opportunities for students to apply theoretical knowledge to develop and consolidate skills, reflect on ICT practice.

- ☆ For **Group Research Projects** of one-semester duration, the assigned credit value is six, hundred notional hours for a credit including time allocated for literature survey, research work, documentation, presentation and evaluation is equivalent to one credit.

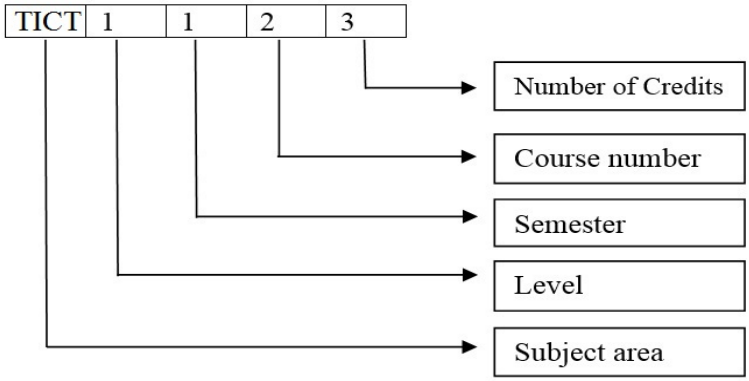
2.4.3 Auxiliary Course Units

Auxiliary course units in this subject area are designed to provide basic knowledge on topics that an undergraduate should possess in the present era. The auxiliary course units treated as credit valued course units and they are not taken for the calculation and they cover areas related to English Language and Communication Skills, Social Harmony, Active Citizenship, Career Guidance, Entrepreneurship, Research Methodology and Scientific Writing according to the guidelines and policies.

2.4.4 Course Codes:

Each Course unit is assigned with a code which reflects the subject area of the course, level (year) of the course, semester number of that level, course number in that semester and credit value of the course.

An example of a code assigned for course unit is depicted in figure given below:



The course codes with its respective subject areas are as follows:

Course code	**Subject area**
TICT	Core Course Unit
AUX	Auxiliary Course Unit

2.4.5 Definition of a credit

- ☆ For course units consisting of theory only, fifteen (15) hours of lectures and tutorials is equivalent to one credit.
- ☆ For course units involving laboratory work, fifteen (15) practical sessions each of two to three hours duration is equivalent to one credit.

- ☆ The credit values of course units that have both theory and practical components are calculated by giving appropriate weightage to the components accordingly, as stipulated above.
- ☆ For Research Project of one semester duration the assigned credit value is six (06).
- ☆ For Industrial Training of one semester duration the assigned credit value is six (06).

2.4.6 Credit Requirements

Students should earn minimum 120 credits in the core course units and the credit is distributed for each semester accordingly. Students will be evaluated in all registered course units including those in auxiliary subject areas. However, the credit-values earned for the auxiliary course units shall not be considered for the calculation of the overall Grade Point Average of the degree programme.

2.5 Graduate Profiles

In generic term, BICT Honours graduates will have the understanding of the fundamental knowledge prerequisite for the role as an efficient ICT professional, attitudes and ethics necessary in fulfilling their responsibilities towards the national and international communities. Further, the Graduates have the ability to:

- ☆ Communicate well with the clients.
- ☆ Adapt him/herself to the global work environment.
- ☆ Lead an application development in an organization based on knowledge of important contemporary issues in ICT.
- ☆ Conduct research in the field of ICT at a postgraduate level and in his/her own organization and the ability to engage in self-directed continuing professional development and lifelong learning.

Accordingly, the curriculum of the BICT Honours degree programme is designed to:

- ☆ Impart the necessary/relevant knowledge in ICT, Computing, Mathematics, and Science.
- ☆ Develop skills for identifying and understanding ICT related problems.
- ☆ Provide computing technological skills and multi-disciplinary exposure.
- ☆ Develop creative capabilities for information processing innovation.
- ☆ Provide opportunities to work independently and in groups.
- ☆ Develop skills to make correct judgment and appropriate action.
- ☆ Provide opportunities to develop interpersonal skills.

2.5.1 Graduate attributes - Academic Specific

The BICT Honours graduates are expected to have the following attributes:

- ☆ Gain a sound knowledge in computer programming, web development, interactive system development, data communication, mathematics for ICT, science for ICT, and computing application in engineering.
- ☆ Capable of Designing and developing appropriate prototypes according to the requirements of an organization in ICT.
- ☆ Capable of proposing innovative and creative solution to ICT problems.
- ☆ Show commitment to come up with sustainable information communication technological solutions for environmental issues with minimum adverse impact on environment.
- ☆ Have an effective communication through verbally and in written form with technical and non-technical staff in the working environment.
- ☆ Adapt to new technologies introduced in the methodology and implementation of their field of specialization in technology.
- ☆ Show responsibility and accountability in their duties.
- ☆ Capable of making decisions in accordance with professional ethics.
- ☆ Be able to use modern high-tech equipment/tool when needed in investigation, experimentation and research.
- ☆ Be able to work independently in the field of ICT as well as part of team while respect alternative views and multicultural aspects.
- ☆ Be able to emerge as small/medium level entrepreneur in their/related field of ICT.

In accordance with graduate attributes, the profile of the ICT graduate is depicted in the figure given below:

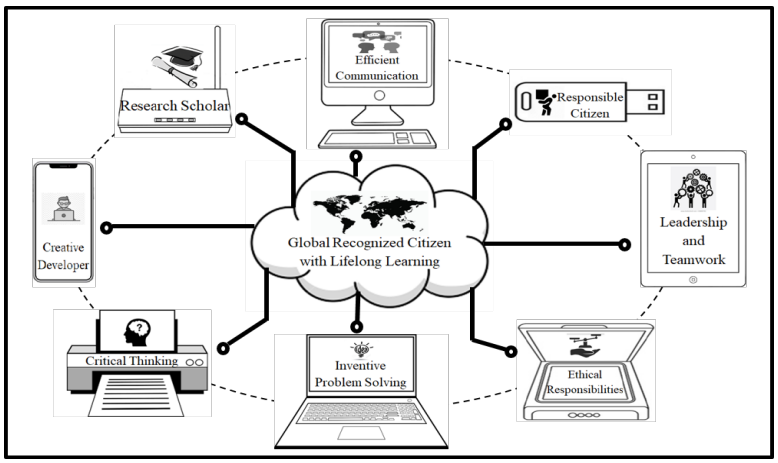


Figure 2.1: Graduate Profile of BICT Honours degree graduates.

3. Evaluation Systems

A course unit shall be evaluated by means of

- ☆ Formative Assessments: In-Course Assessments (ICA) consisting of suitable combinations of assignments, course-works, reports, oral presentations, oral examinations, quizzes, spot tests, classroom tests, mid-semester examinations, mini-projects etc.
- ☆ Summative Assessments: End of Semester Examination (ESE).

3.1 In-Course Assessments

All in-course assessments of any course unit (assignments, reports, oral presentations, quizzes, Spot tests, classroom tests, mid-semester examinations, mini-projects, etc.) shall be carried out during the delivery period of that course unit.

In-course assessments of a course units shall be carried out at the dates and times determined by the department offering that course unit. The Head of the Department concerned is responsible for the marks awarded to all components of the in-course assessment of a course units offered by the respective department.

The grades scored by a student in the various components of the in-course assessment of any course unit shall be displayed in the Notice Board to enable the students to know the grade by the Head of the Department.

3.2 End Semester Examination

An end semester examination shall be conducted for each course unit at the end of the semester in which the teaching of the course is completed. The end semester examination shall be conducted by the Examination Branch of the University. The date and time of the end of course examinations shall be decided at the beginning of each semester by the Dean in consultation with the Heads of Departments. An Examination Board of the Faculty constituted for each

course unit shall finalize the results of that course unit.

The Grades obtained by the students in the end semester examination and the overall Grades obtained by the students for that particular course shall be displayed by the Head of the Department concerned after ratification by the Faculty Examination Board. The Dean shall send Grades List to the Examination Branch along with detailed mark sheets.

When the results of the examinations on all the course units of a particular Semester of an academic year are received by the Examination Branch, the Examination Branch will summon a meeting of the Examination Board chaired by the Vice-Chancellor. The Board will release the overall performance of the students in that Level of that academic year giving the GPA scored by the students in that Semester.

The Examination Board shall be chaired by the Vice-Chancellor to release the awards of degrees with the overall GPA and the Class of Honours.

3.3 Evaluation Criteria of a Course Unit

☆ **Evaluation of Theory Course Unit**: The final mark is evaluated by giving 30% for in-course assessment ($ICAT$) and 70% for the end-semester ($ESET$) examination. The final mark FMT for the theory course is defined as follows:

$$FMT = ESET * 0.7 + ICAT * 0.3$$

$ICAT$ is the average mark of the best two out of any number of in-course assessments.

☆ **Evaluation of Practical Course Unit**: The final mark is evaluated by giving 40% for in-course assessment ($ICAP$) and 60% for the end-semester ($ESEP$) examination. The final mark FMP for the practical course is defined as follows:

$$FMP = ESEP * 0.6 + ICAP * 0.4$$

$ICAP$ is the average of the best two out of any number of in-course assessments.

☆ **Evaluation of Course unit with theory and practical component**: The final mark is evaluated using the marks obtained in both theory and practical examinations. The final marks FM for a course unit with theory and practical component is calculated as follows:

$$FM = (CT * FMT + CP * FMP)/(CT + CP)$$

Where CT and CP are the credits of the theory part and practical part of the course unit

respectively.

☆ **Evaluation of Industrial Training**

1. The evaluation of industrial training is done as follows:
   (a) Daily diary and evaluation from the supervisor 30%
   (b) Final report 30%
   (c) Oral presentation and viva-voce 40%
2. The members of the evaluation panel shall be incorporated with the list of examiners.
3. Obtaining a grade C or above in industrial training is a requirement for the award of degree.

☆ **Evaluation of Group Research Project**

1. The evaluation of group research project is done as follows:
   (a) Final report 40%
   (b) Oral presentation 20%
   (c) Viva-voce 40%
2. The members of the evaluation panel shall be incorporated with the list of examiners.
3. Obtaining a grade C or above in industrial training is a requirement for the award of degree.

3.4 Grading System

Performance of students in respect of a course unit is graded according to the following grading system. A Grade Point Value (GPV) and Grades as indicated in the following:

3.4.1 Grades and Grade Point Values

Grades, Grade Point Values and the Descriptions are as follows:

Grade	Grade Point	Description
A+	4.0	Excellent
A	4.0	
A-	3.7	
B+	3.3	Good
B	3.0	
B-	2.7	
C+	2.3	Pass
C	2.0	

C-	1.7	Weak Pass
D	1.0	Conditional Pass
E	0.0	Fail

Note: In order to earn grade D or above, student must score more than the minimum prescribed marks for the composite of both In-Course Assessment (ICA) and End Semester Examination (ESE).

3.4.2 Marks and Grades

Percentage marks ranges for the purpose of reference are as follows:

Percentage Marks for refernce	**Grade**
85 and above	A+
75 to 84	A
70 to 74	A-
65 to 69	B+
60 to 64	B
55 to 59	B-
50 to 54	C+
45 to 49	C
40 to 44	C-
35 to 39	D
0 to 34	E

3.4.3 Status when a course unit is not completed

Following or similar references may be used to indicate the status when a student has not completed a module. This is for record keeping of the university and for the information of the students.

Reference	**Grade Point**	**Description**
E	0.0	Both Theory (T) and Practical (P) marks are either below the prescribed minimum or absent. Incomplete T and P

E(T)	0.0	Theory (T) mark is either below the prescribed minimum or absent. Incomplete T
E(P)	0.0	Practical (P) mark is either below the prescribed minimum or absent. Incomplete P
N	-	Academic concession
W	-	Withdrawn

3.5 Grade Point Average

The calculation of the **Semester Grade Point Average** (SGPA) will be based on the summation of Grade Points earned for all GPA modules registered (except those awarded with academic concession or withdrawn) in a semester weighted according to number of credits as per the following formula, where C_i is the number of credits for the i^{th} module in a given semester and GP_i is the grade points earned for that module and n is the number of GPA modules in the semester.

$$SGPA = \frac{\sum_{i=1}^{n} C_i \ GP_i}{\sum_{i=1}^{n} C_i}$$

Note: It must be noted that weightage for In-Course Assessment may vary depending on the module. Therefore, fixed weightages must not be brought into the SGPA calculation equation. Industrial Training should be allocated GPA credits.

The **Cumulative Grade Point Average** (CGPA) describes a student's existing standing in terms of grade points earned for all GPA modules registered up to a given point of time (except those awarded with academic concession or withdrawn) weighted according to number of credits as per the following formula, where C_i is the number of credits for the i^{th} module and GP_i is the grade points earned for that module and n is the total number of registered GPA modules.

$$CGPA = \frac{\sum_{i=1}^{n} C_i \ GP_i}{\sum_{i=1}^{n} C_i}$$

Note: The weightage for each semester is taken as uniform for the calculation of CGPA. All semesters must be successfully completed for the award of degree.

3.6 Academic Progression and Attendance

3.6.1 Pass/Fail Criteria

- ☆ Percentage pass mark for the ICA is equivalent to the minimum mark assigned for Grade **C-** and that for ESE is equivalent to the minimum mark assigned for Grade **D**. (*Proportion of marks allocated for ICA and ESE must be approved by the university. It is recommended to adopt* 30% *for ICA and* 70% *for ESE for theory oriented components and* 40% *for ICA and* 60% *for ESE for practically oriented components*).
- ☆ Grade **D** or above is required to earn credit value for a course unit.
- ☆ Student should pass in both theory and practical component in order to pass the respective course unit.
- ☆ Student failing in ICA, ESE or both ICA and ESE must repeat the respective component.
- ☆ Grades **C-**, **D** or **E**, which can be improved to Grade **C**, are considered for calculating Semester Grade Point Average (SGPA).
- ☆ Student is considered to have completed a semester successfully only if he/she has achieved a SGPA of 2.00 or above, and has, in that semester, no E grade and no more than three grades at the levels of **C-** or **D**. (Note: **E** grades will be included in the calculation of SGPA).
- ☆ In repeat attempts, all **D** and **E** grades should be improved to **C-** or **C**, and improve grade **C-** to **C** if necessary, and achieve a SGPA of 2.00 or above.
- ☆ All course units for which the student has registered for the semester, except non-GPA course units, will be counted in calculating the SGPA.

3.6.2 Progression Criteria

A student who has not earned a CGPA of the first three semesters of 2.0 or above will not be permitted to register for the fifth semester until the CGPA of the first three semesters is improved as required.

3.6.3 Attendance

- ☆ Attendance at 80% of theory and practical classes is compulsory.
- ☆ Those who do not satisfy the attendance requirement for the course unit will not be allowed to sit for end semester examinations.
- ☆ Students who abstained from theory and practical classes on medical grounds with the recommendation of the University Medical Officer along with Dean and the Faculty Board

will be allowed to sit for end course assessments, if overall attendance is more than 50%. Medical should be submitted within fourteen days from the examination date.

- ☆ Those who abstained from submitting medical or sit for the ICA or ESE examinations within the due time (six academic year period) will be classified as incomplete candidates.
- ☆ Those who are not allowed to sit for the examinations due to poor attendance may repeat the course / component(s) with the approval of the Head of the Department/Dean of the Faculty.

3.7 Repeat/Re-Sit Examinations

The student who failed to obtain the requisite number of credit passes or failed to appear for an end semester examination are required to appear for such examination when it is held next.

- ☆ A course unit / individual component (either theory or practical) with **E** must be repeated.
- ☆ Students who obtained a grade **C-** or **D** for a course unit / individual component are given an option to repeat the course unit in order to improve the grade up to **C**.
- ☆ In the event of (2), a student obtains a lower grade while attempting to improve his/her grade, he/she will be entitled to his/her previous grade from course unit / respective component.
- ☆ The studentdent failing in theory (**E(T)**) or practical (**E(P)**) must repeat the respective component(s).
- ☆ No student shall be allowed to repeat the In-course Assessments (ICA) of any course unit.
- ☆ For repeat students, the best marks at the End Semester Examinations (ESE) and the marks at his/her previous In-course Assessments (ICA) will be taken for computation.
- ☆ Repeat examination of a student supported by a Medical Certificate either by the University Medical Officer (UMO) or certified by the UMO will be considered as that of his/her first attempt. The said student's previous continuous assessments will be considered for computation.

  Important: such Medical Certificate should be submitted with the appropriate certification of UMO within two weeks from the date of the said examination held.
- ☆ Students are not allowed to sit for the exams of the course units for more than three times.
- ☆ The students who failed to sit for an End-semester Examination are requested to sit for such examination at the next earliest opportunity and it will be considered as re-sit.
- ☆ The students who failed to sit for an End-semester Examination of a course unit or a component of a course unit on the medical ground are requested to submit a medical certificate, certifed by the university medical officer to the DR/Examination through Dean/Faculty of Technological Studies within two weeks. In this circumstances the candidate will be allowed

as a proper candidate for the course unit or the component of the course unit when the examination held next.

Important: A course unit will be considered as a repeat, while one component would be medical with proper attempt and another component may be a repeat.

3.8 Medical for Examinations

- ☆ The students who are unable to appear for an End-semester Examination of a course unit or a component of a course unit on the medical grounds during the examination period he/she should report to the University Medical Officer (UMO) and obtain a medical certificate from the UMO.
- ☆ Those who are unable to report to UMO during the examination period he/she should then report to closest Government Heath Care System and obtain the government medical certificate and certified by the UMO.
- ☆ In all the above circumstances, the Medical certificate recommended by the UMO should be submitted to the Assistant Registrar of the relevant faculty within 14 days of the conclusion of the examination in the appropriate application form ("Consideration of absence from examination").
- ☆ All the certified Medical Certificates will be forwarded to Senate Sub-committee known as "Medical Certificates Process and Mercy Chance", there these certificates will be carefully studied for its authenticity in a case-by-case basis, if necessary, the applicant will be called for an interview to find out more details.
- ☆ This committee, based on the case, will decide and inform the Dean of the relevant Faculty whether the submitted Medical Certificate can be acceptable so that the candidate may be allowed as a proper candidate, with the approval of the Senate, for the course unit or the component of the course unit when the examination held next available date.

3.9 Award of Honours Degree

A student is deemed to have satisfied the requirement for the Award of Degree of Bachelor of Information Communication Technology Honours if he / she has obtained:

- ☆ Grade **D** or above in core course units amounts to 120 credits offered for the degree programme.
- ☆ Grade **D** or above in the auxiliary course units, inclusive of English Language course units.
- ☆ Grade **C** or above in the industrial training and group research project.
- ☆ A minimum SGPA of 2.00 in each individual semester.

☆ Meeting the relevant requirements above within the period of 06 academic years is mandatory.

3.10 Maximum Period for the completion of the Degree

The maximum period for the completion of all requirements for the award of degree is recommended to be 06 academic years. The Senate of the university may grant one academic year at a time, beyond initial 06 academic years, based on the merit of individual applications, for a maximum of 03 years.

3.11 Award of Class

A student who satisfies the requirement of the award of degree within four academic years may earn a class honours. The class honours will be determined based on his/ her GPA as summarized in the following table

Class/Pass	CGPA
First Class	≥ 3.70 and ≤ 4.00
Second Class (Upper)	≥ 3.30 and < 3.70
Second Class (Lower)	≥ 3.00 and < 3.30
Pass	≥ 2.00 and < 3.00

All requirements for the award of degree must be completed in four academic years to earn a Class.

3.12 Effective Date of the Degree

Effective date of degree awarded shall be the date of the last end semester examination evaluation of the semester in which a student completes the degree programme.

4. Curriculum Layout

The Bachelor of Information and Communication Technology honours degree programme is designed to meet the SLQF Level 6 and Computer Society of Sri Lanka requirements. Volume of learning of the entire programme is 120 academic credits including 12 credits from the group research project and industrial training.

4.1 Title of the course units and credit values

4.1.1 Bachelor of Information Communication Technology (Honours)

Course Number	Title	Number of Credits
TICT11XX	First year first semester	15
TICT12XX	First year second semester	15
TICT21XX	Second year first semester	14
TICT22XX	Second year second semester	16
TICT31XX	Third year first semester	15
TICT32XX	Third year second semester	15
TICT41XX	Fourth year first semester	12
TICT42XX	Fourth year second semester	18

4.1.2 Courses of BICT (Honours) - An outline

Level 1 Semester I			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT1114	Essentials of ICT	4:30/60	15
TICT1123	Mathematics for Technology	3:45/00	
TICT1134	Fundamentals of Computer Programming	4:30/60	
TICT1142	Fundamentals of Web Technologies	2:15/30	
TICT1152	Principles of Management	2:30/00	
AUX1113	English Language I	3:45/00	Non-GPA

Level 1 Semester II			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT1212	Discrete Structures	2:30/00	15
TICT1224	Object Oriented Programming	4:30/60	
TICT1233	Operating Systems	3:30/30	
TICT1243	Electronics and Digital Circuit Designs	3:30/30	
TICT1252	Computational Engineering Drawing	2:15/30	
TICT1261	IT Law	1:15/00	
AUX1212	Social Harmony and Active Citizenship	2:30/00	Non-GPA

Level 2 Semester I			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT2113	Data Structures and Algorithms	3:30/30	14
TICT2122	Statistics for Technology	2:30/00	
TICT2134	Advanced Computer Programming	4:30/60	
TICT2142	Multimedia Design and Technologies	2:30/00	
TICT2153	Human Computer Interaction	3:30/30	

AUX2113	English Language II	3:45/00	Non-GPA

Level 2 Semester II			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT2212	Operational Research	2:30/00	16
TICT2222	Computer Networks	2:30/00	
TICT2233	Database Management Systems	3:30/30	
TICT2244	Computer Graphics	4:30/60	
TICT2252	System Analysis and Design	2:30/00	
TICT2263	Accounting for Technology	3:30/30	
AUX2212	Communication and Soft Skills	2:30/00	Non-GPA

Level 3 Semester I			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT3113	Computer Architecture and Organization	3:30/30	15
TICT3123	Advanced Database Management Systems	3:30/30	
TICT3132	Advanced Web Technologies	2:15/30	
TICT3142	Social and Professional Issues in IT	2:30/00	
TICT3153	Software Engineering	3:30/30	
TICT3162	Information Security	2:30/00	
AUX3112	Career Guidance	2:30/00	Non-GPA

Level 3 Semester II			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT3214	Advanced Computer Networks and Administration	4:30/60	15
TICT3222	IT Project Management	2:30/00	
TICT3232	Software Quality Assurance	2:30/00	

TICT3243	Mobile Computing	3:30/30	
TICT3252	Green Computing	2:30/00	
TICT3262	Distributed Systems	2:30/00	
AUX3212	Research Methodology and Scientific Writing	2:30/00	
AUX3221	Entrepreneurship for Technology	1:15/00	Non-GPA

Level 4 Semester I			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT4116	Group Research Project	6:00/600	12
TICT4126	Industrial Training	6:00/600	

Level 4 Semester II			
Course Code	**Course Title**	**Credits & L/P Hrs**	**Total Credit**
TICT4213	Data Mining and Data Warehousing	3:30/30	18
TICT4223	Digital Image Processing	3:30/30	
TICT4233	e-Commerce	3:30/30	
TICT4242	Mobile Application Development	2:15/30	
TICT4253	Intelligent Systems	3:30/30	
TICT4262	Cloud Application Development	2:15/30	
TICT4272	Applied Bio-informatics	2:15/30	

5. Examination Rules

5.1 Attendance

Candidates shall be in attendance outside the examination hall at least 15 minutes before the commencement of each paper, but shall not enter the hall until they are requested to do so by the Supervisor.

5.2 Seating

On admission to the hall a candidate shall occupy the seat allowed to him/her shall not change it except on the specific instruction of the Supervisor.

5.3 Admission to Hall

No candidate shall be admitted to the examination hall for any reason whatsoever after the expiry of half an hour from the commencement of the examination. Nor shall a candidate be allowed to leave the hall until half an hour has lapsed from the commencement of the examination or during the last 15 minutes of the paper.

5.4 Record Book as Identity

A candidate shall have his/her student Record Book/Identity Card and the Admission Card with him/her in the examination hall on every occasion he/she presents himself/herself for a paper. His/Her candidature is liable to be cancelled if he/she does not produce the Record Book/Identity Card. If he/she fail to bring his/her Record Book/Identity Card on any occasion, he/she shall sign a declaration in the form provided for it, and produce the Record Book/Identity Card in the next occasion when he/she appears for the examination. If it is the last paper or the only paper he/she is sitting, he/she shall produce the Record Book/Identity Card to the Se-

nior Assistant Registrar/Examination on the following day. If a candidate loses his/her Record Book/Identity Card in the course of the day or if a candidate loses his/her Record Book/Identity Card in the course of the Examination, he/she shall obtain a duplicate Record Book/Identity Card from the Senior Assistant Registrar/Examination, for production at the examination hall.

5.5 Documents which candidates should not bring

No candidate is allowed to have any written documents in his or her possession.

5.6 Declaration of Articles in Possession

If a supervisor so requires every candidate shall declare everything he/she has in his/her possession.

5.7 Copying

No candidate shall copy or attempt to copy from any book or paper or notes or similar material or from the scripts of another candidate. No shall any candidate either help another candidate or person whomsoever. No shall any candidate conduct himself so negligently that an opportunity is given to any other candidate to read anything written by him/her or to watch any practical experiment conducted by him/her. No shall any candidate use any other unfair means or obtain or render improper assistance at the examination.

5.8 Cheating

No candidate shall submit a practical or a field book or a dissertation or a project study or an answer script which has been wholly or partly done by anyone other than the candidate himself/herself.

5.9 Articles that candidate may bring

Candidates shall bring their own pens, ink, mathematical instruments, erasers, pencils or any other equipment or stationary which the candidates have been instructed to bring.

5.10 Examination Stationery

Examination stationery (i.e. writing paper, graph paper, drawing paper, ledger paper, precise paper etc.) will be supplied as and when necessary. No sheet of paper or answer book supplied to candidate may be torn, crumpled, folded or otherwise mutilated. No other papers shall be used by candidates. Log tables or any other materials provided by the University shall be used with care and left behind on the desk. Such material supplied whether used or unused, shall be left behind on the desk and not removed from the examination halls.

5.11 Index Number

Every candidate shall enter his/her Index Number on the answer book and on every continuation paper. He/She also enter all necessary particulars as indicated in the cover of the answer book. A candidate who inserts on his/her own script an index number other than his/her is liable to be considered as having cheated. A script that bears no Index Number or an Index number which cannot be identified is liable to be rejected. No candidate shall write his/her name or any other identifying mark on the answer script.

5.12 Rough work to be canceled

All calculations and rough work shall be done only on paper supplied for the examination, and shall be canceled and attached to the answer script. Such work should not be done on admission cards, time tables, question papers, record books or on any other paper. Any candidate who disregards these instructions will be considered as having written notes or outline of answers with the intension of copying.

5.13 Unwanted parts of Answers to be crossed out

Any answer or part of answer which is not to be considered for the purpose of assessment shall be neatly crossed out. If the same questions have been attempted in more than one place the answer or answers that are not to be counted shall be neatly crossed out.

5.14 Under Supervisors Authority

Candidates are under the authority of the Supervisor and shall assist him/her by carrying out his/her instructions and those of his/her Invigilators, during the examination and immediately before and after it.

5.15 Conduct

Every candidate shall conduct himself/herself in the Examination Hall and its precincts so as not to cause disturbance or inconvenience to the Supervisor or his/her staff or to other candidates. In entering and leaving the hall, shall conduct him/her as quietly as possible. A candidate is liable to be executed from the examination hall for disorderly conduct.

5.16 Stopping work

Candidates shall stop work promptly when ordered by the Supervisor/Invigilator to do so.

5.17 Maintenance of Silence

Absolute silence shall be maintained in the examination hall and its precincts. A candidate is not permitted for any reason whatsoever to communicate or have any dealings with any person other than the Supervisor/Invigilator. In case of urgent necessity the candidate may communicate with the Supervisor/Invigilator. The attention of the Supervisor/Invigilator shall be drawn by raising his hand from where he is seated.

5.18 Leaving

During the course of answering a paper no candidate shall be permitted to leave the examination hall temporarily. In case of an emergency, the Supervisor/Invigilator will grant permission to do so but the candidate will be under his surveillance.

5.19 Impersonation

No person shall impersonate a candidate whether in the examination hall or before or after the examination, nor shall any candidate allow himself to be impersonated by any other person.

5.20 Prior knowledge

No candidate shall obtain or attempt to obtain prior knowledge of questions.

5.21 Dishonesty

Serious notice will be taken of any dishonest assistance given to candidate, by any person.

5.22 Cancelation/Postponement

If circumstances arise which in the opinion of the Supervisor render the cancelation or postponement of the examination necessary, he/she shall stop the examination, collect the scripts already written and then report the matters as soon as possible to the Rector/Deputy Registrar/Examination.

5.23 Making of statements

The Supervisor/Invigilator is empowered to request any candidate to make a statement in writing on any matter which may have arisen during the course of the examination and such statement shall be signed by the candidate. No candidate shall refuse to make such a statement or to sign it.

5.24 Whom to contact in Examination Matters

No candidate shall contact any person other than the Rector/Dean or Deputy Registrar/Examinations regarding any matter concerning the examinations.

5.25 Handing over of Answer scripts

Every candidate shall handover the answer script personally to the Supervisor/Invigilator or remains in his/her seat until it is collected. On no account shall a candidate hand over his/her answer script to the attendant, a minor employee or another candidate.

5.26 Withdrawal

Every candidate who registers for an examination shall be deemed to have sat an examination within the specified period unless he/she submits a medical certificate prior to the commencement of the examination. The medical certificate shall be from the Campus Medical Officer. If this is not possible the medical certificate should be obtained from a Government Medical Practitioner and should be submitted to the Campus Medical Officer for certification at the earliest possible time.

5.27 Absence from Examination

When a candidate is unable to present himself/herself for any part or section of an examination, he/she shall notify the cause to the Deputy Registrar /Examinations immediately. This should be confirmed with supporting documents within 48 hours by registered post.

5.28 Plagiarism

The Faculty operates on a **zero tolerance** policy when it deals with acts of plagiarism. The students are advised to ensure that all their course work, reports and other reportive work are referenced properly when quoting or citing from another person's work. Of particular importance is the common tendency to 'copy and paste' from the internet that is practiced voraciously at present. This, in the case of the Faculty of Applied Science **will not be tolerated** even to the very minor levels.

6. Services and Facilities

The office of the Deputy Registrar (Examinations and Admission) is located in the Main Campus Building at Park Road. This office carries out Students Registration, Issuing Identity Card, Admission Card for end semester examination, Result Sheets, Official Transcript, Statements and, Degree Certificates. The offices of the student counsellors and Assistant Registrar (Welfare) is located in Pampaimadu premises. All the needs of the students outside their study courses such as loan facilities, grants, scholarships, hostel facilities, cafeteria are opened through the Welfare Branch.

6.1 Financial Assistance

Financial Assistance available is as follows:

- ☆ Mahapola Scheme
- ☆ Bursary Scheme
- ☆ Vice Chancellor welfare fund
- ☆ Rector's Fund

6.2 Awards and Prizes

The Faculty of Technological Studies students are eligible to apply for the following awards. However, the students must satisfy the minimum requirements to apply for these awards.

- ☆ Dean's List and Faculty Award

6.3 Laboratory Facilities

The Faculty has well equipped Computer and Networking Laboratory. Arrangements are underway to set up a fully fledged Electronics Laboratory.

6.4 Library Services

The Campus possesses a well established library to support the teaching, learning and doing research in all disciplines. It is situated in the Main campus (park road) and Pampaimadu premises. Further, the library also provides facilities that enable students to access scientific, technical and innovative information through selected online journal venues.

6.5 IT Centre

The IT Centre of the University of Vavuniya is located in hostel premises at Pampaimadu. There are 50 computers available with internet facilities for teaching, learning and training purposes. The students of the Faculty of Technological Studies also can enjoy the facilities of this IT centre.

6.6 Physical Education

Students are encouraged to participate and utilize the facilities available for sports in the Physical Education Unit of the campus. The Physical Education Unit is located in Pampaimadu Hostel premises having a playground and an indoor stadium with badminton court, netball court and a gymnasium is available for students and staff uses. The physical education unit organizes Inter Faculty meets, Freshers meet, Big Matches, and Open Tournaments annually.

6.7 Accommodation and Lodging

The Campus is taking initiative to provide accommodation and lodging to all the first year students from outstations. There is a hostel facility for 400 male students and 600 female students at Pampaimadu.

6.8 Health Facilities

The Campus Medical Officers (CMO) are appointed to obtain treatment and for necessary consultation. Medical Officers daily visit to the Main Campus and Pampaimadu between 12.00 noon to 1.00pm. In case of serious illness the students will be channeled to the Vavuniya General Hospital.

6.9 Facilities for the differently abled students

The Faculty building has the ramp facility, special washrooms and elevators to support the differently abled students. In addition to that lecture halls are equipped with left-handed arm chairs.

6.10 Students Union

Students register to follow a degree program at the Faculty shall be the members of the Campus Students Union and Faculty of Technological Studies Students Union.

6.11 Staff and Students Interaction

A committee has been set up to promote staff and students interaction. This committee arranges various programmes to enhance togetherness and social harmony.

6.12 Students Counselors

Students counselors are in service in the Faculty. Students can obtain any assistance and can clarify any problem with the students counselors.

6.13 Virtual Learning Environment (VLE)

All the course units offered by the Faculty of Technological Studies are designed in accommodating Virtual Learning Environment (VLE) as a tool to facilitate the undergraduates to learn course contents by means of learner centred approach. All the students and staff members of the faculty are given an account in the VLE and it will be rearranged when a fresh semester of an academic year starts. The activities of each student will be monitored by the teacher through the VLE. Also, Course materials, Announcements, feedbacks questionnaires, practice quizzes, assignments and tutorials submission of a course unit can be easily managed with the VLE. The VLE can be accessed through http://vle.vau.jfn.ac.lk

7. Schedules and Contacts

7.1 Semester Schedules

First Semester	
First Semester First Half	8 weeks
Mid Semester Vacation	1 week
First Semester Second Half	7 weeks
End Semester Examinations and Vacation	10 weeks

Second Semester	
Second Semester First Half	8 weeks
Mid Semester vacation	1 week
Second Semester Second Half	7 weeks
End Semester Examinations and Vacation	10 weeks

7.2 How to Contact

↬ **Website address of the University of Vavuniya:** www.vau.ac.lk

A.

Detailed Syllabus

Bachelor of Information Communication Technology Honours

Level 1

Course Title	Essentials of Information Communication Technology		
Course Code	TICT1114		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To introduce the basic concepts and trends in the developments of information communication technology.

Intended Learning Outcomes:

- Explain the basic concept of hardware, software, networking, and security.
- Compare the technology evolution in the computer history.
- Identify common ethical issues that arise in an information system environment.
- Apply necessary commands for the basic configuration.
- Define various system software and firmware required for the ICT devices.
- Outline the installation of hardware devices, system and application software.
- Utilize presentation and word processing software.
- Develop documents for computational applications.

Course Contents:

Theory: Introduction to Information Technology: Overview of the history of IT, Characterization and classification of computers, Information Systems: Representation of information in a computer, problem solving with computer, Number system; Hardware Components; Information Systems Software, Managing Data Resources, network and data communication, Operating system and its function, The Internet; Computer Architecture, Computer Virus; Impact of IT on business and society; Application Domains; **Practical:** Implementation of basic features of application software, PC Management, DOS Commands, Word processing, Spread-sheets and presentations.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:

- Ralph, M. Stair. & George, W. Reynolds. (2016) *Principles of Information Systems.* 12^{th} Ed.
- Brian, K. Williams. & Stacey, C. Sawyer. (2010) U*sing Information Technology: A Practical Introduction to Computers & Communication: Complete Version.* 9^{th} Ed.
- Timothy, J. O'Leary. & Linda, I. O'Leary. (2006) *Computing Essentials.* Introductory Ed.

Course Title	Mathematics for Technology		
Course Code	TICT1123		
Credits	3:3/0	Theory	45 hours

Course Objectives: To familiarize the mathematical principles and concepts.

Intended Learning Outcomes:

- formulate limits, derivatives, and definite & indefinite integrals of algebraic, logarithmic and exponential functions
- solve systems of linear equations by use of the matrix
- determine number of possible outcomes of elementary combinatorial processes
- use transformation equation of line and circle
- apply recursive and structural induction algorithms

Course Contents:

Linear Algebra: Matrices, Vectors, Matrix operations, System of equations and solving techniques; Differential Calculus: Limits and Continuity, Integration, Differential coefficients; Coordinate Geometry: Coordinates, transformation Equation of line, circle; Induction and Recursion: Mathematical Induction, Recursive Definitions and Structural Induction, Recursive Algorithms; Counting: Basics of Counting, Permutations and Combinations, Binomial Coefficients and Identities.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

- Ernest Davis. (2012) *Linear Algebra and Probability for Computer Science Applications.* 1^{th} Ed.
- Graham., Knuth. & Patashnik. (1994) *Concrete Mathematics: A Foundation for Computer Science.* 2^{nd} Ed.
- Haym Kruglak., John, T. Moore. & Ramon, A. Mata-Toledo. (2009) *Schaum's Outline of Basic Mathematics with Applications to Science and Technology.* 2^{nd} Ed.

Course Title	Fundamentals for Computer Programming		
Course Code	TICT1134		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To provide knowledge and skills to implement realistic problems using a high-level language.

Intended Learning Outcomes:

- outline the basic structures in programming
- define data types for computer program
- determine the properties of algorithm and devise an algorithm to solve any real-world problem
- utilize the functions to breaking down the tasks to solve problem
- explain the usage of array data structure
- develop programs using the high-level languages

Course Contents:

Theory: Overview of Programming Languages: Machine languages, Assembly languages and High level languages; Basic Elements in Programming, Structure of a Program, Input / Output Streams, Variable declaration, Arithmetic Operations, Relational Operations, Logical Operations; Control Structures: If/ Else, While repetition, For repetition, Switch multiple selection, Do /while, Break and Continue; Arrays: Single Dimensional Arrays, Multidimensional Arrays; Functions: Predefine Functions, User define Functions, Scope of variables and parameters, Recursion; Techniques of Problem solving: Algorithm, Flowchart and Pseudo codes; **Practical:** Implementation of all the concepts covered in the theory using C++.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:

- Gary Willoughby. (2009) *Pure Basic - A Beginner's Guide to Computer Programming.* Aardvark Global Publishing.
- Malik, D. S. (2011) *C++ Programming: From Problem Analysis to Program Design.* 5^{th} Ed.
- Kenneth Leroy Busbee. (2013) *Programming Fundamentals: A Modular Structured Approach Using C++.* Rice University, Texas.

Course Title	Fundamentals of Web Technologies		
Course Code	TICT1142		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To provide knowledge and skills to create web pages using mark-up & scripting languages and style sheets.

Intended Learning Outcomes:

- create an HTML document for the requirement of the user
- design web pages with multimedia contents
- build tables for presenting data
- modify attributes to make more usable and friendly web links
- utilize script to add functional objects effectively
- test user input using validation methods

Course Contents:

Theory: Introduction to Computers and the Internet; Basics of Web Browser and protocols: introduction to HTML, Basic Text Formatting; Links and Navigation: Understanding URLs, Adding multimedia objects; Tables: Basic Table Elements and Attributes, Grouping Sections of a Table, Nested Tables; Forms: Introducing Forms, Creating form, Form Controls, Creating Labels for Controls, Sending Form Data to the Server; Frames; Cascading Style Sheets: Introducing CSS, CSS Properties, Controlling Text, Text Formatting, Selectors, JavaScript: Add a Script, The Document Object Model, Starting to Program with JavaScript, Variables, Operators, Functions, Conditional Statements, Looping, Events, Built-in Objects, Form Validation, Form Enhancements, JavaScript Libraries. **Practical:** Developing web pages with the concepts covered in the theory using HTML, CSS and JavaScript.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:

- Jon Duckett. (2010) *Beginning HTML, XHTML, CSS, and JavaScript.*
- Deitel, P. J. & Deitel, H. M. (2008) *Internet & World Wide Web How to Program.* 4^{th} Ed.
- Faithe Wempen. (2011) *HTML5 Step by Step. Microsoft Corporation.*
- Nicholas, C. Zakas. (2012) *Professional JavaScript for Web Developers.* 3^{rd} Ed.

Course Title	Principles of Management		
Course Code	TICT1152		
Credits	2:2/0	Theory	30 hours

Course Objectives: To familiarize the Principles of Management and develop the ability to apply them in ICT contexts.

Intended Learning Outcomes:
- define the basic management theories
- explain the evolution of management in various eras
- illustrate the managerial roles, levels and skills of the organization
- identify the functions of Management
- discuss the necessity of good management practices in organizations

Course Contents: Introduction to management, the evolution of management theory, planning, importance of planning,(types of plans, vision, mission, goals, objectives, aims, tasks, formal planning process, importance of decision making process and types of decisions), organizing (Organizational structure, Co-ordination in Organization, Delegation of Authority, Responsibility, Accountability, Span of control, Power, Centralization and decentralization, departmentalization), leading (leadership, motivation, communication) and controlling.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

- Daft, R.L. (2012) *New Era of Management*, 10^{thEd}., Cengage Learning.
- Griffin, R.W. (2013) *Management: Principles and Applications*, 10^{thEd}., Cengage Learning.
- James, L. & Burrow. (2012) *Business Management*. 13^{th} Ed.
- Peter Stimpson. (2015) *Business Management for the IB Diploma Course book*. 2^{nd} Ed.

Course Title	English Language I		
Course Code	AUX1113		
Credits	2:2/0	Theory	30 hours

Course Objectives: To provide necessary language skills to read, write, listen and speak in English in formal and informal academic and professional contexts **at the intermediate level**.

Intended Learning Outcomes:

- explain the fundamental knowledge on the use of the four skills - speaking, listening, reading and writing
- identify the semantic and pragmatic forms and meanings for contextual application
- demonstrate efficiency and effectiveness in both receptive and expressive skills create distinct style and rhetoric orally, aurally, graphically, and grammatically

Course Contents: At the intermediate level, Reading skills, Identifying main points, Understanding vocabulary, Introducing the mechanics of writing, Introducing vocabulary in and around the University environment, Developing sentences and paragraphs, Transferring graphic, pictorial information into writing, Preparing to write an essay or a project, Describing objects, Interviewing, Giving instructions, Making short speeches, Listening to discriminate sounds, Listening for speci?c information, Listening and responding to telephone conversion, Introducing structures, Question formation, Articles, Preposition, Pronouns, Quanti?er, Word class, Active and passive, Topics to be selected from student's field of interest, Submission of individual projects.

Teaching and Learning Methods: Class room lectures, self-learning, computer assisted language learning, individual and group discussion and presentation.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

- Miles Craven., Craig Thaine. & Sally Logan. *Cambridge English Skills: reading, writing, listening and speaking from Elementary Advanced.* Cambridge University Press.
- Alison Pohl., Eric Glendinning. & Lewis Lansford. (2013) *Oxford English for Careers Technology for Engineering and Applied Sciences: Student Book*, Oxford University Press. United Kingdom.
- Murphy, R. (2012) *Essential English Grammar.* Cambridge Publications.

Course Title	Discrete Structures		
Course Code	TICT1212		
Credits	2:2/0	Theory	30 hours

Course Objectives: To impart knowledge to solve IT related mathematical problems using appropriate techniques and converting the real problem to computationally solvable problems using various problem-solving strategies.

Intended Learning Outcomes:

- apply the operations associated with sets, functions and relations
- build logical statements from informal language to propositional and predicate logic expression
- apply the proving thermos to establish the truth of a statement
- outline Boolean logic relates to computing problems as truth tables, logic circuits and Boolean algebra
- construct the problems in IT using graphs and trees

Course Contents: Basic Structures; Sets , Relations and Functions; Logic and Proofs: Propositional Logic, Predicates and Quantifiers, Rules of Inference; Number Systems; Boolean Algebra: Logic Gates, Karnaugh maps; Graphs and Trees; Automata and Turing machine

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

- Bernard Kolman. & Robert, C. Busby. (1987) *Discrete Mathematical Structures for Computer Science.* 2^{nd} Ed.
- Kerneeth, H. Rosen. (2012) *Discrete Mathematics and its Applications.* 7^{th} Ed.
- 3Susanna S. Epp. *Discrete Mathematics with Applications.* 4^{th} Ed.5

Course Title	Object Oriented Programming		
Course Code	TICT1224		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To understand the Object Oriented Design strategies in programming and problem-solving.

Intended Learning Outcomes:

- explain the basic concepts of structured and object oriented languages
- match the real world objects into programming paradigm
- apply object oriented concept in program development
- apply good programming style and understand the impact of style on developing and maintaining programs
- design polymorphic objects to improve the reusability of programming
- develop object oriented solutions for small systems involving multiple objects

Course Contents:

Theory: Introduction; Structured Programming and OOP: Specifying a class, Defining Member Functions, Constructors and Destructors, Copy Constructors, Static Data Members, Static Member Functions; Inheritance: Extending Classes, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Member Classes, Operator overloading and type conversions, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings Using Operators, Rules for Overloading Operators; Type Conversions.
Practical: Developing object oriented programs using the concepts covered in the theory.

Teaching and Learning Methods: Classroom Lectures , self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:

- David, J. Barnes. (2000) *Object-Oriented Programming with Java: An Introduction.* Prentice Hall.
- Thomas, C. Wu. (2006) *An Introduction to Object-Oriented Programming with Java.* 5^{th} Ed. TATAMcGraw-Hill.
- David West, Brett McLaughlin, Gary Pollice. (2011) *Head First Object-Oriented Analysis and Design*, 1^{st} Ed.

Course Title	Operating Systems		
Course Code	TICT1233		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge to understand the software based resource management in computers and encourages to develop inter process communication programs using shell script.

Intended Learning Outcomes:
- define the core functionalities of an Operating System
- discuss various file system organizations and their interaction
- explain the memory management techniques in an Operating System
- compare the various operating system
- outline inter-process communication
- create script to design solutions for system tasks

Course Contents:

Theory: Introduction: Operating-System Structure, Operating-System Operations, kernel services, system calls, system boot; Process Management: Process States, Process Scheduling; Process Coordination: Inter process communication, Synchronization, Deadlocks; Memory Management: Memory-Management Strategies, Memory allocation, Segmentation , Paging, Loading , Linking , and libraries, Virtual-Memory Management; Storage Management: File System, Implementing File Systems, Secondary-Storage Structure, I/0 Systems; Protection And Security: System Protection, System Security; System programming in the UNIX environment: Review of C Programming, C shell command language, System calls for process management, File access, and Network system calls, RPC, Threading, and Program development.
Practical: Implementation of inter process communication using C and Shell scripting.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings :

- Stallings. & William. (2014) *Operating systems internals and design principles.* 8^{th} Ed.
- Abraham Silber schatz., Peter Baer Galvin. & Greg Gagne. (2012) *Operating System Concepts.* 9^{th} Ed.
- Andrew, S. Tanenbaum. (2014) *Modern Operating Systems.* 4^{th} Ed.
- Richard, W. Stevens. & Stephen, A. Rago. (2013) *Advanced Programming in the UNIX Environment.* 3^{rd} Ed.

Course Title	Electronics and Digital Circuit Designs		
Course Code	TICT1243		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge and skills on operations and hands on practice in solid state electronics, devices and digital components.

Intended Learning Outcomes:

- define the role of semiconductor in electronic devices
- explain the use of different electronic components and their functions
- develop analytical capabilities for simple circuits
- outline the basic functions of operational amplifier
- build simple electronic circuit
- create programming for electronic devices

Course Contents:

Theory: Introduction to electronics and electronic systems, Alternating and direct current and measurements, Semiconductor and devices, diodes, Transistors, BJT, FET, MOSFET, Rectifier and Filters, Transistor biasing. Small signal transistor amplifiers, Operational amplifiers, Feedback and Oscillators, Analog to Digital and vice versa conversion, Digital circuit and combinational logic, Sequential logic and flip flops, ADC & DAC, Data and Memory systems, Programmable Logic Devices (PLD), microprocessors, radio & TV broadcasting, fibre optics & networking, Case studies.
Practical: Implementation of electronic designs covered in the theory using electronic equipment.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

- Anant Agarwal. & Jeffrey, H. Lang. (2005) *Foundations of Analog and Digital Electronic Circuits.*
- J. C. N. Rajendra. (2008) *Fundamentals of Electronics.*
- Anil, K. Maini. (2007) *Digital Electronics Principles, Devices and Applications.*

Course Title	Computational Engineering Drawing		
Course Code	TICT1252		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To provide knowledge to design and analyse the engineering drawing in computer-based application.

Intended Learning Outcomes:
- explain standard drafting principles and theory of projection
- identify underlying techniques behind engineering graphics
- design mechanical, architectural, and household wiring drawings at designated scales
- construct objects freehand in 3-D
- create drawings using Computer Aided Drawing (CAD) software package

Course Contents:

Theory: Introduction to engineering drawing, Orthographic projection, Fundamentals of mechanical drawing, architectural drawing, graphics for engineering, sketching. **Practical:** Implementation of drawing applications covered in the theory using AutoCAD.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training. practical demonstration & training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:

- James, H. Earle. (2007) *Engineering Design Graphics with AutoCAD.* 12^{th} Ed, Prentice Hall.
- Frederick, E. Giesecke. (2016) *Technical Drawing with Engineering Graphics.* 15^{th} Ed. Peachpit Press.
- David A. Madsen & David A. Madsen (2016) *Engineering Drawing and Design.* 6^{th} Ed. Delmar Cengage Learning

Course Title	IT Law		
Course Code	TICT1261		
Credits	1:1/0	Theory	15 hours

Course Objectives: To familiarize the information technology laws and policies.

Intended Learning Outcomes:
- define the importance of IT legal aspects
- identify IT related acts
- explain the policies and privacy related to IT and computing
- examine the IT legal issues
- apply the legal and ethical framework for IT related projects

Course Contents: Introduction to Sri Lankan Law, ICT and IT policies, ICT act, Computer crime and legal aspects, Digital Violence and electronic transaction act, e laws, copyright and intellectual property rights, payment device frauds. Surveillance and social control, technology transfer, information privacy, Law of robotics, international and European media law, Cyberspace, Cyber-law.law.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:
- Ian Lioyd. (2014) *Information Technology Law.* 7^{th} Ed. Oxford University Press.
- Diane Rowland. (2016) *Information Technology Law.* 5^{th} Ed, Routledge.

Course Title	Social Harmony and Active Citizenship		
Course Code	AUX1212		
Credits	2:2/0	Theory	30 hours

Course Objectives: To impart basic knowledge in Sri Lankan history and natural resources, social concepts, human rights and the importance of social harmony in a multicultural and multi-ethnic society.

Intended Learning Outcomes:

- outline the relationship among the past, present, and the future trends of Sri Lankan lifestyle
- define peace building processes in terms of cultivation of peace culture
- explain the need for the harmony among different ethnic groups for the sustainable development in the country
- create links between classroom participation and community and citizenship knowledge and skills
- develop motivation to work with the community with understanding

Course Contents: Identification of issues relating to Social disharmony: Discrimination, deprivation, Social injustice, Racism, Gender discrimination, Religious fundamentalism; Historical background to social disharmony in Sri Lanka: Denial of equal rights in language, employment, education, and economic development of the regions etc., lack of mutual understanding, criminalization of politics and politicization of social issues; Steps to peace building: Mutual understanding, progressive positive negotiations, dialogue instead of debate, sustainable peace process, participation of the grass root level society in the peace process, cultivating a "Culture of peace", reconciliation, conflict management; Activity based session to enhance and build social harmony; At the political level: Political reform and devolution of powers, good governance, cultivating a sound political culture, cohabitation among political parties and forces, effectively handling pressure groups, inclusive approach than an exclusive one; Natural Resources of Sri Lanka: Land, aquatic-coastal and marine resources, inland aquatic resources, Renewable and Non-renewable resources.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

- Carol Packham. (2008) *Active Citizenship and Community Learning.*
- Arulpragasam, K. D., (2003) *Natural Resource of Sri Lanka. Colombo: National Science Foundation.*
- Bush, K., (2003). *The Intra Group Dimensions of Ethnic Conflict in Sri Lanka.*
- Winslow, D., Michael, D. W., (2004) *Economy Culture and Civil Was in Sri Lanka.*

B.

Detailed Syllabus

Bachelor of Information Communication Technology Honours

Level 2

Course Title	Data Structures and Algorithms		
Course Code	TICT2113		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To excel the knowledge of data representation and structure for develop an efficient program.

Intended Learning Outcomes:

- define data structures with basic operations
- discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing
- apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures
- identify different data structures for sorting techniques
- improve the efficiency of programming using Tree and Graph data structures
- solve problems computationally through the application of fundamental data structures and algorithms

Course Contents:

Theory: Mathematics Foundation: Growth of functions, recurrences, time and space complexity; Basic data structures and algorithms: Array, Linked List, Stack, Queue, Trees, Hashing, Graphs, Divide and Conquer, Sorting and Searching algorithms; Advanced data structures and algorithms: Balanced tree, Heap, priority queue, sorting in linear time; **Practical:** Implementation of the concepts covered in theory using high level languages.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Michael, T., Goodrich & Roberto Tamassia. (2011) *Data Structures & Algorithms in Java.* 5^{th} Ed.
2. Sartaj Sahni. (2000) *Data Structures, Algorithms, and Applications in Java.*
3. Elliot B. Koffman,& Paul A. T. Wolfgang. (2015) *Data Structures: Abstraction and Design Using Java*, 3^{rd} Ed.

Course Title	Statistics for Technology		
Course Code	TICT2122		
Credits	2:2/0	Theory	30 hours

Course Objectives: To familiarize the concepts of summarizing, interpreting and presenting statistical information, probability reasoning and present basic probability theory applicable for ICT tools.

Intended Learning Outcomes:

- model given data graphically and compute descriptive statistics
- solve measures of location and measures of dispersion – grouped and ungrouped data cases
- apply basic principles of probability theory
- apply the binomial theorem to independent events and Baye's theorem to dependent events
- outline random variable and probability distributions

Course Contents:

Introduction to Statistics: Population and sample, parameters and statistics, Graphical statistic, Summary Statistics, Measures of central tendency and dispersion; Skewness and Kurtosis; Probability: Sample space, events, Probability Rules of Probability Equally likely outcomes, probability rules, independence, Conditional Probability, Law of Total Probability, Baye's Rule; Random Variables: Distribution of a random variables, Expectation and variance, Covariance and Correlation, Discrete Distributions: The Binomial Distribution, Normal Distribution; Continuous Distributions: Probability density Distribution, Uniform Distribution, Exponential Distribution; Simple Linear Regression; Hypothesis Testing.sis.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. David Freedman, Robert Pisani, Roger Purves. (2007) *Statistics* 4^{th} Ed.
2. Robert B. Ash. (2008) *Basic Probability Theory.* Dover Ed.
3. Hwei, P. Hsu. (1997) *Schaum's Outline of Theory and Problems of Probability, Random Variables, and Random Processes.*
4. Sheldon Ross. *First Course in Probability.* 7th Ed.

Course Title	Advanced Computer Programming		
Course Code	TICT2134		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To provide knowledge to design and build robust, data-driven Windows-based applications using the .Net framework.

Intended Learning Outcomes:

- create robust applications using Java class libraries
- develop an efficient C# application based on an object-oriented design
- construct a user friendly GUI using visual components
- build feature-rich Windows-based applications
- utilize multi-threaded Java applications for concurrent programming
- design dynamic link libraries for generic applications

Course Contents:

Theory: Advanced Input Output: Accessing Files and Directories, Writing Files, Reading Files, Serializing Objects; Threads: Non-Threaded Applications, Threaded Applications, Creating Threads, Thread States, Thread Synchronization and Concurrency; Introduction to windows Programming: MDI applications, Help providers, Error providers; Programming Based on Events: Delegates, Events handling in C#, ListBox Control Objects, Combo Box Control Objects, MenuStrip Control Objects, CheckBox and RadioButton Objects; Advanced Object Oriented Programming Features: Indexers, Partial Classes, Interfaces, Generics, Dll files; Manipulating Data: ADO.NET Entity Framework, LINQ.

Practical: Implementing simple visual application with interactive and appropriate visual components using Visual Development Tools

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training, mini-group project.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:

1. John Wiley. & Ivor Hortons. (2011) *Beginning Java.* 7^{th} Ed.
2. Daniel, Y. Liang. (2015) *Introduction to java programming comprehensive version.* 10^{th} Ed.
3. Andrew Troelsen. (2010) *Pro C# 2010 and the .NET 4 Platform.* 5^{th} Ed.
4. Barbara Doyle. (2011) *C# Programming: From Problem Analysis to Program Design.* 3^{rd} Ed.

Course Title	Multimedia Design and Technologies		
Course Code	TICT2142		
Credits	2:2/0	Theory	30 hours

Course Objectives: To understand knowledge on efficient data representation, storage and way embedding the multimedia contents in the web page.

Intended Learning Outcomes:

- define characteristics of various multimedia techniques
- compare the various multimedia tools
- illustrate the colour palettes, streaming formats, and CODECs
- distinguish media file formats including lossy vs. lossless
- apply various compression techniques for video and audio such as MP3, MP4, JPEG, and DVD technology

Course Contents:

Multimedia Applications, An Introduction to Multimedia, Data Compression: Basic data compression techniques, Graphic compression, Audio compression, Video compression, Media Composition: Text and Graphic editors, Sound editors, Video editors; Media Entertainment: Virtual reality, Interactive audio, Interactive video; file types, their features and usage, Authoring multimedia, multimedia on the Internet, Emerging trend and future, Social and Legal issues; Multimedia System: Multimedia hardware, Multimedia System architecture; Digital Media: Digital libraries, Media formats, Capture, authoring and production tools, Streaming media.

Teaching and Learning Methods: Class room Lectures, Laboratory session, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Evangeline, D. & Anitha, S. (2016) *Computer Graphics And Multimedia Insights, Mathematical Models And Programming Paradigms.*
2. Tay Vaughan, (2014) *Multimedia: Making It Work.* 9^{th} Ed.
3. Mark J. Guzdial and Barbara Ericson.(2006) *Introduction to Computing and Programming with Java: A Multimedia Approach.*

Course Title	Human Computer Interaction		
Course Code	TICT2153		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge on various design techniques to develop application system with user friendly interactive components.

Intended Learning Outcomes:

- define typical human-computer interaction (HCI) models and styles
- explain an interactive universal design principle for HCI
- analyse the requirements of HCI systems
- discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design
- test a variety of simple methods for evaluating the quality of a user interface
- build interactive system using HCI techniques

Course Contents:

Theory: Foundations of Human-Computer Interaction: The human factor, The computer, The interaction elements, Paradigms; Design Process: Interaction design process, HCI in software process, Design rules, Evaluation techniques, Universal design, User support; Models and theories: Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration Models, Task analysis, Dialog notations and design, Models of the system, Modelling rich interaction; Groupware, Ubiquitous Computing, Virtual and Augmented Reality, Hypertext and Multimedia: Groupware and Computer-supported Collaborative Work, Ubiquitous Computing, Hypertext, Multimedia and the World Wide Web;

Practical: Implementation of HCI concepts taught in the theory

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Alan Dix., Janet Finlay., Gregory D. Abowd. & Russell Beale. (2004) *Human computer interaction.* 3^{rd} Ed.
2. Preece, J., Rogers, Y. & Sharp, H. (2015) *Interaction design: Beyond human-computer interaction.* 4^{th} Ed.
3. Solis (2016) *Tech, Human-Computer Interaction: The Fundamentals Made Easy.*

Course Title	English Language II		
Course Code	AUX2113		
Credits	3:3/0	Theory	45 hours

Course Objectives : To provide necessary language skills to read, write, listen and speak in English in formal and informal academic and professional contexts.

Intended Learning Outcomes:

- explain the advanced knowledge on the use of the four skills - speaking, listening, reading and writing
- identify the semantic and pragmatic forms and meanings for diverse application
- demonstrate efficiency and effectiveness in both receptive and expressive skills
- create distinct style and rhetoric orally, aurally, graphically, and grammatically

Course Contents:

At the advanced level, Exposure to the significant structures for developing the advanced language skills through integration with communicative competence at a higher level, Advanced reading skills: Reading for details, contextual understanding, Intensive reading, Making inference, Summarizing, Advanced writing skills: application of advanced structures and grammatical items - phrases and clauses, sentences and paragraphs, texts and discourses, Controlled writing - Transforming visual, oral and aural information into writing, Communicating in writing - writing notes, memos, personal/o?cial letters, report writing, Advanced Listening: Listening for speci?c information, for gist of the passages, for comprehension, for making inferences, note taking, and reproducing. Advanced Speaking: describing people/events/pictures, asking for information, giving directions/instructions, making requests/complains, using model dialogues/improvisations/reading to stimulate conversations and small group discussion. Project: Writing essays.

Teaching and Learning Methods: Class room lectures, self-learning, computer assisted language learning, individual and group discussion and presentation.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Miles Craven., Craig Thaine. & Sally Logan. *Cambridge English Skills: reading, Writing, listening and speaking from Elementary Advanced.*
2. Martin Hewings. (2005) *Advanced English Grammar.* Cambridge University Press.
3. Gill, R. (2006) *Mastering English Literature.* 3^{rd} Ed.
4. Eric Glendinning, Lewis Lansford, (2013) *Oxford English for Careers Technology for Engineering and Applied Sciences: Student Book.*

Course Title	Operational Research		
Course Code	TICT2212		
Credits	2:2/0	Theory	30 hours

Course Objectives : To familiarize the advanced mathematical concepts to develop analytical thinking to optimize real world problems.

Intended Learning Outcomes:
- identify operational research concepts
- develop operational research models from the verbal description of the real system
- design new simple models to improve decision making
- apply sensitivity analysis to determine the optimal solution as the data change
- built transportation and assignment models

Course Contents: ntroduction: The Main Elements of Operations Research; Overview of the Operations Research Modelling Approach: Formulating a Mathematical Model; Introduction to Linear Programming: Solving Linear Programming Problems: The Simplex Method, The Theory of the Simplex Method, Duality Theory and Sensitivity Analysis, Other Algorithms for Linear Programming, The Transportation and Assignment Problems; Network Optimization Models; Project Management with PERT/CPM.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Frederick, S. Hillier. & Gerald, J. Lieberman. (2001) *Introduction to Operations Research.* 7^{th} Ed.
2. Panneerselvam, R. (2009) *Operations Research.* 2^{nd} Ed.
3. Eiselt, H. A. & Sandblom, C. L. (2010) *Operations Research A Model-Based Approach.*

Course Title	Introduction to Computer Network		
Course Code	TICT2222		
Credits	2:2/0	Theory	30 hours

Course Objectives: To impart knowledge on the data communication between computers, its associated technologies and hardware components.

Intended Learning Outcomes:
- explain the importance of data communications
- identify the different internetworking devices
- discuss the structure of a protocol model
- compare the data transmission modes
- analyse the requirements for a given organizational structure
- select the most appropriate networking architecture and technologies for an organization

Course Contents: Introduction: Data Communications, Networks, The Internet, Protocols And Standards, Network Hardware, Network Software; Reference Models: OSI Reference Model, TCP/IP Reference Model; Data and Signals: Analog And Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance; Digital Transmission: Digital-To-Digital Conversion, Analog-To-Digital Conversion, Transmission Modes; Analog Transmission: Digital-To-Analog Conversion, Analog-To-Analog Conversion; Physical Layer: Theoretical Basis for Data Communication, Guide Transmission Media, Wireless Transmission, Communication Satellites; Digital Modulation and Multiplexing: Frequency Division and Time Division Multiplexing; The Public Switched Telephone Network: Trunks, Multiplexing, Circuit Switching, Packet Switching; Data Link Layer: Framing, Error Control, Flow Control; Error Detection and Correction: Block Coding, Cyclic Codes, Checksum; Application Layer: DNS, Electronic Mail, World Wide Web, Streaming Audio and Video.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Andrew, S. Tanenbaum. & David, J. Wetherall. (2011) *Computer Networks*. 5^{th} Ed.
2. William Stallings. (2014) *Data and Computer Communications*. 10^{th} Ed.
3. Behrouz, A. Forouzan. (2007) *Data Communications and Networking*. 4^{th} Ed. McGraw-Hill Professional.

Course Title	Database Management Systems		
Course Code	TICT2233		
Creditsl	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge and skills to design database and manipulate data using SQL commands

Intended Learning Outcomes:
- define databases and its organizations
- apply appropriate normalization techniques for data analysis and design a database
- determine database requirements for the system implementation
- identify and assign the security facilities in MySQL
- explain the concept of B+ trees, indexes, and hash tables
- utilize SQL commands for data manipulations

Course Contents:
Theory: Introduction to Database system; Information systems: Analysis of data, forms and sources, Data Organization Architecture: Data Modelling: ER & EER, Relational Data Model, Data Definition and Data Manipulation Language; Relational Algebra & Calculus; Normalization and Relational Database Design: 1NF,2NF,3NF,BCNF,4NF and 5NF; Database Security: Access Privileges, Multilevel Security, and Statistical Database Security; Storage and File Structures: RAID, File Organization, Data-Dictionary Storage, Database Buffer; Indexing and Hashing: Ordered Indices, B+ Tree Index Files, B+ Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing; Query Processing.
Practical: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Teaching and Learning Methods: Classroom Lectures, self learning & discussion, computer practical demonstration & training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Carlos Coronel., Steven Morris. & Peter Rob. (2011) *Database Systems: Design, Implementation, and Management.* 9^{th} Ed.
2. Ramezelmasri. & Shamkant, B. Navathe. (2016) *Fundamentals of Database Systems.* 7^{th} Ed.
3. Thomas, M. Connolly. & Carolyn, E. Begg. (2005) *Database Systems a Practical Approach to Design, Implementation, and Management.* 4^{th} Ed.
4. Robert Sheldon. & Geoff Moes. (2005) *Beginning MySQL.*

Course Title	Computer Graphics		
Course Code	TICT2244		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To familiarize the core concepts of computer graphics by implementing graphics concepts through programming languages.

Intended Learning Outcomes:
- define the basic principles of computer graphics
- explain the representation of computer graphics objects
- demonstrate Two-Dimensional and Three-Dimensional transformations
- apply graphics programming techniques to design and create computer graphics scenes
- utilize filling algorithms to colour graphical objects
- develop programs using appropriate languages

Course Contents:
Theory: Introduction to Computer Graphics: Graphics devices; Raster Graphics Algorithms for Drawing 2-D Primitives: Line-drawing algorithms, Circle-generating algorithms; Area Filling: Filling Algorithms; 2-D Geometric Transformation: Translation, Scaling, Rotation, Composite transformation; 2-D Viewing and Clipping, 3-D Geometric Transformation, 3-D Viewing and Projection.
Practical: Implementation of the concepts covered in theory using appropriate languages.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:
1. Peter Shirely. & Steve Marschner. (2009), *Fundamentals of Computer Graphics.* 3^{rd} Ed.
2. Frank Klawonn. (2008) *Introduction to Computer Graphics using Java 2D and 3D.*
3. Donald Hearn. (2010) *Computer Graphics with open GL.* 4^{th} Ed.

Course Title	System Analysis and Design		
Course Code	TICT2252		
Credits	2:2/0	Theory	30 hours

Course Objectives: To develop the knowledge to apply basic Object Oriented Analysis and Design techniques for a software engineering process.

Intended Learning Outcomes:
- apply the knowledge of object oriented modelling in software development
- formulate object oriented model for real world problem
- construct the use case diagram based on the requirements
- model system functionality using UML sequence and collaboration diagrams.
- apply mapping rules in class diagram

Course Contents: Introduction to the Objects Approach in Software: Principles and Characteristics of the Object Approach, Terms in OOP; The Object Model and the Class Diagram: Objects, Classes, Attributes, relationships; Object Oriented Methodologies and the UML:UML, Structure diagram, Behaviour Diagram; Object Oriented Analysis with use cases: Use Case; Mapping Entity Relationship Diagrams to Class Diagrams: Entity Relationship Diagram, Mapping rules; Mapping Class Diagrams and Relational Schemas: Relational Schema, Mapping Rules; Quality and Testing.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Peretz Shoval. (2007) *Functional and Object Oriented Analysis and Design: An Integrated Methodology.*
2. Sarnath Ramnath. & Brahma Dathan. (2011) *Object-Oriented Analysis and Design.*
3. ThomasWa, C. (2010) *An Introduction to Object-Oriented Programming with JAVA.* 5^{th} Ed.

Course Title	Accounting for Technology		
Course Code	TICT2263		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide a comprehensive theoretical and practical knowledge in the application of selected accounting software in business data processing.

Intended Learning Outcomes:
- explain the meaning and purpose of accounting
- measure the financial performance and position of an enterprise
- analyse the feasibility of the ICT concepts for accounting
- construct the manual accounts towards computer based
- create a company using the selected software
- demonstrate a variety of transactions using computer application
- apply the selected accounting software to produce reports for the end users

Course Contents:
Theory: Accounting and the business environment, objectives of the financial statements, elements of financial statements, the conceptual framework for accounting, financial statement analysis, external environmental factors influencing accounting, users of financial statements, accounting as the language of business, accounting as an information system, and the REA data model. Introduction to Computerized Accounting, introduction to the selected accounting package, features of the selected accounting software, creating a company, setting-up general ledger, setting-up customer and supplier records, sales order processing, purchase order processing, entering inventory transactions, and running various reports.
Practical: Lab session using the selected computerized accounting software.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Kemp, R. and Waybright, J. (2017) *Financial Accounting*, 5^{th} Ed., Pearson.
2. Tracie, L.M., Brenda, L.M. and Ella, M.M. (2017) *Horngren's Accounting*, 12^{th} Ed., Pearson.
3. Marshall, B.R. and Paul, J.S. (2017) *Accounting Information Systems*, 14^{th} Ed., Pearson.
4. Asok, K.N. (2018) *Tally ERP 9 Training Guide*, 4^{th} Ed., BPB Publication

Course Title	Communication and Soft Skills		
Course Code	AUX2212		
Credits	2:2/0	Theory	30 hours

Course Objectives: To provide knowledge to excel in communication and soft skills for productivity and personality development.

Intended Learning Outcomes:
- explain the necessary knowledge and skills required for efficient and effective communication
- identify the knowledge and skills for personality development
- find problems and challenges to overcome barriers to communication and soft skills
- apply the knowledge and skills for solving the problems and challenges
- improve excellence in communication using critical and creative skills

Course Contents:
Introduction: Introduction to Communication and soft skills, the patterns and the process, Downward and Upward communication, Horizontal and vertical communication, One-way and two-way communication, Multi-directional communication, Communications for Management, efficiency and effectiveness in communication, Forms: Oral and written communication, Verbal and non-verbal communication, Para-language Code, Signals, Symbols, Icons, Gestures, Active Listening and Speaking, Writing for your people, Publishing and Editing. Levels: Inter personal communication, Public communication. Planning and Organization of communication: Establishment of objectives, Information search, identification, collection, organization and presentation, Analytical skills, Resource allocation, Delegation, Timing, Coordination. Motivation: Instrumental and inspirational, internal and external. Motivational Communication: Instructions, Reporting & Recommendations, Performance Appraisal and Styles of Control. Staffing: Interview Techniques, Communication in Training & Development, Feedback, and Industrial Relations. Leadership: Supportive Leadership, Directive leadership, Achievement Oriented leadership and Participative leadership. Public Relations & Marketing Communication: Negotiating and conflict resolution skills: Opening the process, Negotiations types, Conduct of Negotiation and problem solving skills, balancing personal and professional life, Communication during Negotiations, Bargaining, Teamwork, flexibility and adaptation, and time management, decisiveness, responsibility and accountability.

Teaching and Learning Methods: Class room lectures, self-learning and discussion, individual and group presentation, field visit and project assignment and reporting.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Tara Dixon., & Martin O'hara. (2010) *Communication Skills*, University of Ulster.
2. Helio Fred Garcia. (2012) *The Power of Communication: Skills to Build Trust, Inspire Loyalty, and Lead Effectively.*
3. Ellis, R. (2002) *Communication Skills: Stepladders to success for the Professional.*
4. Barun, K. Mitra. (2011) *Personality Development and Soft Skills.*

C.

Detailed Syllabus

Bachelor of Information Communication Technology Honours

Level 3

Course Title	Computer Architecture and Organization		
Course Code	TICT3113		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To impart knowledge on improving the hardware components performance with low-level coding.

Intended Learning Outcomes:
- explain the integrated function of computer hardware components
- demonstrate programming ability using low-level language
- discuss the involvement of the processor and memory during the instruction execution
- outline the storage organization to improve the data transfer rate
- analyse the methods implemented to improve the instructions execution rate
- examine the organization of major components in various processors

Course Contents:
Theory: Introduction to the performance of computers, internal structure of the processor, hardware interconnections and functions, interrupt mechanism, cache memory organization, secondary storages (RAID), Functions of I/O ports, types of Instruction & its formats, addressing schemes, microprogramming, pipelining execution, organization of Pentium processor, Assembly language programming.
Practical: Implementation of hardware component concepts taught in the theory using assembly.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:
1. William Stallings. (2012) *Computer Organization and Architecture.* 8^{th} Ed.
2. John, L. Hennessy. (2017) *Computer Architecture: A Quantitative Approach.* t^{th} Ed.
3. Barry, B. Brey. (2008) *Intel microprocessors.* 8^{th} Ed.

Course Title	Advanced Database Management Systems		
Course Code	TICT3123		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To excel the advanced database management concepts used in various types of organizational databases.

Intended Learning Outcomes:
- define the principles of query optimization to a database schema
- formulate a transaction management strategy for a database
- design a distributed database for a network environment
- apply concurrency control and recovery mechanism for transaction management
- build queries in MySQL with satisfaction of enterprise rules
- create programs to connect a database embedded in high-level programming languages

Course Contents:
Theory: Advanced data representation models: EER & Object Oriented data model, ODMG standard, NIAM, GOOD, ORM; Storage and File Structures; Database Buffer; Indexing and Hashing; Multiple-Key Access, Static Hashing, Dynamic Hashing; Query Processing & Optimization: Semantic Query Optimization; Database Transactions and Recovery Procedures: Transaction Processing Concepts; Database Security: Access Privileges, Multilevel Security, And Statistical Database Security; Distributed Databases: Reliability and Commit protocols, Fragmentation and Distribution, View Integration, Distributed database design, Distributed algorithms for data management, Heterogeneous and Federated Database Systems; Deductive Databases: Recursive Queries, Prolog / Datalog Notation, Basic inference Mechanism for Logic Programs, Deductive Database Systems, Deductive Object Oriented Database Systems; Data Warehousing and Data Mining: Decision-Support Systems, Data Warehousing, Data Mining, Association Rules, Clustering;
Practical: Implementation of Advanced Database concepts, connectivity and queries using SQL.

Teaching and Learning Methods: Class room lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Abraham Silberschatz., Henry F. Korth. & Sudarshan, S. (2011) *Database System Concepts.* 6^{th} Ed.
2. Ramez elmasri. & Shamkant B.Navathe. (2016) *Fundamentals of Database Systems.* 7^{th} Ed.
3. Carlos Coronal & Steven Morris. (2018) *Database Systems: Design, Implementation, and Management.* 13^{th} Ed.

Course Title	Advanced Web Technologies		
Course Code	TICT3132		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To develop knowledge to build websites with components by understanding the advanced web programming concepts and techniques.

Intended Learning Outcomes:
- define client-server technology in web programming
- identify the framework for dynamic web application
- build multi-tier web applications
- develop authentication models with security concepts
- utilize database connectivity for web applications
- apply the concept of Model View Controller(MVC)

Course Contents:
Theory: Introduction to Client Server Concepts, Multi-tier Applications, Server-side Scripting, Web Forms, Sessions and Cookies, Error Handling and Debugging, Dynamic Web-page Design, Responsive Web Design, Bootstrap, Web Development Cycle, Embedding Multimedia, Secure Socket Layer and Web Security, Content Management System, Database Connectivity, Model View Controller, Web Services, Current trends in Web Development Technologies.
Practical: Developing websites with various components taught in the theory using advanced web programming techniques.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:

1. Simon Stobart. & David Parsons. (2008) *Dynamic Web Application Development Using PHP and MySQL*. 1^{st} Ed.
2. Fernando Monteiro. (2014) *Learning Single-page Web Application Development*.
3. Larry Ullman. (2018) *PHP and MySQL for Dynamic Web Sites: Visual Quick Pro Guide*. 5^{th} Ed. Peachpit.

Course Title	Social and Professional Issues in IT		
Course Code	TICT3142		
Credits	2:2/0	Theory	30 hours

Course Objectives : To excel the concepts on personal and organizational ethics and privacy issues associated with the application of IT.

Intended Learning Outcomes:
- identify the IT professional's responsibility in different contexts
- define professional, ethical and privacy issues and responsibilities
- analyse social and legal issues related to software
- evaluate teamwork concepts and issues
- discuss the appropriate use of relevant codes, standards and licenses

Course Contents: Introduction to Ethics, ethics of IT professionals, internet crime, privacy, IT and life, Intellectual property, Ethics of organization.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. George Reynolds. (2014) *Ethics in Information Technology.* 5^{th} Ed.
2. William John Brinkman. (2012) *Ethics in a Computing Culture.* 1^{st} Ed.
3. Joseph Migga Kizza. (2016) *Ethics in Computing: A Concise Module (Undergraduate Topics in Computer Science).*

Course Title	Software Engineering		
Course Code	TICT3153		
Credits	3:3/0	Theory	45 hours

Course Objectives: To provide knowledge on software development process for various software system.

Intended Learning Outcomes:
- explain step by step software development process
- compare the various software development process model
- develop diagrammatic representations of software requirements
- identify the software requirements specification of an organization
- evaluate the usability of the developed software
- demonstrate the Agile development process

Course Contents:
Introduction: Software processes, Software Life Cycle Models; System modelling: Context models, Interaction models, Structural models, Behavioural models, Model-driven engineering; Architectural design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures; Design and implementation: Design patterns, Implementation issues, Open source development; Objects: Models, Cohesion, Coupling Data Encapsulation; Object-Oriented Analysis: Use-Case modelling, Class Modelling, Dynamic Modelling; Software testing: Development testing, Test-driven development, Release testing, User testing; Software evolution: Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management; Agile Software Development and Engineering Introduction: Defining programming best practices, Transitioning to Agile Development processes; Managing Agile Projects: Gathering software requirements, Planning Agile Projects, Reporting Team Progress; Agile development using XP, Values and Principles; Agile development using Scrum: Scrum Introduction, Prioritizing, Estimating, and Planning; Optimizing Productivity of Agile Teams.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, mini-group project.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:
1. Roger S. Pressman. (2014) *Software Engineering: A Practitioner's Approach*, 8^{th} Ed.
2. Andrew Stellman. & Jennifer Greene. (2014) *Learning Agile*.
3. Ian Sommerville. (2015) *Software Engineering*. 10^{th} Ed.

Course Title	Information Security		
Course Code	TICT3162		
Credits	2:2/0	Theory	30 hours

Course Objectives: To familiarize the information security mechanisms in the various fields of IT.

Intended Learning Outcomes:
- identify appropriate security mechanism for various network architecture
- apply security principles to system design
- utilize the message authentication techniques in information transmission
- discuss the functions of various security methods used in the field of IT
- analyse the security schemes for network and mobile computing
- explain the web based security mechanism of scripting language

Course Contents:
Introduction to information system security :Trends, Attacks, Services, Mechanisms, The OSI Security Architecture, A Model for Network Security; Symmetric Ciphers: Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard, Confidentiality Using Symmetric Encryption; Asymmetric Ciphers: Public-Key Cryptography and RSA; Cryptographic Data Integrity Algorithms: Cryptographic Hash Functions, Message Authentication Codes, Digital Signatures; Mutual Trust: Key Management and Distribution, User Authentication Protocols; Network And Internet Security: Transport-Level Security, Wireless Network Security, Electronic Mail Security, IP Security, Web Security; System Security: Intruders, Malicious Software, Firewalls; Secure Data Transmission: Digital Steganography, Digital watermarking and Fingerprinting.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Chuck Easttom. (2017) *System Forensics, Investigation and Response.*3^{rd} Ed.
2. William Stallings. (2013) *Cryptography and Network Security, Principles and Practice.* 5^{th} Ed. Pearson.
3. David Kim. & Michael, G. Solomon. (2018) *Fundamentals of Information Systems Security.* 3^{rd} Ed.

Course Title	Career Guidance		
Course Code	AUX3112		
Credits	2:2/0	Theory	30 hours

Course Objectives: To introduce knowledge on overall view of the career perspective and guidance.

Intended Learning Outcomes:
- develop attitudes of the outside world of work
- discuss the use of technology in career development
- build better public relations for career advancement
- find their career options and goals
- apply their soft and survival skills in career development
- identify expectation of private employers
- select suitable carrier opportunity by analysing job banks and databases.
- create effective resume

Course Contents:
The world of work: Unemployment in Sri Lanka, Recent demographic, Economic and social changes of Sri Lanka and how they affect the graduate labour market; The private sector culture - emphasis on attitudes The role of scientists in various employment sectors. The expectations of private sector employer from new graduate employees. Career guidance Employment search; Image Projection: Social graces, Public relations, Career development and survival skills of young graduates, Personality development, Leadership, Team work, Human relations, effective communication, Problem solving, Stress management; Presentation Techniques: The bio-data, Facing interviews, assertiveness.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Seamus Whitney & Suzanne Power, (2017) *Guide Your Career.*
2. Brian McIvor. (2009) *Career detection: Finding and managing your career.*
3. Niles, S. & Harris-Bowlsbey, J. (2005) *Career development interventions in the 21st century*, 2^{nd} Ed.

Course Title	Advanced Computer Networks and Administration		
Course Code	TICT3214		
Credits	4:2/2	Theory	30 hours
		Practical	60 hours

Course Objectives: To excel knowledge on advanced functionalities, techniques, and protocols used in the computer networks.

Intended Learning Outcomes:
- define the concepts of Internetworking
- demonstrate the principles and functionality of Cisco IOS
- identify the need for services integrated with the switches
- explain the relevant issues and techniques of network management solutions
- apply the routing protocol with the network testing
- develop the simulation-based implementation on VLAN techniques

Course Contents:
Theory: Connection oriented networks, Internetworking, Traffic engineering, High speed LAN, FDDI, Operating Cisco IOS, Configuring a router, Discovering and Connecting to Neighbours, Getting Information about Remote Devices, Managing the Cisco Router File System, Routing Protocols, TCP/IP Suite Error and Control Messages, Network Testing, Overview of Transport Layer Ports, Switching Concepts, Switch Operation and configuration, Spanning Tree Protocol, VLANs Configuration and Troubleshooting, introduction to wireless communication, Network management system.
Practical: Implementation of network infrastructure taught in the theory using routing and switching techniques.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 2 \times Practical}{4}$	

Recommended Readings:
1. Larry, L. Peterson. & Bruce, S. Davie. (2011) *Computer Networks: A Systems Approach*. 5^{th} Ed. Morgan Kaufmann.
2. William Stallings, (2014) *Data and Computer Communications*. 10^{th} Ed. Prentice Hall.
3. James, F. Kurose. & Keith, W. Ross. (2017) *Computer Networking: A Top-Down Approach*. 7^{th} Ed. Pearson.

Course Title	IT Project Management		
Course Code	TICT3222		
Credits	2:2/0	Theory	30 hours

Course Objectives: To provide knowledge and skills to develop successful IT related projects.

Intended Learning Outcomes:

- analyse the general issues necessary for the information technology projects
- compare the various management methods between the hierarchy of stakeholders
- discuss the unique attributes, diverse nature, monitoring and controlling processes and, controlling a project
- explain the process for creating a work breakdown structure
- identify the risk factors of an IT Project

Course Contents:

Introduction to Project Management; A Systems View of Project Management; The Context of Information Technology Projects; The Project Management Process; Project Integration Management; Project Scope Management; Project Time Management; Project Cost Management : Estimating Costs, Determining the Budget , Controlling Costs; Project Quality Management : Planning Quality Management , Performing quality assurance, Tools; and Techniques for Quality Control, Improving IT Project Quality; Project Human Resource Management : Keys to Managing People, Developing the Human Resource Plan, Developing the Project Team; Project Communications Management : Keys to Good Communications, Planning Communications Management, Managing Communications, Controlling Communications; Project Risk Management : Planning Risk Management , Common Sources of Risk on IT Projects, Identifying Risks, Performing Qualitative Risk Analysis, Performing Quantitative Risk Analysis, Controlling Risks, Project Reporting.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings :

1. Kathy Schwalbe. (2014) *Information Technology Project Management.* 7^{th} Ed.
2. *A Guide to The Project management Body of Knowledge (PMBOK@ Guide).* 4^{th} Ed.
3. Jack T. Marchewka, (2016) *Information Technology Project Management: Providing Measurable Organizational Value*, 5^{th} Ed.

Course Title	Software Quality Assurance		
Course Code	TICT3232		
Credits	2:2/0	Theory	30 hours

Course Objectives: To impart knowledge and skills involved in software testing and quality assurance

Intended Learning Outcomes:

- define the quality assurance process and its role in software development
- identify various test cases in test management
- compare log and identified defects effectively
- apply the techniques to improve the quality of the software development
- build a software quality plan for a software project to test the progress

Course Contents:

Introduction: The software quality challenge, software quality, Software quality factors, The components of the software quality assurance system; Pre-project software quality components: Contract review, Development and quality plans; SQA components in the project life cycle: Integrating quality activities in the project life cycle, Reviews; Testing: Concept and Definition, Plan and Design, Execution and Reporting; Software quality infrastructure components: Procedures and work instructions, Supporting quality devices, Configuration management; Management components of software quality: Project progress control, Software quality metrics, Costs of software quality; Challenges: Incident Management, Defect Management, Risk Vulnerability and Threat Management; Software Quality Expectation: Information Security, Information Audit, Software Reliability and Process Improvement.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Abu Sayed Mahfuz. (2016) *Software Quality Assurance: Integrating Testing, Security, and Audit.* CRC Press.
2. Nina, S. Godbole. (2016) *Software Quality Assurance: Principles and Practice.*
3. Neil Walkinshaw, (2017) *Software Quality Assurance: Consistency in the Face of Complexity and Change.* Springer.

Course Title	Mobile Computing		
Course Code	TICT3243		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To excel knowledge on mobile communication techniques used in emerging mobile computing devices.

Intended Learning Outcomes:
- define the basic concepts and principles in mobile computing
- compare different mobile communications and architectures
- outline the structure and components for mobility management
- construct content-based application using a mobile computing software framework
- build mobile software application for mobile devices
- develop simulation based experiments in mobile communication scenario

Course Contents:
Theory: Introduction to Mobile Communications and Computing: Wireless Communications, Wireless Networks, GSM, 3G, 4G; Wireless Medium Access Control: Motivation for Specialized MAC, Multiple Access Schemes: FDMA, TDMA, CDMA and SDMA; Wireless Communication Technologies: Cellular networks, Wireless (802.11), TCP/IP in the mobile setting, Geolocation and Global Positioning System (GPS); Mobile Network Layer: Mobile IP and Mobility Management; Mobile Transport Layer: TCP in wireless environments, Snooping TCP, Time-out Freezing; Mobile Ad-hoc Networks (MANETs): Introduction to Ad-hoc Networks, Routing in mobile Ad-hoc networks; Location Management: Location Management, Registration, Area-based Location Management; Protocols and Tools: Wireless Application Protocol, Bluetooth Technology.
Practical: Implementation of mobile communication techniques taught in the theory using mobile simulation tools.

Teaching and Learning Methods: Classroom Lectures, self-learning & discussion, computer practical demonstration & training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:
1. Annabel Z. Dodd. (2012) *The Essential Guide to Telecommunications.* 5^{th} Ed. Prentice Hall.
2. Wei-Meng Lee. (2012) *Beginning Android TM 4 Application Development.*
3. Prasant K. Pattnaik & Rajib Mall. (2015) *Fundamentals of Mobile Computing.* 2^{nd} Ed.

Course Title	Green Computing		
Course Code	TICT3252		
Credits	2:2/0	Theory	30 hours

Course Objectives: To provide knowledge for efficient energy management in information technology and computing with green concepts.

Intended Learning Outcomes:
- define policies of Green computing environment
- explain the benefits of Green Computing
- apply techniques and strategies for green computing
- apply basic audit of equipment usage
- build energy efficient green computing society

Course Contents:
Introduction to green computing, Green IT policies, Green Protocols and Conventions, Energy management in devices and network, smart energy regulated buildings, Monitoring tools, paperless institutions, paperless education or e-Learning , data center cooling recycling, e-waste management

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Toby, J. Velete., Anthony, T. Velete. & Robert Elsenpeter. (2008) *Green IT Reduce Your Information Systems Environmental Impact While Adding to the Bottom Line.* 1^{st} Ed. McGraw-Hill.
2. Marty Poniatowski. (2009) *Foundation of Green IT.* Prentice Hall.
3. Bud, E. Smith. (2013) *Green Computing: Tools and Techniques for Saving Energy, Money, and Resources.* 1^{st} Ed.

Course Title	Distributed Systems		
Course Code	TICT3262		
Credits	2:2/0	Theory	30 hours

Course Objectives: To familiarize the concepts in designing and implementing distributed real-time cloud systems.

Intended Learning Outcomes:

- explain the important concepts of distributed systems
- distinguish synchronization and concurrency control for a parallel and distributed computing systems
- discuss the different communication operations between multiprocessor systems
- outline the systems, protocols and mechanisms to support cloud computing
- design the conceptual model for cloud computing applications

Course Contents:

Introduction to distributed systems, types of distributed systems, system architectures, self-management in distributed systems; processes: threads, virtualization, clients, servers, networking in distributed system; Processor communication: remote procedure call, message-oriented communication, stream-oriented communication, multicast communication, synchronization, consistency and replication, fault tolerance, programming models, distributed file systems and web systems, Security.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Andrew, S., Tannenbaum. & Maarten Van Steen. (2007) *Distributed Systems: Principles and Paradigms*. 2^{nd} Ed. Pearson.
2. George Coulouris., Jean Dollimore., Tim Kindberg. & Gordon Blair. (2011) *Distributed Systems: Concepts and Design*. 5^{th} Ed. Addison Wesley.
3. Randal, E. Bryant. & David, R. O'Hallaron. (2003) *Computer Systems: A Programmer's Perspective*. Prentice Hall.

Course Title	Research Methodology and Scientific Writing		
Course Code	AUX3212		
Credits	2:2/0	Theory	30 hours

Course Objectives: To understand the procedures to involve in an efficient research.

Intended Learning Outcomes:
- discuss the overall process of designing a scientific research
- formulate a research question
- create a research proposal
- define scientific reasoning and problem solving
- analyse the relevant literatures critically
- identify the types of methods best suited for the question
- summarize the research findings and publishing

Course Contents:
Introduction to research, Building blocks of science in research, Various steps in scientific research, Concept of applied and basic research, Quantitative and Qualitative research techniques, Hypothesis development, Review of advantages and disadvantages of various data collection methods and their utility, Stability measures, Statistical techniques, Application of Statistical software package in research, Purpose of the written report, Structure and components of research report, Mechanism of writing a research report.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Kothari, C. R. (2014) *Research Methodology Methods and Techniques*. 3^{rd} Ed. New Age International Publishers.
2. Zobel, J. (2014) *Writing for Computer Science*, 3^{rd} Ed.
3. Peter Pruzan. (2016) *Research Methodology: The Aims, Practices and Ethics of Science*. Springer

Course Title	Fundamentals of Entrepreneurship		
Course Code	AUX3221		
Credits	1:1/0	Theory	15 hours

Course Objectives: To provide knowledge and skills to understand the concept of Entrepreneurship and work with the ICT based organization.

Intended Learning Outcomes:
- analyse the characteristics of entrepreneurs
- identify various challenges of entrepreneurial project
- explain the process of entrepreneurship, and methods to manage the process
- develop an appreciation for opportunity and do the evaluation
- define ways in which entrepreneurship manifests itself

Course Contents:
Introduction; Resource-Based Perspective in the Entrepreneurial: Environment and Entrepreneurship, Entrepreneurial Culture, Enterprising; Process-Oriented Perspective in Entrepreneurship: creativity in Entrepreneurship, Innovation, Opportunity Exploitation, The Start-up stage, Mentorship, Coaching and Counselling, Planning and Managing an Entrepreneurial venture, Marketing, Financing the Entrepreneurial venture; Output-Oriented Perspective in the Entrepreneurial: Evaluating and Measuring the Firm's Success.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion.

Evaluation Methods:	Theory
Formative Assessments: In-course assessment	30%
Summative Evaluation: End semester exam	70%

Recommended Readings:

1. Dafna Kariv. (2011) *Entrepreneurship: An International Introduction.*
2. Robert Hisrich. (2012) *Entrepreneurship.* 9^{th} Ed.
3. Daft, R.L, (2012) *New Era of Management*, 10^{th} Ed.

D.

Detailed Syllabus

Bachelor of Information Communication Technology Honours

Level 4

Course Title	Group Research Project		
Course Code	TICT4116		
Credits	6:0/6	Practical	600 hours

Course Objectives: To impart knowledge to analyse the existing research and propose a suitable methodology to overcome the drawbacks.

Intended Learning Outcomes:

- formulate as team to develop software
- analyse critically existing literatures
- identify the research problem
- determine suitable methodology for the research problem
- apply software engineering models for the development process
- evaluate solution derived using the selected methodology
- create scientific reports
- build presentation in logical manner
- utilize the findings in public domain

Course Contents:

Student should do an individual research project for 6 credits under the guidance and supervision of academic staff holding SLQF qualification of level 10, 11 or 12. of the department. Supervisor should be selected by the student by discussing the research proposal and submit it to the head of the department for the approval after the proposal presentation. At the end of the research, student should submit a report for the evaluation and should do the viva voce presentation. During of the first semester of the Level four students are required to do the following Select the research topic with the guidance of the supervisor Present the proposal for approval Monthly Meeting with Supervisor and Monthly Progress Report The research will be carried out throughout the Level four and it is evaluated at the end of the Level four.

Teaching and Learning Methods: The research methodology & scientific writing covered under the auxiliary course unit AUX3212.

Evaluation Methods:	Final report	40%
	Oral presentation	20%
	Viva-voce	40%

1. Students are required to submit a substantial report for research project.
2. Presentation shall take place after the completion of the research project.
3. The presentation evaluation is done by a panel.
4. Report should be submitted during presentation.
5. The report evaluation is done by the Academic Supervisor.
6. A Viva-voce comprising comprehensive questions based on the presentation and research project undergone will be put forth after the presentation.
7. Refer evaluation section.

Note: *Any special circumstances are decided by the department and implemented with the approval of the Faculty Board of Faculty of Technological Studies*

Recommended Readings:

1. *Guidelines for Research Project* - Department of Information and Communication Technology, University of Vavuniya.
2. Michael Alley. (2009) *The Craft of Scientific Writing*. 3^{rd} Ed. Springer.
3. Wayne, C. Booth., Gregory, G. Colomb. & Joseph, M. Williams. (2008) *The Craft of Research*. 3^{rd} Ed.
4. Zobel, J. (2007) *writing for computer science*, Springer.

Course Title	Industrial Training		
Course Code	TICT4126		
Credits	6:0/6	Practical	600 hours

Course Objectives: To excel knowledge and skills by experiencing in an ICT related industries for theoretical knowledge, consolidate skills, reflect on practice.

Intended Learning Outcomes:

- maximize their self-confidence and commercial awareness.
- develop their negotiation, leadership and teamwork skills.
- take part in a team and working towards the objectives of the industry.
- apply learning methods for improving skills in both verbal and written.
- demonstrate employability skills by applying their job role effectively.

Course Contents:

- Student should get a placement opportunity in an industry where IT is the main field and follow minimum six months training
- The student who placed in an industry should be assigned an IT related task under the guidance of an industrial supervisor
- The student tries to learn the systems - objectives, organization, administrative process, progress of ongoing projects, problems faced by, practical issues if any, etc. in the industry
- The student should participate in the usual daily activity of the industry
- The weekly diary should be maintained and signed by the supervisor assigned
- A set of lecturers from the department visits to the industry to monitor the students' performance during the training period
- They need to submit final report and do a presentation at the end of the training

Teaching and Learning Methods: This course is based on the principles of experiential learning and requires students to be placed in a business environment with workplace supervision and mentoring. Students will also be expected to meet one-on-one with an Academic Supervisor to discuss the nature of their academic project for assessment. An Academic Supervisor is a member of the teaching staff of the department and will be assigned to students near the commencement of the placement to maintain regular contact with the students. The students should communicate the assigned academic supervisor every week via email to discuss the progress.

Evaluation Methods:	Daily diary and evaluation from the supervisor	40%
	Final report	20%
	Oral presentation and viva-voce	40%

1. Students are required to submit a substantial report for assessment.
2. Employers are asked to assess the performance of the students and give marks to the student by providing feedback preferably on the Employers Assessment Questionnaire.
3. Presentation shall take place after the completion of the training.
4. The presentation evaluation is done by a panel.
5. Report should be submitted during presentation.
6. The report evaluation is done by the Academic Supervisor.
7. A Viva-voce comprising comprehensive questions based on the presentation and training undergone will be put forth after the presentation.
8. Refer evaluation section.

Note: *Any special circumstances are decided by the department and implemented with the approval of the Faculty Board of Faculty of Technological Studies*

Recommended Readings:

1. *Industrial Training Guidelines and Diary*, Department of Information and Communication Technology, University of Vavuniya.

Course Title	Data Mining and Data Warehousing		
Course Code	TICT4213		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To familiarize the concepts of retrieval from data repositories and facilitating data analysis via decision making.

Intended Learning Outcomes:

- demonstrate advanced knowledge of data mining concepts and techniques
- explain the techniques of clustering, classification, association finding on real world data
- determine whether a real world problem has a data mining solution
- apply data mining software and tool kits in a range of applications
- outline acquire knowledge for understanding, modelling and design of data warehouses
- define the fundamental concepts, benefits and problem areas associated with data warehousing

Course Contents:
Theory: Introduction to data mining; Data Mining Process: Data preparation, Selection, Pre-processing, Transformation, Mining, analysing; Data Mining Techniques: Market Basket Analysis: Refinements, Partitioning Algorithm; Classification; Clustering: Distance Calculation, Portioning Algorithms, Hierarchical algorithms, Dendograms, Limitations; Introduction to data warehousing; Architecture; Multidimensional Data Model: Dimensions, Facts, 2D data cube, 3D data cube, 4D data cube, Schemas; Concept Hierarchies; OLAP: OLAP operations;
Practical: Implementation of data mining and data warehousing concepts taught in the theory using appropriate tools.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Jiawei Han, & MichelineKamber. (2010) *Data Mining: Concepts and Techniques*. 3^{rd} Ed.
2. Alex Berson, & Stephen, J.Smith. (2004) *Data Warehousing, Data Mining, & OLAP*. Tata McGraw-Hill.
3. Pang-Ning Tan, Michael Steinbach, AnujKarpatne, & Vipin Kumar. (2018) *Introduction to Data Mining*. 2^{nd} Ed. Pearson

Course Title	Digital Image Processing		
Course Code	TICT4223		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge on digital image processing techniques and storage.

Intended Learning Outcomes:
- outline the display devices and digital imaging techniques
- explain various linear and non-linear image filtering methods
- compare the image enhancement techniques
- apply morphological operations in processing images
- develop an algorithm for image processing application
- improve the image quality using histogram analysis

Course Contents :
Theory: Introduction to display devices and digital images, Intensity transformation, spatial and frequency domain filtering, smoothing and enhancements, image compression, image segmentation, morphological operations, Implementing the techniques using programming language.
Practical: Implementation of real time image based problems taught in the theory using digital image processing techniques.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:

1. Gonzales, R. C. & Woods, R. E. (2009) *Digital Image Processing using MATLAB*. 2^{nd} Ed.
2. Chris Solomon, & Toby Breckon. (2011) *Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab*. 1^{st} Ed.
3. Gonzales, R. C. & Woods, R. E. (2007) *Digital Image Processing*. 4^{th} Ed. Pearson.

Course Title	e-Commerce		
Course Code	TICT4233		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To provide knowledge on the impact of Information Communication Technology in Business oriented world.

Intended Learning Outcomes:
- analyse the impact of e-commerce on business models and strategy
- identify the major E-Commerce revenue models to evaluate existing websites
- discuss the techniques used to process online payments
- explain the significance of social networks in E-Commerce
- assess various strategies in e-applications
- build e-commerce application using web programming

Course Contents:
Theory: Introduction to Electronic Commerce: Getting started with electronic commerce, Electronic Commerce fundamentals, Technology infrastructure: The internet and the WWW, Business models; Business strategies for Electronic Commerce: Electronic Data Interchange (EDI), Value Chain, Supply Chain, Electronic Commerce in Auction; Electronic Commerce Supporting Activities: Marketing and Advertising on the web, Electronic Payment System; Implement and Management Issues in Electronic Commerce: Technologies and Applications to support Electronic Commerce, Infrastructure for Electronic Commerce, Designing and Building E-Commerce websites, Personal, Social, Organizational, Legal, Tax and International Issues; Security issues and Measures: Protecting Electronic Commerce Resources, Social Networks and Search Engine Optimization; Mobile Commerce: Introduction, Framework, Models, Agents in Electronic Commerce; E-Government and E-Learning : Introduction, Varieties of e-learning, e-learning technologies, Mobile learning.
Practical: Implementation of E-commerce application taught in the theory using web programming techniques.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration, and training.

Recommended Readings:
1. Bhasker. (2009) *E-Commerce: Framework, Technologies and Applications.* 3^{rd} Ed.
2. Amir Manzoor. (2010) *E-Commerce: An Introduction.*
3. Dave Chaffey. (2015) *Digital Business and E-Commerce Management: Strategy, Implementation and Practice.* 6^{th} Ed.

Course Title	Mobile Application Development		
Course Code	TICT4242		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To develop and design mobile and other portable device application according to the emerging trends.

Intended Learning Outcomes:
- define the mobile application development framework
- identify the technology and business trends impacting mobile applications
- develop applications for various mobile platform
- build applications with location awareness and hardware sensors
- apply utilities included in mobiles for application development
- construct power and memory efficient applications

Course Contents:
Theory: Mobile application frameworks, Development Tools, Languages, User-interface design, Mobile application Data management, battery, power and memory management, GPS, Gyroscope, gesture, multi-touch applications, image, video, audio applications, hardware sensors, Testing methodologies for mobile applications, deployment and maintenance.
`Practical`: Implementation of developing mobile applications covered in the theory using relevant high level languages. maintenance.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:
1. Brian Fling. (2009) *Mobile Design and Development*. O'Reilly Media, Inc.
2. Joseph Annuzzi., Lauren Darcey. & Shane Conder. (2014) *Introduction to Android Application Development: Android Essentials*. 5^{th} Ed. Addison-Wesley Professional.
3. Eff Mcwherter. & Scott Gowell. (2012) *Professional Mobile Application Development*.

Course Title	Intelligent Systems		
Course Code	TICT4253		
Credits	3:2/1	Theory	30 hours
		Practical	30 hours

Course Objectives: To develop and implement systems that can incorporate the essential elements of intelligent systems.

Intended Learning Outcomes:
- demonstrate the fundamental concepts of Artificial Intelligence
- apply predicate logic to represent the real world scenario
- inference the conclusion using reasoning techniques
- discuss machine learning techniques in intelligent system
- build a knowledge system for the given problem domain
- construct logic programming using various techniques

Course Contents:
Theory: Introduction to Artificial Intelligence: A Brief History of Artificial Intelligence, Uses and Limitations, Knowledge Representation; Search: Search Methodologies, Advanced Search, Game Playing; Logic: Propositional and Predicate Logic, Inference and Resolution for Problem Solving, Rules and Expert Systems; Constraint Satisfaction Problems: Backtracking Search, Constraint Propagation (Arc Consistency), Exploiting Graph Structure; Machine Learning: Introduction to Machine Learning, Neural Networks, Probabilistic Reasoning and Bayesian Belief Networks; Artificial Life: Learning through Emergent Behaviour, Genetic Algorithms; Planning: Introduction to Planning, Planning Methods; Advanced Topics: Advanced Knowledge Representation, Fuzzy Reasoning, Intelligent Agents, Understanding Language, Machine Vision; Fuzzy Computing: Fuzzy sets, membership, Operations, properties, Fuzzy Relations, Fuzzy Control, Fuzzy Logic, Fuzzification, Fuzzy Inference, Fuzzy Rule-Based System, Defuzzification; Intelligent Agents: Perception , Action, Multi-agent System, Agent communication and Agent Applications; Prolog Programming: Facts, Rules, Backtracking, Cuts, List, Developing a Knowledge Base.
Practical: Implementation of the Intelligent system concepts covered in theory using appropriate techniques.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{2 \times Theory + 1 \times Practical}{3}$	

Recommended Readings:
1. Ben Coppin. (2004) *Artificial Intelligence Illuminated.*
2. Stuart Russell. & Peter Norvig. (2010) *Artificial Intelligence a Modern Approach.* 3^{rd} Ed.
3. Tim Jones, M. (2008), *Artificial Intelligence a Systems Approach.*
4. Kwang H. Lee. (2005) *First Course on Fuzzy Theory and Applications.*

Course Title	Cloud Application Development		
Course Code	TICT4262		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To impart knowledge to design and develop cloud-based tools and applications.

Intended Learning Outcomes:
- define cloud computing
- identify the role of cloud computing in application development
- discuss cloud data services and management
- apply security strategies in cloud application development
- build cloud-based applications

Course Contents:
Theory: Introduction to cloud computing, SAAS, PAAS, IAAS, BPAAS, Cloud Architecture and Characteristics, Cloud-based Database Design, Cloud Data Services, Scripting Languages, Cloud-based Web Application Development, Cloud-based Mobile Application Development, Tenant-Aware Application Development, Cloud Security, Cloud-based automated testing, Cloud Data Management, High Performance Computing (HPC) on Cloud, Cloud Service providers.
Practical: Implementation of cloud application concepts covered in theory using appropriate platforms and high level languages.

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:
1. David, E. Y. Sarna. (2011) *Implementing and Developing Cloud Computing Applications.*
2. Lee Chao. (2015) *Cloud Computing Networking: Theory, Practice, and Development.*
3. Jeff Mcwherter, & Scott Gowell. (2012) *Professional Mobile Application Development (WROX) Paperback.*

Course Title	Applied Bio-informatics		
Course Code	TICT4272		
Credits	2:1/1	Theory	15 hours
		Practical	30 hours

Course Objectives: To understand the various approaches in bioinformatics with the practical implementation to solve the biological related problems.

Intended Learning Outcomes:
- explain the basics of molecular biology
- identify the bioinformatics database
- model computational techniques in sequence analysis
- apply probabilistic model in bioinformatics
- apply different approaches and algorithms for solving biological problems

Course Contents:
Theory: Aims and tasks of Bioinformatics, Bioinformatics databases, Genomes, Proteins and Proteomes, Applications of Bioinformatics, Data Visualization, General-purpose technologies, Micro Arrays and Gene Expression, Probabilistic modelling of array data, Clustering and classification, Technology overview of data mining, Pattern recognition and discovery, Pattern matching, alignments methods, Computational methods, Modelling and Simulation, Drug discovery, Protein structure.
Practical: Implementation of Bioinformatics algorithms using R and Python

Teaching and Learning Methods: Classroom Lectures, self-learning and discussion, computer practical demonstration and training.

Evaluation Methods:	Theory	Practical
Formative Assessments: In-course assessment	30%	40%
Summative Evaluation: End semester exam	70%	60%
Final Marks	$\frac{1 \times Theory + 1 \times Practical}{2}$	

Recommended Readings:

1. Neil, C. Jones. & Pavel, A. Pevzner. *An Introduction to Bioinformatics Algorithms.* 1^{st} Ed. The MIT Press Cambridge. England.
2. David, W. Mount. *Bioinformatics: Sequence and Genome Analysis.* 2^{nd} Ed. Cold Spring Harbor Laboratory Press.
3. Xion Ju, (2013) Essential Bioinformatics, 1^{st} Ed.