ICT 101 DISCRETE MATHEMATICS FOR IT T318 - Brief

(Foundation Mathematics for IT)

All information contained within this Subject Outline applies to **all** students enrolled in the trimester as indicated**.**

1. General Information

1.1 Administrative details

Associated HE Award(s)	Duration	Level	Subject Coordinator
Bachelor of Information Technology (BIT)	1 trimester	Level 1	Chaitali Samani chaitali.samani@koi.edu.au P: 92833583 (Ext.156) L: Level 1, 545 Kent St. Consultation: via Moodle or by appointment.

1.2 Core / Elective

Core subject for the BIT

1.3 Subject Weighting

Indicated below is the weighting of this subject and the total course points.

Subject Credit Points	Total Course Credit Points
4 Credit Points	BIT (96 credit points)

1.4 Student Workload

Indicated below is the expected student workload per week for this subject

No. timetabled hours/week*	No. personal study hours/week**	Total workload hours/week***
4 hours/week (2 hour Lecture + 2 hour Tutorial)	6 hours/week	10 hours/week

* Total time spent per week at lectures and tutorials
** Total time students are expected to spend per week in studying, completing assignments, etc.
*** Combination of timetable hours and personal study.

1.5 Mode of Delivery On-campus

1.6 Pre-requisites Nil

1.7 General Study and Resource Requirements

- Dedicated computer laboratories are available for student use. Normally, tutorial classes are conducted in the computer laboratories.
- Students are expected to attend classes with the requisite textbook and must read specific chapters prior to each tutorial. This will allow them to actively take part in discussions. Students should have elementary skills in both word processing and electronic spreadsheet software, such as OFFICE 365 and MS Office.
- Computers and WIFI facilities are extensively available for student use throughout KOI. Students are encouraged to make use of the campus Library for reference materials.

- Students will require access to the internet and email. Where students use their own computers, they should have internet access. KOI will provide access to required software.

Software resource requirements specific to this subject: Office 365, Microsoft Imagine.

2 Academic Details

2.1 Overview of the Subject

Discrete mathematics is the science of counting. It is used to analyse processes with a finite number of steps such as computer programs. The subject focuses on the mathematical concepts in discrete mathematics, with an emphasis on computing and information systems. Topics include algorithms, logic, functions, recursion, graphs and trees. In this subject, you will practise solving problems using mathematical reasoning and appropriate technology, communicate mathematical ideas and explore the applications of mathematics in computing.

2.2 Graduate Attributes for Undergraduate Courses

Graduates of Bachelor courses from King's Own Institute (KOI) will be able to demonstrate the attributes of a successful Bachelor degree graduate as outlined in the Australian Qualifications Framework (2nd edition, January 2013). Graduates at this level will be able to apply an advanced body of knowledge across a range of contexts for the purposes of professional practice or academic scholarship, and as a pathway for further learning.

King's Own Institute's key generic graduate attributes for a bachelor's level degree are summarised below:

	KOI Bachelor Degree Graduate Attributes	**Detailed Description**
	Knowledge	Current, comprehensive and coherent knowledge
	Critical Thinking	Critical thinking and creative skills to analyse and synthesise information and evaluate approaches to new problems
	Communication	Communication skills for effective reading, writing, listening and presenting in varied modes and contexts and for transferring knowledge and skills to others
	Information Literacy	Information and technological skills for accessing, evaluating, managing and using information professionally
	Problem Solving Skills	Skills to apply logical and creative thinking to solve problems and evaluate solutions
	Ethical and Cultural Sensitivity	Appreciation of ethical principles, cultural sensitivity and social responsibility, both personally and professionally
	Teamwork	Leadership and teamwork skills to collaborate, inspire colleagues and manage responsibly with positive results
	Professional Skills	Professional skills to exercise judgement in planning, problem solving and decision making

Across the course, these skills are developed progressively at three levels:

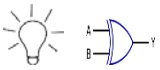
- **Level 1 Foundation –** Students learn the basic skills, theories and techniques of the subject and apply them in basic, standalone contexts
- **Level 2 Intermediate –** Students further develop the skills, theories and techniques of the subject and apply them in more complex contexts, and begin to integrate this application with other subjects.

- **Level 3 Advanced** – Students demonstrate an ability to plan, research and apply the skills, theories and techniques of the subject in complex situations, integrating the subject content with a range of other subject disciplines within the context of the course.

2.3 Subject Learning Outcomes

This is a Level 1 subject.

On successful completion of this subject, students should be able to:

Subject Learning Outcomes	Contribution to Course Graduate Attributes
a) Identify and use basic concepts of arithmetic, logic, set theory, probability, proof techniques, binary relations, graphs and trees	
b) Produce and analyse mathematical arguments	
c) Apply mathematical knowledge and skills to investigate and solve a variety of discrete mathematical problems	
d) Communicate mathematical ideas in a range of forms (written, oral, graphic)	

2.4 Subject Content and Structure

Below are details of the subject content and how it is structured, including specific topics covered in lectures and tutorials. Reading refers to the text unless otherwise indicated.

Weekly Planner:

Week (beginning)	Topic covered in each week's lecture	Reading(s)	Expected work
1 05 Nov	Introduction to algorithms: Examples Decimal and binary number systems, conversion and addition	G: Ch. 1 G: Ch 2 sections 2,3,5	Practise writing simple algorithms and explore their operation to find and correct errors Practise arithmetic in binary representation Complete problem set
2 12 Nov	Logic Propositions Truth tables Logical equivalence Laws of logic Problems involving logical reasoning	G: Ch. 4, sections 1-6	Convert between logical propositions and symbolic form Construct simple truth tables and analyse logical propositions Complete problem set 2
3 19 Nov	Predicate logic Proof techniques Problems involving logical reasoning	G: Ch. 4, sections 7-8	Construct more complex truth tables and analyse logical propositions Construct and analyse logical proofs Complete problem set 3
4 26 Nov	Functions and computing Composite and inverse functions Functions in programming	G: Ch. 6	**Assessment 1 Quiz** Solve problems using functions Complete problem set 4
5 03 Dec	Recursion Sequences	G: Ch. 7, sections 1-4	Solve problems involving recurrences

	Proof by induction Linear recurrences		Solve linear recurrences Prove mathematical statements by induction Complete problem set 5
6 10 Dec	Solving problems with mathematics Modelling with recurrences Recursively defined algorithms Computer representation	G: Ch. 7, section 5 G: Ch 3 section 1, 2 ,6	Explore mathematical models using recurrences Use Excel for computation, tables and graphs Complete problem set 6
7 17 Dec	Combinatorics Divide and conquer relations Principle of inclusion and exclusion Branching	G: Ch. 9, sections 1-3	Investigate Venn diagrams Solve problems using combinatorial principles Complete problem set 7
23 Dec 2018 – 06 Jan 2019	**Mid-trimester break**		
8 07 Jan	Permutations Combinations Probability	G: Ch. 9, sections 4-5	**Assessment 2 Quiz 2 – recurrences (1 hour)** Solve problems involving permutations and combinations Explore and prove relations between binomial coefficients Complete problem set 8
9 19 Jan	Graph theory Representing graphs by diagrams and matrices Paths and circuits	G: Ch. 10	Model problems using graphs Convert between diagrams and matrices for graphs Find circuits in graphs Complete problem set 9
10 21 Jan	Trees Spanning trees Minimal distance paths Rooted trees	G: Ch. 11	Model and solve problems using trees Find minimum distance paths Complete problem set 10
11 28 Jan	Codes and cryptography Congruences Euclidean algorithm Public-key cryptography	G: Ch. 12	Solve problems involving congruences and greatest common divisors Complete problem set 11
12 04 Feb	Algorithms and computational complexity Sorting Tractable and intractable problems	G: Ch. 13	**Assessment 3 Group project due** Analyse simple algorithms Complete problem set 12
13 11 Feb	Study review week		
14 18 Feb	Examinations		Please see exam timetable for exam date, time and location
15 25 Feb	Student Vacation begins Enrolments for T119 open		
16 04 Mar	Results Released 05 Mar 2019 Certification of Grades 08 Mar 2019		
T119 begins 11 Mar 2019			
1 11 Mar	Week 1 of classes for T119 **Friday 08 Mar 2019 – Review of Grade Day for T318** – see Sections 2.6 and 3.6 below for more information.		

2.7 Teaching Methods/Strategies

Briefly described below are the teaching methods/strategies used in this subject:

- *On-campus lectures* (2 hours/week) are conducted in seminar style and address the subject content, provide motivation and context and draw on the students' experience and preparatory reading.
- *Tutorials* (2 hours/week) include class discussion of case studies and research papers, practice sets and problem-solving and syndicate work on group projects. Tutorial participation is an essential component of the subject and contributes to the development of graduate attributes (see section 2.2 above). It is intended that specific tutorial material such as case studies, recommended readings, review questions etc. will be made available each week in Moodle.
- *Online* teaching resources include class materials, readings, model answers to assignments and exercises and discussion boards. All online materials for this subject as provided by KOI will be found in the Moodle page for this subject. Students should access Moodle regularly as material may be updated at any time during the trimester
- *Other contact* - academic staff may also contact students either via Moodle messaging, or via email to the email address provided to KOI on enrolment.

2.8 Student Assessment

Assessment is designed to encourage effective student learning and enable students to develop and demonstrate the skills and knowledge identified in the subject learning outcomes. Assessment tasks during the first half of the study period are usually intended to maximise the developmental function of assessment (formative assessment). These assessment tasks include weekly tutorial exercises (as indicated in the weekly planner) and low stakes graded assessment (as shown in the graded assessment table). The major assessment tasks where students demonstrate their knowledge and skills (summative assessment) generally occur later in the study period. These are the major graded assessment items shown in the graded assessment table.

Final grades are awarded by the Board of Examiners in accordance with KOI's Assessment and Assessment Appeals Policy. The definitions and guidelines for the awarding of final grades within the BIT degree are:

- HD High distinction (85-100%) an outstanding level of achievement in relation to the assessment process.
- D Distinction (75-84%) a high level of achievement in relation to the assessment process.
- CR Credit (65-74%) a better than satisfactory level of achievement in relation to the assessment process.
- P Pass (50-64%) a satisfactory level of achievement in relation to the assessment process.
- F Fail (0-49%) an unsatisfactory level of achievement in relation to the assessment process.

Provided below is a schedule of formal assessment tasks and major examinations for the subject.

Assessment type	When assessed	Weighting	Learning outcomes assessed
Assessment 1 Quiz 1 – logic (1 hour)	Week 4	10%	a, b
Assessment 2 Quiz 2 – recurrences (1 hour)	Week 8	10%	a, b, c
Assessment 3 Group project – modelling with combinatorics and graphs (2000 words)	Week 12	30%	a, b, c, d
Final exam (3 hours)	Week 15	50%	a, b, c, d

Requirements to Pass the Subject:

To gain a pass or better in this subject, students must gain a *minimum of 50%* of the total available subject marks.

2.9 Prescribed and Recommended Readings

Prescribed Texts:

Grossman, P., 2009. *Discrete Mathematics or Computing*, 3rd edition, Palgrave Macmillan, Basingstoke.