ICT101 DISCRETE MATHEMATICS FOR IT T324 Brief

All information in the Subject Outline is correct at the time of approval. KOI reserves the right to make changes to the Subject Outline if they become necessary. Any changes require the approval of the KOI Academic Board and will be formally advised to those students who may be affected by email and via Moodle.
Information contained within this Subject Outline applies to 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	Dr Krish Muralee muralee.krish@koi.edu.au P: +61 (2) 9283 3583 L: Level 1-2, 17 O'Connell 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

Classes will be face-to-face or hybrid. Certain classes will be online (e.g., special arrangements).

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.

1.8 Academic Advising

Academic advising is available to students throughout teaching periods including the exam weeks. As well as requesting help during scheduled class times, students have the following options:

- Consultation times: A list of consultation hours is provided on the homepage of Moodle where appointments can be booked.
- Subject coordinator: Subject coordinators are available for contact via email. The email address of the subject coordinator is provided at the top of this subject outline.
- Academic staff: Lecturers and Tutors provide their contact details in Moodle for the specific subject. In most cases, this will be via email. Some subjects may also provide a discussion forum where questions can be raised.
- Head of Program: The Head of Program is available to all students in the program if they need advice about their studies and KOI procedures.
- Vice President (Academic): The Vice President (Academic) will assist students to resolve complex issues (but may refer students to the relevant lecturers for detailed academic advice).

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 achieve the graduate attributes expected under the Australian Qualifications Framework (2nd edition, January 2013). Graduates at this level will be able to apply an advanced body of knowledge from their major area of study in a range of contexts for professional practice or scholarship and as a pathway for further learning.

King's Own Institute's 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 a variety of audiences
	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:

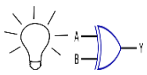
- **Level 1 Foundation –** Students learn the basic skills, theories and techniques of the subject and apply them in basic, standalone contexts
- **Level 2 Intermediate –** Students further develop the skills, theories and techniques of the subject and apply them in more complex contexts, and begin to 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 Graduate Attributes**
a) Identify and use basic concepts of arithmetic, logic, algorithms, functions, 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 as listed in Moodle
1 28 Oct	Decimal and binary number systems, conversion and addition	G: Ch. 2 sections 2,3,5 J: Ch. 5 section 2	Practice arithmetic in binary representation. Complete Tutorial 1 problems and submit Weekly assessment 1
2 04 Nov	Introduction to algorithms: Examples	G: Ch. 1 J: Ch. 4 sections 1,2	Practice writing simple algorithms, explore their operations and find and correct errors. Complete Tutorial 2 problems and submit Weekly assessment 2
3 11 Nov	Logic Propositions Truth tables Logical equivalence Laws of logic Problems involving logical reasoning	G: Ch. 4 sections 1-6 J: Ch. 1 sections 1,2,3	Convert logical propositions to symbolic form and vice versa. Construct a truth table for a given proposition and simplify propositions by use of logical laws. Complete Tutorial 2 problems and submit Weekly assessment 3
4 18 Nov	Predicate logic Proof techniques Problems involving logical reasoning	G: Ch. 4, sections 7-8 J: Ch. 2 Sections 1,2	Use predicate logic and quantifying notations in propositions and prove simple mathematical statements Complete Tutorial 3 problems and submit Weekly assessment 4
5 25 Nov	Functions and computing Composite and inverse functions in programming	G: Ch. 6 J: Ch. 3 Section 1	Solve problems in function and identify inverse functions. Complete Tutorial 5 problems and submit Weekly assessment 5
6 02 Dec	Recursion Sequences Proof by induction Linear recurrences	G: Ch. 7 sections 1-4 J: Ch. 7 section 1,2 J: Ch. 2 Section 4	Identify a recurrence relation and non-recurrence for a sequence and prove a mathematical statement with use of induction. Complete Tutorial 6 problem, submit Week assessment 5 and Quiz 1 (20%) in class

Week (beginning)	Topic covered in each week's lecture	Reading(s)	Expected work as listed in Moodle
7 09 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 J: Ch. 7 section 2	Writing function algorithm, number representation and practicing BCD arithmetic. Complete problem set 7, submit Weekly assessment 7 and Quiz 1(20%) DE in class
8 16 Dec	Codes and cryptography Congruences Euclidean algorithm Public-key cryptography Algorithms and computational complexity Sorting algorithms	G: Ch. 12 G: Ch. 13 (only introductory) J: Ch. 5 sections 2, 3 J: Ch. 7 section 3	Practicing Euclidean Algorithm, solving congruence equations and solving problems with affine cipher function. Complete Tutorial 7 problems, submit Weekly assessment 8 and Deferred Quiz 1 (20%) in class
9 06 Jan	Graph theory Representing graphs by diagrams and matrices Paths and circuits	G: Ch. 10 J: Ch. 8 sections 1-6	Solving the problem using the theory of Graphs. Complete Tutorial 9 problems, submit Weekly assessment 9
10 13 Jan	Trees Spanning trees Minimal distance paths Rooted trees	G: Ch. 11 J: Ch. 9 Sections 1-4	Solving the problem using the theory of Trees. Complete Tutorial 10 and submit Weekly assessment 10
11 20 Jan	Combinatorics Divide and conquer relations Principle of inclusion and exclusion Multiplication principle Permutations Combinations	G: Ch. 9, sections 1-3 G: Ch. 9 sections 4-5 J: Ch. 6 sections 1-4	Practicing problems involving counting techniques. Complete Tutorial 11 problems and Quiz 2 (20%) in class
12 28 (Tue) Jan	Assessment 4 presentation in class.		Preparing materials for presentation
13 03 Feb	Individual assessment submission on Monday of this week and Trimester break starts		
14 10 Feb	Enrolments for T125 open		
15 17 Feb	Student Vacation begins New students - enrolments for T125 open		
16 24 Feb	Results Released Review of Grade Day for T324 – see Sections 2.6 and 3.2 below for relevant information. Certification of Grades		

Week (beginning)	Topic covered in each week's lecture	Reading(s)	Expected work as listed in Moodle
	NOTE: More information about the dates will be provided at a later date through Moodle/KOI email.		
T125 3 Mar 2025			
1 03 Mar	Week 1 of classes for T125		

2.5 Teaching Methods/Strategies

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

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. Tutorials often include group exercises and so contribute to the development of teamwork skills and cultural understanding. Tutorial participation is an essential component of the subject and contributes to the development of many of the graduate attributes (see section 2.2 above). Tutorial participation contributes towards the assessment in many subjects (see details in Section 3.1 for this subject). Supplementary 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.

2.6 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	rning outcomes assessed
Assessment 1: Weekly Exercises	Weeks 1 - 10	2×10=20%	a, b, c, d
Assessment 2: Quiz 1	Week 6	20%	a, b, c
Assessment 3: Quiz 2	Week 11	20%	a,b,c
Assessment 4: Individual Assignment report (2,000 words) and presentation	Week 12 and Week 13	40%	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.

2.7 Prescribed and Recommended Readings

Provided below, in formal reference format, is a list of the prescribed and recommended readings.

Prescribed Texts:

Grossman, P, & Grossman, P 2009, *Discrete Mathematics for Computing*, 3rd ed. Macmillan Education UK, London. Available from: ProQuest Ebook Central. [9 June 2021].

Johnsonbaugh, R 2019, *Discrete Mathematics*, eBook, Global Edition, Pearson Education, Limited, Harlow. Available from: ProQuest Ebook Central. [9 June 2021].

Recommended readings

Harry Lewis, Rachel Zax 2019. *Essential Discrete mathematics for computer science*, Princeton University Press.

Kenneth Rosen 2019. *Discrete Mathematics and its application*, 8th ed., McGraw Hill

Levin, O. 2019, *Discrete mathematics: an open introduction*, 3rd edn, Createspace Independent Publishing Platform, Scotts Valley, Calif.

Conference/ Journal Articles:

https://www.researchgate.net/publication/344863390_Discrete_Mathematics_The_Backbone_of_Computer_Science
https://www.grafiati.com/en/literature-selections/discrete-mathematics-in-computer-science/journal/

Students are encouraged to read peer reviewed journal articles and conference papers. Google Scholar provides a simple way to broadly search for scholarly literature. From one place, you can search across many disciplines and sources: articles, theses, books, abstracts and court opinions, from academic publishers, professional societies, online repositories, universities and other web sites.