ICT724 INTELLIGENT SYSTEMS T325 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
Master of Information Technology (MIT) Master of Information Systems (MIS) Graduate Diploma of Information Technology (GDIT) Graduate Certificate of Information Technology(GCIT)	1 trimester	Postgraduate	Dr Hui Wu hui.wu@koi.edu.au P: +61 (2) 9283 3583 L: 7-11, 11 York Street. Consultation: via Moodle or by appointment.

1.2 Core/Elective

This subject is
- a core subject for the Master of Information Technology (MIT) Data Analytics
- an elective subject for the Master of Information Technology (MIT) General
- an elective subject for the Master of Information Systems (MIS)
- an elective subject for the Graduate Diploma of Information Technology (GDIT)
- an elective subject for the Graduate Certificate of Information Technology (GCIT)

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	MIT (64 Credit Points); MIS (64 Credit Points); GDIT (32 Credit Points); GCIT (16 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***
3 hours/week plus supplementary online material	7 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

- Students are expected to attend classes with the weekly worksheets and subject support material provided in Moodle. Students should read this material before coming to class to improve their ability to participate in the weekly activities.
- Students will require access to the internet and their KOI email and should have basic skills in word processing software such as MS Word, spreadsheet software such as MS Excel and visual presentation software such as MS PowerPoint.
- 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.

Software resource requirements specific to this subject: Office 365, Python, Altair AI Studio.

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

Intelligent systems are a computer-based approach to decision making using artificial intelligence. These systems learn from, and adapt to, a changing and unknown environment to respond to a wide range of real world problems. They are in use all around us from traffic lights to high-end medical technology. This subject will enable students to apply machine learning, fuzzy logic, search, expert systems, neural networks, and peripheral techniques to develop intelligent systems. Students will be required to work on a business case study to apply these techniques to a real world problem and make a convincing argument to executive management when promoting data-driven changes.

2.2 Graduate Attributes for Postgraduate Courses

Graduates of postgraduate courses from King's Own Institute will achieve the graduate attributes expected from successful completion of a postgraduate degree under the Australian Qualifications Framework (2nd edition, January 2013). Graduates at this level will be able to apply 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 master's level degree are summarised below:

	KOI Postgraduate Degree Graduate Attributes	**Detailed Description**
	Knowledge	Current, comprehensive and coherent knowledge, including recent developments and applied research methods

	Critical Thinking	Critical thinking skills to identify and analyse current theories and developments and emerging trends in professional practice
	Communication	Communication and technical skills to analyse and theorise, contribute to professional practice or scholarship, and present ideas to a variety of audiences
	Research and Information Literacy	Cognitive and technical skills to access and evaluate information resources, justify research approaches and interpret theoretical propositions
	Creative Problem Solving Skills	Cognitive, technical and creative skills to investigate, analyse and synthesise complex information, concepts and theories, solve complex problems and apply established theories to situations in professional practice
	Ethical and Cultural Sensitivity	Appreciation and accountability for ethical principles, cultural sensitivity and social responsibility, both personally and professionally
	Leadership and Strategy	Initiative, leadership skills and ability to work professionally and collaboratively to achieve team objectives across a range of team roles Expertise in strategic thinking, developing and implementing business plans and decision making under uncertainty
	Professional Skills	High level personal autonomy, judgement, decision-making and accountability required to begin professional practice

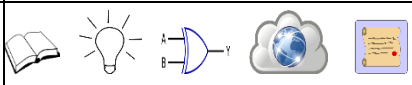
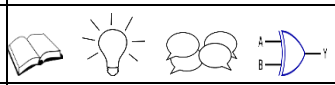
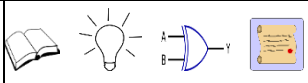
Across the courses, these skills are developed progressively at three levels:

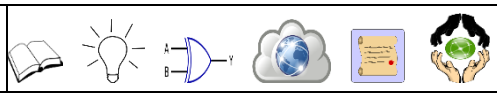
- **Level 1 Foundation –** Students learn the skills, theories and techniques of the subject and apply them in stand-alone contexts
- **Level 2 Intermediate –** Students further develop skills, theories and techniques of the subject and apply them in more complex contexts, beginning to integrate the application with other subjects
- **Level 3 Advanced** – Students have a demonstrated 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

Generally, skills gained from subjects in the Graduate Certificate and Graduate Diploma are at levels 1 and 2 while other subjects in the Master's degree are at level 3.

2.3 Subject Learning Outcomes

Listed below, are key knowledge and skills students are expected to attain by successfully completing this subject:

Subject Learning Outcomes	Contribution to Graduate Attributes
a) Analyse intelligent systems using concepts from machine learning, fuzzy logic, search, expert systems, neural networks, and peripheral techniques	
b) Implement intelligent systems to solve business problems	
c) Present and communicate complex results, derived from intelligent systems, to non-technical audiences to encourage data-driven changes	

d) Evaluate emerging trends and ethical issues in intelligent systems and their application in industry	

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
Week 1 27 Oct	Introduction to Artificial Intelligence	Ch.1 (Russell) Ch. 1 (Artasanchez)	Research and compare and contrast between AI, Data Science and Intelligent Systems Formative not graded
Week 2 03 Nov	Uninformed search	Ch.3 (Russell)	Analyse and write code to solve a given problem using uninformed search methods. Summative graded.
Week 3 10 Nov	Informed search	Ch 3 & Ch.4 (Russell) Ch. 10 & Ch. 1 (Artasanchez)	Analyse and write code to solve a given problem using informed search methods. Summative graded
Week 4 17 Nov	Knowledge and reasoning	Ch.7 & Ch. 12 (Russell)	Analyse techniques in the reasoning process. Summative graded
Week 5 24 Nov	Uncertain knowledge and reasoning	Ch.12 & Ch. 14 (Russell)	Use Naive Bayes classifier to make predictions. Summative graded **A2: Quiz**
Week 6 01 Dec	Decision Theory	Ch. 17 (Russell)	Solve problems about simple Bayesian networks. Summative graded Summative graded
Week 7 08 Dec	Decision Tree Learning Model	Ch.18 (Russell)	Use the decision tree learning model to make predictions. Summative graded

Week (beginning)	Topic covered in each week's lecture	Reading(s)	Expected work as listed in Moodle
Week 8 15 Dec	Feedforward Neural Networks	Ch.18 (Russell)	Use the feedforward neural network learning model to make predictions. Summative graded **Assessment 3 due: Report and Presentation video**
Week 9 05 Jan	Recurrent Neural Networks	Ch. 21 (Artasanchez)	Use the recurrent neural network learning model to make predictions Summative graded
Week 10 12 Jan	Reinforcement Learning	Ch.21 (Russell)	Use the reinforcement learning model to solve a problem Summative graded
Week 11 19 Jan	Planning and ethics	Ch. 11 (Russell)	Write an essay to summarize all the planning approaches learned. Summative graded
Week 12 27Jan (Tue)	Expert Systems	Ch.16 (Russell)	**Assessment 4 - Report and Presentation**
Week 13 02 Feb	Study review week and Final Exam Week		
Week 14 09 Feb	Examinations Continuing students - enrolments for T126 open		Please see exam timetable for exam date, time and location
Week 15 16 Feb	Student Vacation begins New students - enrolments for T126 open		
Week 16 23 Feb	• Results Released • Review of Grade Day for T325 – see Sections 2.6 and 3.2 below for relevant information. • Certification of Grades NOTE: More information about the dates will be provided at a later date through Moodle/KOI email.		
T126 2 Mar 2026			
Week 1 02 Mar	Week 1 of classes for T126		

2.5 Teaching Methods/Strategies

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

- *Lectures* (1 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 assessments (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 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.
- *C 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.
- *FW:* This grade will be assigned when a student did not submit any of the compulsory assessment items.

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: Tutorial Portfolio	Week 2 – Week 11	20%	a, b, c, and d
Assessment 2: Quiz	Week 5	10%	a, b
Assessment 3: Individual Research Project with presentation (4000 words report)	Week 8 – Report and Presentation	Report 25% Presentation 10%	a, c and d
Assessment 4: Group Research and Practical Assignment (4000 words report)	Week 12 – Report and Presentation	Report - 25% (Group – 15%, Individual – 10%) Presentation - 10% (Group – 5%, Individual – 5%)	a, b, c and 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:

Russell, S. and Norvig, P. (2022) *Artificial Intelligence: A Modern Approach, Global Edition*. 4th ed. Harlow: Pearson.

Artasanchez, A. and Joshi, P. (2020) *Artificial intelligence with Python: your complete guide to building intelligent apps using Python 3.x and TensorFlow 2*. 2nd ed. Birmingham: Packt Publishing. Available at: ProQuest Ebook Central

Recommended Readings:

Hu, Z., Wang, Y. and He, M. eds. (2022) *Advances in intelligent systems, computer science and digital economics III*. Springer International Publishing.

Bazzan, A.L. and Klügl, F. (2022) *Introduction to intelligent systems in traffic and transportation*. Springer Nature.

S. Dong, P. Wang , K. Abbas (2021). A survey on deep learning and its applications. Computer Science Review. Volume 40, 100379.

C. Badue, R. Guidolini et al. (2021). Self-driving cars: A survey, Volume 165, 113816.

Hopgood, A.A. (2021) *Intelligent systems for engineers and scientists: A practical guide to artificial intelligence*. CRC Press.

Shin, D., He, S., Lee, G.M., Whinston, A.B., Cetintas, S. and Lee, K.-C. (2020) 'Enhancing social media analysis with visual data analytics: A deep learning approach', *MIS Quarterly*, 44(4), pp. 1459-1492.

S. M. Bohloul (2020). Smart Cities: A Survey on New Developments, Trends, and Opportunities. Journal of Industrial Integration and Management, Vol. 05, No. 03, pp. 311-326.

Self-driving cars: C. Badue, R. Guidolini et al., 2021. Self-driving cars: A survey. Volume 165, 113816.

Kanagavalli, R. and Hanji, B.R. (2020) 'A survey of deep learning techniques in natural language processing applications', *Journal of Computer Science Engineering and Software Testing*, 06(02), pp. 24-29.

Haenlein, M. and Kaplan, A. (2019) 'A brief history of artificial intelligence: On the past, present, and future of artificial intelligence', *California Management Review*, 61(4), pp. 5-14.

Pattanayak, S. (2019) *Intelligent projects using Python*. Packt Publishing. Available from: O'Reilly Learning.

Hulten, G. (2018) *Building intelligent systems: A guide to machine learning engineering*. Apress. Available from: O'Reilly Learning.

Recommended Conference/Journal Articles:

Rohde, F., Wagner, J., Meyer, A., Reinhard, P., Voss, M., Petschow, U. and Mollen, A., 2024. Broadening the perspective for sustainable artificial intelligence: sustainability criteria and indicators for Artificial Intelligence systems. *Current Opinion in Environmental Sustainability*, 66, p.101411.

Huda, N.U., Ahmed, I., Adnan, M., Ali, M. and Naeem, F., 2024. Experts and intelligent systems for smart homes' transformation to sustainable smart cities: A comprehensive review. *Expert Systems with Applications*, 238, p.122380.

Hejase, M., Katis, A. and Mavridou, A., 2024. Design, formalization, and verification of decision making for intelligent systems. In *AIAA SCITECH 2024 Forum* (p. 2409).

Ahmed, H.M. and Sorour, S.E., 2024. Classification-driven intelligent system for automated evaluation of higher education exam paper quality. *Education and Information Technologies*, pp.1-27.

Varsha, P.S., 2023. How can we manage biases in artificial intelligence systems–A systematic literature review. *International Journal of Information Management Data Insights*, 3(1), p.100165.

Ahmad, K., Abdelrazek, M., Arora, C., Bano, M. and Grundy, J., 2023. Requirements engineering for artificial intelligence systems: A systematic mapping study. *Information and Software Technology*, 158, p.107176.

Vyas, B., 2023. Java-Powered AI: Implementing Intelligent Systems with Code. *Journal of Science & Technology*, 4(6), pp.1-12.

Pimenov, D.Y., Bustillo, A., Wojciechowski, S., Sharma, V.S., Gupta, M.K. and Kuntoğlu, M., 2023. Artificial intelligence systems for tool condition monitoring in machining: Analysis and critical review. *Journal of Intelligent Manufacturing*, 34(5), pp.2079-2121.

Hu, H., Xu, J., Liu, M. and Lim, M.K., 2023. Vaccine supply chain management: An intelligent system utilizing blockchain, IoT and machine learning. *Journal of Business Research*, 156, p.113480.

Suggested e-journals:

- IEEE Transactions on Neural Networks and Learning Systems
- IEEE Transactions on Fuzzy Systems
- International Journal of Intelligent Systems

Conferences in AI:

- AAAI
- IJCAI
- NeurIPS

Useful Websites:

The following industry websites are useful introductory sources covering a range of information useful for this subject.

- https://www.rayven.io/
- https://aimagazine.com/
- https://www.analyticsinsight.net/magazine/
- https://news.mit.edu/topic/artificial-intelligence2

Conference/ Journal Articles:

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.