New College of the Humanities

Mathematical Structures and Methods Course Descriptor

Course Title	Mathematical Structures and Methods	Faculty	EDGE Innovation Unit (London)
Course code	NCHNAP444	Course Leader	Professor Scott Wildman (interim)
Credit points	15	Teaching Period	This course will typically be delivered over a 6-week period.
FHEQ level	4	Date approved	June 2020
Compulsory/ Optional	Compulsory		
Prerequisites	None		

COURSE SUMMARY

This course introduces mathematical structures and methods that form the foundation of computer science. Learners will study structures such as sets, tuples, sequences, lists, trees, and graphs. Functions, relations, ordering, and equivalence relations and inductive and recursive definitions of structures and functions will be explored. The course covers principles of proof such as truth tables, inductive proof, basic logic, counting techniques and arguments needed to estimate the size of sets, the growth of functions, and the space-time complexity of algorithms.

COURSE AIMS

- Train learners in the mathematical foundations of computer science.
- Train learners in mathematical terminology and core techniques.
- Give learners the tools to solve basic mathematical problems.
- Give learners the underpinning mathematical knowledge and tools required for programming and computer science.

LEARNING OUTCOMES

On successful completion of the course, learners will be able to:

KNOWLEDGE AND UNDERSTANDING

K1a	Demonstrate an understanding of the basic body of knowledge associated with mathematical structures, functions and manipulations.
K2a	Understand the basics of counting, such as the pigeonhole principle, permutations, and combinations.
K3a	Understand the meaning of an algorithm and the ability to analyze an algorithm to determine its computational complexity.

SUBJECT SPECIFIC SKILLS

S1a	Apply mathematical logic for solving a range of data-driven problemss.
S2a	Apply the inclusion-exclusion principle for common counting problems.
S3a	Develop recurrence relations for divide-and-conquer algorithms and to determine their complexity.

TRANSFERABLE AND PROFESSIONAL SKILLS

T1ai	Understand logical arguments, identifying the assumptions made and the conclusions drawn.
T1aii	Display a developing technical proficiency of written English skills that demonstrates an ability to communicate clearly and accurately when producing structured and coherent pieces of text.
T2a	Solve problems relating to qualitative and quantitative information.
T3a	Demonstrate skill in numeracy and computation.

TEACHING AND LEARNING

This is an e-learning course, taught throughout the year.

This course can be offered as a standalone short course.

Teaching and learning strategies for this course will include:

- On-line learning
- On-line discussion groups
- On-line assessment

Course information and supplementary materials will be available on the College's Virtual Learning Environment (VLE).

Learners are required to attend and participate in all the formal and timetabled sessions for this course. Learners are also expected to manage their self-directed learning and independent study in support of the course.

The course learning and teaching hours will be structured as follows:

- Off-the-job learning and teaching (6 days x 7 hours) = 42 hours
- On-the-job learning (12 days x 7 hours) = 84 hours (e.g. 2 days per week for 6 weeks)
- Private study (4 hours per week) = 24 hours

Total = 150 hours

ASSESSMENT

FORMATIVE

Learners will be formatively assessed during the course by means of set assignments. These will not count towards the final degree but will provide learners with developmental feedback.

SUMMATIVE

Assessment will be in two forms:

AE	Assessment Type	Weighting	Online submission	Duration	Length
1	Set Mathematical Exercises	60%	Yes	Requiring on average 20-30 hours to complete	-
2	Computer-based Examination	40%	Yes	1 hour	-

FEEDBACK

Learners will receive formal feedback in a variety of ways: written (via email or VLE correspondence) and indirectly through online discussion groups. Learners will also attend a formal meeting with their Academic Mentor (and for apprentices, including their Line Manager). These bi- or tri-partite reviews will monitor and evaluate the learner's progress.

Feedback is provided on summatively assessed assignments and through generic internal examiners' reports, both of which are posted on the VLE.

INDICATIVE READING

Note: Comprehensive and current reading lists for courses are produced annually in the Course Syllabus or other documentation provided to learners; the indicative reading list provided below is used as part of the approval/modification process only.

BOOKS

- Rosen, K. H., (2012), *Discrete Mathematics and Its Applications*, Content Technologies
- Rosen, K. H., (2011), *Student's Solution Guide to accompany Discrete Mathematics and Its Applications*, Mcgraw Hill Higher Education
- Lewis, H. R., (2019), *Essential discrete mathematics for computer science*, Princeton: Princeton University Press

JOURNALS

Learners are encouraged to read material from relevant journals on Mathematical Structures and Methods as directed by their course trainer.

ELECTRONIC RESOURCES

Learners are encouraged to consult relevant websites on Mathematical Structures and Methods.

INDICATIVE TOPICS

- Propositional Logic and Truth Tables
- Binary Numbers
- Sets and Set Operations
- Counting and Combinatorics

Title: NCHNAP444 Mathematical Structures and Methods Course Descriptor **Approved by: Academic Board** **Location: Academic Handbook/Programme specifications and Handbooks/ Undergraduate Apprenticeship Programmes/BSc (Hons) Digital & Technology Solutions Programme Specification/Course Descriptors**					
Version number	Date approved	Date published	Owner	Proposed next review date	Modification (As per AQF4) & category number
2.1	May 2022	May 2022	Scott Wildman	June 2025	Category 1: Corrections/clarifications to documents which do not change approved content.
2.0	January 2022	April 2022	Scott Wildman	June 2025	Category 3: Changes to Learning Outcomes
1.0	June 2020	June 2020	Scott Wildman	June 2025	