SUBJECT: COMPUTER SCIENCE

Module name: Principles of Computer Programming

Module code: CS101

Level: 1 **Semester:** 1 & 2

Credit Weighting: 15

Teaching Methods: 72 Lecture Hours, 72 Laboratory Hours, 96 Hours Independent Study

Responsible Department: Computer Science

Module Objective: Introduce fundamental programming principles and skills.

Module Content: Introduction to problem solving, algorithms, pseudo-code, principles of program design, overall program structure; introduction to a programming language: the concepts of syntax and semantics; basic type declarations; arithmetic operators and assignment; boolean logic; conditional statements; loops and recursion; procedures, functions and parameters; basic data structures; elementary searching and sorting; files; data abstraction and encapsulation. Principles of testing, debugging and re-testing. Boolean algebra, Karnaugh Maps, simple digital logic.

Assessment: Total Marks: 100%. 70%, Three-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%, Class Tests and Laboratory Tests in Semesters 1 & 2

Penalties: See page 286.

Pass Standard: 40%. See page 286.

Autumn Supplemental Examination: 70%, Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: End-User Computing

Module code: CS120

Level: 1 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: The objective of this course is to introduce students to the use of computers and their applications.

Module Content: The module covers the following topics: history of computing; word processing; desk-top publishing; spreadsheets; graphics; databases; html and the internet; decision support systems; networking; information management; office automation; information centre; managing end-user computing; computer applications; viruses; social impact of information technology.

Assessment: Total Marks: 100%. 70%, Two-hour written examination at the end of Semester 1, Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Practical Databases

Module code: CS130

Level: 1 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To introduce the fundamentals concepts of database design.

Module Content: Data organisation; file systems; storage and access methods; conceptual modelling; relational database model; data structure; data integrity; data manipulation; Structured Query Language (SQL); relational algebra; alternative database models; basic transaction processing; distributed database technology.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Discrete Structures 1

Module code: CS151

Level: 1 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 12 Tutorial Hours, 44 hours Independent Study

Responsible Department: Computer Science

Module Objective: To provide a foundation in discrete mathematics suitable for computer scientists.

Module Content: Logical statements, proof strategies, how do we reason? Storing data using sets and bags: Basic set and bag definitions, operations, and properties e.g. membership, equality, subsets, power sets, cartesian product, union, intersection and set difference. Using Functions to solve problems: to include definitions of function domain, range, image, composition, identity, inverse, lambda notation, abstraction, application, total & partial functions, injections, bijections & surjections.

Examples include simple computations such as floor, ceiling, mod, gcd and log, as well as the use of common list operators. Solving Problems using recursive functions and procedures: Inductively defined sets, writing recursive functions and procedures, proving function are correct using proof by Induction. Reasoning using First Order Logic: formal reasoning using truth tables and equivalence rules, use of conjunction, disjunction, implication, equivalence, negations, assertions, tautologies, contradictions, normal forms, universal and existential quantifiers. Representing natural language in a formal logic, semantics, interpretations and proving the validity of logic statements. Rules of inference, proof by contradiction and natural deduction.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: Two x 45 minute Class Examinations (10% each).

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Discrete Structures 2

Module code: CS152

Level: 1 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS151 or equivalent

Teaching Methods: 24 Lecture Hours, 12 Tutorial Hours, 44 hours Independent Study

Responsible Department: Computer Science

Module Objective: To provide a foundation in discrete mathematics suitable for computer scientists

Module Content: Formal reasoning: Inference rules, formal proofs. Program correctness: Hoare triples, assignment, consequence, composition, if-then, if-then-else, while Ordered structures: tuples, words over alphabets, languages over alphabets, lexicographical ordering, relations, representing arbitrary problems as language acceptance problems. Set theory: cardinality, countable sets, uncountable sets, diagonalisation, limits on computabilit. Graphs: graphs, paths, traversals, trees. Relations: binary relations, equivalence relations, equivalence classes, partitions, order relations, partial orders, topological sorting.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, not less than 60%. Continuous Assessment: Class Examinations up to 40%.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Sound Synthesis

Module code: CS153

Level: 1 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours

Responsible Department: Computer Science

Module Objective: To introduce and explain the principles of various sound synthesis techniques.

Module Content: This module will focus on the basic techniques of synthesis. Topics include basic elements of synthesis: additive, subtractive, distortion, granular techniques and physical models.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: Class Examinations 30%.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Science: Past, Present & Future

Module code: CS154

Level: 1 **Semester:** 1 & 2

Credit Weighting: 5

Teaching Methods: 24 lecture hours, 48 hours practicals, 8 hours independent study.

Responsible Department: Computer Science

Module Objective: To promote an understanding of some of the important ideas that have shaped computer science and to provide practical exposure to some of the more popular tools used by computer scientists.

Module Content: The past with an emphasis on the history of computing; the present with an emphasis on the Web, the Internet, and Multimedia; the future with an emphasis on Artificial Intelligence and robotics.

Assessment: Continuous Assessment 100%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: Continuous assessment mark is carried forward to the Autumn

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SUBJECT: COMPUTER SCIENCE

Module name: What is Computation?

Module code: CS156

Level: 1 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 lecture hours, 24 hours practicals, 32 hours independent study.

Responsible Department: Computer Science

Module Objective: Introduction to concepts of Computing Machines

Module Content: Contents: Introduction to models of computation. History of models of computation. Turing machines introduction. Languages. Regular expressions. Finite automata. Transition graphs. Kleene's theorem, Push-Down Automata, Non-deterministic Finite Automata. NFA to DFA conversion.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 70%. Continuous Assessment: 30%. Class Tests and Practicals

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Models of Computation

Module code: CS157

Level: 1 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS156 or equivalent.

Teaching Methods: 24 lecture hours, 24 hours practicals, 32 hours independent study.

Responsible Department: Computer Science

Module Objective: To promote an understanding of various models of computation

Module Content: Contents: Kleene's theorem. Finite Automata with output. The Von-Neumann machine. Regular languages. The pumping lemma. Context-free grammars. Syntax Trees. Regular grammars. Conversion from grammars to automata. Decidability. Turing Machines.

Assessment: Total Marks: 100%. Two-hour written examination at end of Semester 2 70%. Continuous Assessment (Class Tests and Practicals) 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Algorithms & Data Structures 1

Module code: CS210

Level: 2 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 6 Hours Tutorials and 26 Hours Independent Study.

Responsible Department: Computer Science

Module Objective: Selection and implementation of Data Structures.

Module Content: Introduction to algorithms and data structures. Contents: Features of a programming language suitable for the implementation of abstract data types (operators, types and expressions; control of flow; functions; program structure; recursion; input & output); data abstraction; arrays; stacks; sets; queues; lists; binary trees; elementary sorting (selection sort, insertion sort); searching (binary search); analysis of basic algorithms.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: Two-hour written examination.

SUBJECT: COMPUTER SCIENCE

Module name: Algorithms & Data Structures 2

Module code: CS211

Level: 2 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS210 or equivalent

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 6 Hours Tutorials and 26 Hours Independent Study.

Responsible Department: Computer Science

Module Objective: Advanced Java programming with the use of the SWING GUI and top-down development.

Module Content: Application of data structures and algorithms. Contents: Application of data structures and algorithms to problem solving; input and output of data; graphics; event-based programming and graphical user interfaces (GUI's). Use of inheritance in applications.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Architecture 1

Module code: CS220

Level: 2 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent

Teaching Methods: 24 Lecture Hours, 20 Laboratory Hours, 36 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: Introduction to basic processor circuitry and assembly language.

Module Content: Flip-Flops and Sequential Logic Design, Registers, Counters, Arithmetic Circuitry, Multiplexors and Decoders, Data Representation, Addressing Modes, Instruction Set, Assembly Language Programming.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%. Class Tests and Practicals

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Information Processing

Module code: CS230

Level: 2 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: The objective of this course is to give students an understanding of the principles of Information Processing, looking specifically at how they apply to the World Wide Web.

Module Content: The course starts with an introduction to Information Processing followed by a look at Data Storage and Data Transfer before moving on the architecture of the WWW and an in-depth look at some of the protocols involved (including SMTP, POP3 and HTTP). The course also deals with client side web programming in detail, covering topics like XHTML, JavaScript, DHTML, CSS, and XML before examining server side web programming and in particular the Common Gateway Interface and server side programming with Perl. The course also deals with Internet security and the operation of SSL as well as web proxies and server farms.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%. Laboratory Tests in Semester 2

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Operating Systems

Module code: CS240

Level: 2 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent

Co-requisite(s): CS210 or equivalent

Teaching Methods: 24 Lecture Hours, 20 Laboratory Hours, 36 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: Introduction to Operating System Principles & Concurrency Theory

Module Content: Functions of operating systems, scheduling theory, concurrency control, deadlock management, memory management, file systems, interprocess communication, protection and security.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 70%. Continuous Assessment: 30%. Class Tests and Practicals

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Architecture 2

Module code: CS253

Level: 2 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS220 or equivalent

Teaching Methods: 24 Lecture Hours, 20 Laboratory Hours, 6 Hours Tutorials and 30 Independent Study

Responsible Department: Computer Science

Module Objective: Course bridges the gap between studying the computer as a Digital Electronic Machine and as a programmable device. Students completing the course should have a thorough understanding of the fundamental operation of a CPU based microcomputer.

Module Content: Architecture of a Small Microprocessor based Computer, Assembly language programming, Interrupts and IO, Machine Cycle, Representation of data, Memory Buses

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 76%. Continuous Assessment: 24%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Object-Oriented Development

Module code: CS254

Level: 2

Credit Weighting: 10

Pre-requisite(s): CS101 or equivalent

Teaching Methods: 48 lecture hours, 48 hours tutorials & practicals, 64 hours independent study

Responsible Department: Computer Science

Module Objective: Software Methodology and Engineering: principles and practice of Object-Oriented development.

Module Content: Object-oriented design and implementation: objects, classes, attributes, messages & methods, relationships, aggregation, inheritance, polymorphism; support for reuse; implementation strategies; implementation issues; introduction to OO modelling languages; OO languages; Forward Engineering modelling notations.

Assessment: Total Marks: 100%. Two-hour written examination (open book) at the end of Semester 2, 70%. Continuous Assessment: 30%. Class Tests and Laboratory Tests in Semesters 1 & 2

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Communication Skills

Module code: CS255

Level: 2 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: Teach and improve basic written and oral communication skills.

Module Content: Presentation skills, effective verbal expression, preparing CV's and interviewing skills, effective listening skills, interpersonal communication skills, group communication skills, identifying elements of persuasion and using these effectively, public speaking, precise writing skills, critical analysis, research methods.

Assessment: Total Marks: 100%. No Formal Written Examination. Continuous Assessment: 100%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: Resubmission of Technical Report. Other marks carried from Summer.

SUBJECT: COMPUTER SCIENCE

Module name: Programming Languages and Compilers

Module code: CS310

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS210

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To introduce the fundamentals concepts of compiler design.

Module Content: Compilers, interpreters and assemblers; applications environments; formal grammars; lexical scanning; syntactic parsing; symbol tables and semantic analysis; code and data generation; optimisation.

Assessment: Total Marks: 100%. 70%. Two-hour written examination at the end of Semester 1.

Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Networks

Module code: CS320

Level: 3 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent, CS240 or equivalent

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To introduce the student to the principles and practices used in the design and implementation of communication networks.

Module Content: Introduction to networking: history, evolution and architectural elements of networking, network types, layered models, OSI and TCP/IP models. Physical layer: application of information theory to communications, transmission media, the telephone system, modulation, multiplexing. Data-link layer: framing, error detection and correction, flow-control, sliding window protocols, case study of real-world protocol. Medium access control sub-layer: the channel allocation problem, ALOHA protocols, CSMA and CSMA/CD, IEEE 802 standards. Network layer: network layer organisation, routing, congestion control, Internet Protocol (IP), Internet control protocols. Transport layer: transport layer services, Transmission Control Protocol (TCP), connection-management, two-army problem.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Software Engineering & Software Process

Module code: CS335

Level: 3 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To understand the principles, practices and techniques required for Software Engineering.

Module Content: Issues in software engineering; modelling the software process; UML; software cost estimation; software process quality management; software design with reuse; distributed system architectures.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%. 2 One- hour Practical examinations at end of Semester 1.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Advanced Architecture

Module code: CS350

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent, CS220 or equivalent, CS240 or equivalent

Teaching Methods: 24 Lecture Hours, 56 Tutorials/Practicals/Assignments/ Independent Study Hours

Responsible Department: Computer Science

Module Objective: Focus on in depth design alternatives for computer system components and communication interfaces leading to a balanced computer system design.

Module Content: Field programmable gate arrays, Memory systems hierarchy, on-chip decoding, interleaving, cache organisation and coherency, processor design, instruction formats and coding, microprogrammed control, pipelining, superscalar architectures, RISC/CISC design, floating point arithmetic, Bus systems synchronisation and arbitration, I/O interfacing, performance issues.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Programming Paradigms

Module code: CS351

Level: 3 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: Principles and practice for various programming paradigms.

Module Content: 4GL principles and practices (logic and functional programming); parallel and concurrent programming principles and practices; GUI programming principles and practices.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Architecture 3

Module code: CS352

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS220 or equivalent, CS253 or equivalent

Teaching Methods: 24 Lecture Hours, 18 Laboratory Hours, 38 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: The course provides a comprehensive introduction to practical issues involved in interfacing in both the industrial and the research environment.

Module Content: Communication: Physical links, Wires/Fibres, Shannon's theory, Modulation methods, Serial/Parallel. Interfacing: Instrumentation, I/O Control methods, Analogue meets digital, Control Strategies Standard devices: Mouse, Video, Keyboard, Interrupts. Embedded Control: Microcontrollers, FPGAs, PLC, Lego Mindstorms. Interfacing: 8255 Based Traffic Light controller, 8254 Based Counter Timer, Analogue to Digital Conversion, Digital to Analogue Conversion, Interrupts, Optical Sensors, Stepper/Servo/DC Motors, switching large loads. Practical Skills: Use of Oscilloscopes and Multimeters, for basic electrical tests, including the identification and test of components. Graphics and Vision: VGA Screen Driver, Interfacing using a vision camera. Embedded Controllers: Microcontrollers, PLC Programmable Logic Controller, Lego Mindstorms, FPGAs

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 85%. Continuous Assessment: 15%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Group Project

Module code: CS353

Level: 3 **Semester:** 1

Credit Weighting: 10

Teaching Methods: This course employs a Problem-based Learning (PBL) approach. Tutorials are arranged in specific topics, as dictated by student needs. Course delivery is through team practical work. There is one four-hour practical period each week during one semester.

Responsible Department: Computer Science

Module Objective: To experience working in a team on a real-world software project.

Module Content: Software requirement elicitation, design, testing and implementation as a team; project management techniques and meeting skills; specific technical content matched to the project topic.

Assessment: Total Marks: 100%. Two hour written examination 70%. Continuous Assessment 30%. Continuous assessment is employed, including student peer assessment. Feedback forms are compiled by the students to assess the usefulness of the course and steer the tutorial sessions. Meetings between individual team members and course instructor(s) are also employed. A full team presentation is made at the end of the project. Students are awarded a team and individual mark.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Theory of Computation

Module code: CS355

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): (i) A discrete structures course or an introductory logic course or a models of computation course, (ii) an introductory programming course

Co-requisite(s): An algorithms and data structures course (co-requisite or pre-requisite)

Exemptions: Students need not take this course if they have taken CS370

Teaching Methods: 24 lecture hours, 56 Tutorials/Practicals/Independent Study Hours

Responsible Department: Computer Science

Module Objective: To provide an understanding of aspects of computer theory related to machine models and their computational power

Module Content: Mathematical preliminaries; regular languages, finite automata, and regular expressions; nondeterminism and determinism in finite automata; properties of regular languages; nonregular languages; context-free languages, context-free grammars, and pushdown automata; nondeterminism and determinism in pushdown automata; properties of context-free languages; non-context-free languages; multi-stack machines; recursively-enumerable languages and Turing machines; recursive and nonrecursive languages; proofs of undecidability.

Assessment: Total Marks: 100%. Two-hour written examination, 60%-80%. Continuous Assessment: remainder of marks

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Optical and Image Processing

Module code: CS356

Level: 3 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To introduce the underlying concepts and practices of Signal processing

Module Content: Time-domain signal representations and the need for spectral analysis, FIR filters: description in terms of their impulse response, frequency response and system function. Spectral Analysis and the DFT. The role of the FFT algorithm and its application to the spectrogram.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 90%. Continuous Assessment: 10%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Industrial Work Placement

Module code: CS359

Level: 3 **Semester:** 2

Credit Weighting: 20

Teaching Methods: N/A

Responsible Department: Computer Science

Module Objective: Experience software engineering work in an industrial or commercial environment.

Module Content: A minimum of six months work placement from February.

Assessment: Student report and report from company supervisor.

Pass Standard: A successful report is required to advance to fourth year.

SUBJECT: COMPUTER SCIENCE

Module name: Semantics of Programming Languages

Module code: CS360

Level: 3 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Tutorials/Practicals/Independent Study Hours

Responsible Department: Computer Science

Module Objective: Introduction to Lambda Calculus, Lisp, Scheme and functional programming techniques

Module Content: Lambda Calculus and computability theory; recursion; types; lists and trees. Interpreters: strict, partial, and lazy. Overview of Scheme and its implementation.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 70%. Continuous Assessment: 30%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computation and Complexity

Module code: CS370

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS151 or CS156 or equivalent, CS101 or equivalent

Co-requisite(s): CS210 or equivalent.

Exemptions: Students need not take this course if they have taken CS335

Teaching Methods: 24 lecture hours, 56 Tutorials/Practicals/Independent Study Hours

Responsible Department: Computer Science

Module Objective: To provide an understanding of the limits of computers in terms of decidability and computational complexity

Module Content: Incompleteness, Turing's computable numbers, algorithmic decidability and uncomputability, models of computation and the reducibility between unrestricted models. Intractability, machine-independent complexity, measures of complexity and asymptotic analysis. Complexity classes, intra-class reductions, complexity analysis (best, worst, average case) of algorithms, optimal algorithms for a given model of computation and given complexity measures. More complexity classes, nondeterminism, NP, NP-completeness, NP-hardness, membership and nonmembership.

Assessment: Total Marks: 100%. Two-hour written examination, 60%-80%. Continuous Assessment: remainder of marks

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Machine Learning & Neural Networks

Module code: CS401

Level: 4 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 hours Lectures, 6 hours using online materials and resources, 10 hours practicals, and 40 hours Private study.

Responsible Department: Computer Science

Module Objective: Get computers to analyse previous solutions to some problem, and from this solve new instances of that problem.

Module Content: Machine learning principles. Target functions and Inductive bias. Decision trees, ID3 and C4.5. Lazy learning, CBR and K Nearest neighbours, Biological nerons and Hebbian learning. Perceptrons and decision spaces. Multi layer-Perceptrons, and back-propagation learning. Recurrent neural networks, Hopfield neural networks. Stochastic networks. Evolutionary and Genetic computation.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Parallel & Distributed Systems

Module code: CS402

Level: 4 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS211 or equivalent, CS240 or equivalent, CS370 or equivalent

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: In depth theory of Distributed Systems, Parallel Systems

Module Content: Models of distributed computation, processes, threads and groups, load sharing and process migration, interprocess communication, remote procedure call, ordered broadcasts, event ordering, real and logical clocks, transaction systems, distributed shared memory, distributed file systems, naming, authentication, fault tolerance. Parallel computation and parallel programming.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Artificial Intelligence & Natural Language Processing

Module code: CS404

Level: 3 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS151 or equivalent

Teaching Methods: 24 Lecture Hours, 24 Laboratory Hours, 32 Hours Tutorials and Independent Study.

Responsible Department: Computer Science

Module Objective: To introduce the fundamentals concepts of Artificial Intelligence and Natural Language Processing

Module Content: Defining intelligence, artificial life; the limits of computation; Logic and theorem-proving; Problem-solving and game-playing; Graph-searching, state-spaces, two-person games; Programming for AI in LISP,

Prolog, etc; Expert systems and knowledge representation; Incorporating Uncertainty.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Applied Software Engineering

Module code: CS406

Level: 4 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: Gain an overview of how to approach the construction of large software systems in the real world.

Module Content: The course concentrates on software quality, software processes, software testing, software design and the Unified Modelling Language (UML). It also explores software project management techniques.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%. Assessment is through an exam, which will account for at least 80% of the final mark. Assignments will not account for more than 20% of the final mark.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Formal Methods

Module code: CS407

Level: 4 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS151 or equivalent, CS101 or equivalent

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: To introduce the basics of formal methods

Module Content: Formal Methods: Motivations for formal derivation of programs; programming as a methodology; program semantics; overview of Dijkstra-Gries method; transformations and the weakest precondition calculus; from specification to program; loop guards and invariants; efficiency; case studies; moving to macro specification, Z & VDM; industry and Formal Methods; sets, relations, and types; schemas; proof in Z/VDM; brief case studies.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Vision

Module code: CS410

Level: 4 **Semester:** 1

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: The aim of this course is to give the student a firm understanding of the theory underlying the concepts and methodologies for digital image processing, analysis and computer vision.

Module Content: Content: Introduction (human visual perception, basic principals of Industrial Machine Vision Systems). Image formation (digital images, image acquisition, resolution). Image enhancement (statistical methods, frequency methods). Segmentation (edge and region based segmentation, statistical methods). Mathematical morphology. Feature extraction and description (shape, geometric features). Selected topics in Image Analysis. On completion of this module students understand sufficient fundamentals to be able to continue to learn about the subject independently.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1 not less than 80%. Continuous Assessment: up to 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Computer Science & Philosophy

Module code: CS412

Level: 4 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: This course provides an opportunity to examine scientific methodologies, the justification for science and the extent to which computer science has a scientific core.

Module Content: Content: Common-sense view of science and it's problems. Inductive reasoning and naïve science. Scientific methodology. Falsifacation: Popper. Sophisticated falsificationism: Lakatos. Limitations of falsificationism. Two views of computer science: formal versus empirical. Kuhns's theory of scientific paradigms. Paradigm's in computer research. Feyerabend and the rejection of method. Similarity with Eric Raymond's Great Programmer Theory. The political philosophy of growth in computer science. Philosophy of mathematics and the search for the object of computer science. The role of artificial intelligence. Minds and machines. The Chinese Room debate.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Neurocomputation

Module code: CS413

Level: 4 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours (including a weekly reading, and a weekly student seminar)

Responsible Department: Computer Science

Module Objective: To provide students with an appreciation of current thinking on the computational nature of the human brain and the implications this has for the development of artificially intelligent systems

Module Content: The content covers the following topics: (a) Neuroscience: This section of the course will provide a brief introduction to the modern theory of neurons; the cellular components of the nervous system; how neurons work; functional neuroanatomy; principal anatomical divisions; structure of the cortex; specialisation and lateralisation. (b) Evolution and Development: Brains do not exist in isolation, they evolved, and the process of evolution places constraints on their architecture and style of computation. This section of the course will explore two papers dealing with the implications of an evolutionary and developmental perspective on brain function. (c) Vision: The visual capacity in humans accounts for a significant proportion of the cerebral cortex. It has been extensively studied in humans and animals, and is the best understood part of the brain. However, much of the way the visual system operates is counterintuitive from a computational point of view. (d) Cognition: Our understanding of the neural substrates of cognition is considerably less than that of the sensory or motor areas. The two papers in this section of the course will explore a number if theories and models that aim account for the brain's cognitive capacities. (e) Language: Our language capacity is what distinguishes us from the all other animals. Apes have a limited language, but with nothing of the productivity of their human cousins. This section of the course will explore theories and models that try to account for the difference that makes the difference.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 50%. Continuous Assessment: 50%. Written responses to weekly readings 40%. Seminar presentation 10%.

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Cryptography

Module code: CS416

Level: 4 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): MT158 or equivalent, CS101 or equivalent

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: The course aims to introduce the main areas of cryptology with an emphasis on implementation and cryptanalysis of concepts.

Module Content: Introduction to cryptology, Classical cryptosystems, their implementations and their cryptanalysis. Symmetric ciphers, their implementation and their cryptanalysis. The java cryptographic architecture. Message authentication and hash functions. Asymmetric ciphers. The discrete log problem and its applications to cryptanalysis. Factorization and its applications to cryptography. Cryptographic protocols and their application in Computer Science.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 85%. Continuous Assessment: 15%

Penalties: The problems work on a first past the post system. Problems are grouped together in sections. Any student succeeding in solving one problem in a section will get no more marks for solving other problems in the same section. This is a measure to spread out the marks among more students.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Numerical Computation

Module code: CS417

Level: 4 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: The purpose of this course is to introduce computer science students to the basic techniques of Numerical computation used to solve real world problems. Good software engineering practice tells us not to reinvent the wheel if we can avoid it so the course will concentrate on utilising powerful numerical software packages. The emphasis will be on the role of the computer scientist in the implementation of these techniques. Students will be introduced to a variety of numerical algorithms and study their strengths and weaknesses, highlighted by interesting and relevant examples. The course will not include rigorous theoretical analysis but powerful mathematical techniques will be discussed and implemented.

Module Content: Orientation: An introduction to Matlab (The Matlab software package will be used extensively throughout the course. No previous knowledge of Matlab will be assumed) Section 1: Errors and floating point arithmetic

Section 2: Systems of linear equations

Section 3: Interpolation

Section 4: Ordinary Differential equations

Section 5: Numerical differentiation

Section 6: Topics from Boundary value problems, Partial differential equations, Pseudo random number generators and other numerical topics.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Robotics

Module code: CS421

Level: 4 **Semester:** 2

Credit Weighting: 5

Semester: 2

Teaching Methods: 24 Lecture Hours, 6 Tutorial Hours, and 50 Independent Study Hours.

Responsible Department: Computer Science

Module Objective: The course focuses on building basic mathematical methods for describing and controlling the motion of robotic systems.

Module Content: Introduction: History of Robotics and machine automation, Application areas, Definition of Robotics. Articulated Robots (Arms): Mechanics of Motion (Applied Maths, Physics), Simple Machines (Levers, Wedges, Gears etc), Joints, Number Synthesis (Grueblers Equation), Coupler Curves, Cartesian, Cylindrical, Spherical, SCARA Robots, Forward and Inverse Kinematics, Matrix Methods, Denavit & Hartenberg Matrix (DH Matrix), The Puma 560 a case study, Wrists and Hands (Jacobians). Sensors

and Actuators Hydraulic, Pneumatic, Electric Actuators, Control Valves, Motors (Stepper, DC), Exotic Actuators (Muscles, Piezoelectric), Transmissions (Gears, Belts and pulleys), Instrumentation, Position Transducers, Servo control theory (closed loop control), Simulation of servo controller. Mobile Robots: Wheels (Rimless, Venetian, Tyred, Tracks), Walking Machines, Foot Fall Sequences, Gait Matrixes (Steps and Strides), Stability. Robot Navigation:Triangulation, Trilateration, Beacon Design, GPS, Path Planning.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 2

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Programming Language Design & Language Semantics

Module code: CS424

Level: 4 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS101 or equivalent, CS151 or equivalent

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: To give the student an understanding of the issues involved in designing a programming language.

Module Content: This module is about the design of programming languages. In particular we are concerned with the syntax, the semantics and usability of a programming language. We will study the appearance and structure of a languages sentence to determines which symbol sequences are permitted phrases of the language (syntax), the assignment of meanings to the sentences of a programming language so that we can explain what the various phrases of a language mean (semantics) and the usability of a language, including the possible areas of application of the language.

Assessment: Total Marks: 100%. Two-hour written examination at the end of Semester 1, 80%. Continuous Assessment: 20%

Penalties: See page 286.

Pass Standard: See page 286.

Autumn Supplemental Examination: See page 286.

SUBJECT: COMPUTER SCIENCE

Module name: Audio & Speech Processing

Module code: CS425

Level: 4 **Semester:** 2

Credit Weighting: 5

Teaching Methods: 24 Lecture Hours, 56 Practicals/Tutorials/Independent Study Hours.

Responsible Department: Computer Science

Module Objective: Advanced topics in audio and speech processing

Module Content: Time domain speech processing; frequency domain speech analysis; time frequency representations; implementations of digital audio effects. Algorithms for the analysis, synthesis, and modification of instrumental sounds.

Assessment: Total Marks: 100%. Two-hour written examination at end of Semester 2 80%. Continuous Assessment 20%

Penalties: See page 286

Pass Standard: See page 286

Autumn Supplemental Examination: See page 286

SUBJECT: COMPUTER SCIENCE

Module name: Final Year Project

Module code: CS440

Level: 4 **Semester:** 1 & 2

Credit Weighting: 15

Teaching Methods: 240 hours independent work. Regular meetings with the project supervisor where each students individual requirements are addressed.

Responsible Department: Computer Science

Module Objective: Develop each students ability to work effectively on a challenging topic: to research alternative solutions, develop a solution, and to evaluate both the usefulness of the solution and the process that lead to it.

Module Content: Depends entirely on the individual project, which may be proposed by either the student or a Member of staff.

Assessment: Total Marks: 100%. A written thesis plus any relevant Supporting materials.

Penalties: The marks awarded for theses submitted after the deadline will be reduced by 2% for every day (or any part of a day) that they are late - up to a maximum of 14% deduction for projects 7 days overdue. Projects will not be accepted later than one week past the deadline.

Pass Standard: 40%

SUBJECT: COMPUTER SCIENCE

Module name: Final Year Project – Single Honours

Module code: CS450

Level: 4 **Semester:** 1 & 2

Credit Weighting: 15

Teaching Methods: 240 hours independent work. Regular meetings with the project supervisor where each students individual requirements are addressed.

Responsible Department: Computer Science

Module Objective: Develop each students ability to work effectively on a challenging topic: to research alternative solutions, develop a solution, and to evaluate both the usefulness of the solution and the process that lead to it.

Module Content: Depends entirely on the individual project, which may be proposed by either the student or a Member of staff.

Assessment: Total Marks: 100%. A written thesis plus any relevant Supporting materials.

Penalties: The marks awarded for theses submitted after the deadline will be reduced by 2% for every day (or any part of a day) that they are late - up to a maximum of 14% deduction for projects 7 days overdue. Projects will not be accepted later than one week past the deadline.

Pass Standard: 40%

SUBJECT: COMPUTER SCIENCE

Module name: Final Year Project – Double Honours

Module code: CS460

Level: 4 **Semester:** 1 & 2

Credit Weighting: 5

Teaching Methods: 80 hours independent work. Regular meetings with the project supervisor where each students individual requirements are addressed.

Responsible Department: Computer Science

Module Objective: Develop each students ability to work effectively on a challenging topic: to research alternative solutions, develop a solution, and to evaluate both the usefulness of the solution and the process that lead to it.

Module Content: Depends entirely on the individual project, which may be proposed by either the student or a Member of staff.

Assessment: Total Marks: 100%.
A written thesis plus any relevant Supporting materials.

Penalties: The marks awarded for theses submitted after the deadline will be reduced by 2% for every day (or any part of a day) that they are late - up to a maximum of 14% deduction for projects 7 days overdue. Projects will not be accepted later than one week past the deadline.

Pass Standard: 40%

SUBJECT: COMPUTER SCIENCE

Module name: Process Assessment, Improvement and Metrics

Module code: CS601

Level: 5 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: The objective is to provide students with a knowledge of SPI and the role of metrics in process quality and assessment.

Module Content: CMM, ISO9000, SPICE. Software metrics and their application in software development process.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 2 not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Rigorous Software Process

Module code: CS603

Level: 5 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: To examine the reasons why software projects fail, and identify the role of rigour in the software process in improving the chances of success.

Module Content: All aspects of software development lifecycle – requirements, design, implementation, testing, maintenance, and reuse – with emphasis on rigour and formality.

Assessment: Total Marks: 100%. not less than 60%. Three-hour written examination at the end of Semester 1. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: The Mathematics and Theory of Computer Science

Module code: CS605

Level: 5 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: The purpose of this module is to explain the fundamental and practical limits of computers.

Module Content: Students will learn how to identify problems that cannot be solved with a computer, how to identify problems that should not be solved (but only approximated) with a computer, and how to proceed in both cases.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 1 not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Requirements Engineering and System Design

Module code: CS607

Level: 5 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: This module investigates user requirements document (URD), knowledge gathering techniques.

Module Content: Structured Systems Modelling, OO modelling and the Unified Modelling Language using Rational Rose.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 2 not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Testing and Benchmarking Strategies

Module code: CS608

Level: 5 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: This module introduces the principles and practice of software testing.

Module Content: Classic approaches to testing procedural software; specific approaches to testing object-oriented software. Testing as a software quality measure. Blackbox, whitebox, integration, regression, stress, unit, configuration testing.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 1, not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Human-Computer Interfaces

Module code: CS610

Level: 5 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: In this module you will explore machine and human translation, and the cultural implications.

Module Content: Design for localisation and globalisation; HCI design; GUI design.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 2, not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Object-Oriented Programming and C++

Module code: CS613

Level: 5 **Semester:** 1

Credit Weighting: 5

Responsible Department: Computer Science

Module Objective: This module is a pre-requisite for all others. It examines the object oriented programming paradigm, focusing primarily on the syntax and semantics of the C++ programming language.

Module Content: A combination of advanced object-oriented programming techniques and design issues in object-oriented languages are discussed.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 1, not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Component Based Software Engineering

Module code: CS614

Level: 5 **Semester:** 1

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: This module is concerned with the practical aspects of distributed component-based development using Java technology.

Module Content: The course covers both Java Beans and Enterprise Beans. It is a pre-requisite for CS615 and CS616.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester, not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Internet Solutions Engineering

Module code: CS615

Level: 5 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent, CS614 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: This module looks at the development of web-based software, web standards, client and server-side programming and database integration.

Module Content: The content of the module examines the course objectives through the Java technologies, making comparisons with alternative technologies and emphasising the application of software engineering principles.

Assessment: Total Marks: 100%. Three-hour written examination at the end of Semester 2, not less than 60%. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Cryptography and Network Security

Module code: CS616

Level: 5 **Semester:** 2

Credit Weighting: 5

Pre-requisite(s): CS613 or equivalent, CS614 or equivalent

Teaching Methods:

Responsible Department: Computer Science

Module Objective: The purpose of the module is to familiarise the students with the concepts behind information security and the networked systems on which information is stored.

Module Content: The module is a mix of theoretical concepts and practical implementations. Attack and defence are covered. Interesting emerging systems will be outlined and industrial security certifications discussed.

Assessment: Total Marks: 100%. not less than 60%. Three-hour written examination at the end of Semester 2. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

SUBJECT: COMPUTER SCIENCE

Module name: Reliable Systems

Module code: CS619

Level: 5 **Semester:** 2

Credit Weighting: 5

Responsible Department: Computer Science

Module Objective: The reliable systems module investigates why systems fail, examining the consequences of faults, failures and errors caused by both the software and the end operators.

Module Content: The module explores software engineering approaches, techniques and technology employed to increase system reliability, including Fault Tolerance, Self Healing Systems and state-of-the-art software processes that embody Fault Avoidance.

Assessment: Total Marks: 100%. not less than 60%. Three-hour written examination at the end of Semester 2. Continuous Assessment: up to 40%

Penalties: See page 286.

Pass Standard: 50%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.

Autumn Supplemental Examination: Three-hour written examination. Continuous assessment mark is carried forward to the Autumn.

Penalties: *Penalties will be at the discretion of the lecturer and will be announced prior to the commencement of the module.*

Pass Standard: *40%. A standard of at least 30% must be attained in continuous assessment. Otherwise the student may be deemed to have failed the module by extreme weakness.*

Autumn Supplemental Examination: *Two-hour written examination. Continuous assessment mark is carried forward to the Autumn.*