



# **Oman College of Management & Technology**

## **BSc. In Computer Science Courses Description**

## **Computer Science** **“Bachelor’s Degree”**

### **Course Description**

#### **College Requirements**

**501100: Introduction to Computer Sciences: (3 Credit Hours)**  
General introduction to computer systems, technology and applications, Computer application package such as word processing, database management systems, power point, Internet etc.

**701101: English Language (1) (3 Credit Hours)**  
This course will have more stress on language skills, especially from a business point of view. The course aims at a consolidation of language skills at the intermediate level as continuation of foundation studies. Each skill will be taught in more extensive manner to enable the students to use the language as a source of communication more accurately. Stress will be on teaching the basic grammatical structure as well that are important for the use and application of basic skills. Extensive reading exercises and group discussions will be held to enable the students to learn new vocabulary and then practice and apply it more effectively. Along with that guided and individual writing exercises will be done at the end of each module. The course will cover all the areas of language skills. It will support them for the future English studies and equip them to use their language skills without fail.

**701102: English Language ( 2) (3 Credit Hours)**  
This course is a continuation of language skills learnt at the intermediate level. The course will have extensive writing and reading components and will take students to upper intermediate level of language competency. It equally stresses functional grammar and comprehensive coverage of vocabulary related to marketing, finance and human resources. As part of the course, students are required to acquire skills in report writing, negotiating, emails and presentations. The course also features a lot of speaking activities tailor made to suit the business environment in the modern day context. The course also functions as a preparation for advanced level of English, as language is taught in a very comprehensive manner.

**701103: English Language ( 3)****(3 Credit Hours)**

This course is the final polishing and shaping of the student's language at the advanced level of English learning. This course will enlighten the student's abilities of using proper language skills. It's a combination of stimulating content with comprehensive grammar, vocabulary and skill work. This course will give students an experience of learning the language as a whole, not through separated skills. The clear explanation and extensive practice exercises revise and expand student's knowledge of grammar. Man of today needs high frequency and useful vocabulary that is practiced in this course by special focus on phrases and language "chunks". Competence in speaking skills is more focused as compared to other skills. So, the target of the course is to enable the students to speak and understand English completely and also to adjust their selves in any kind of working environment, in or out of their country.

**701105: Arabic Language****(3 Credit Hours)**

The course covers grammar, reading and writing practice as well as an insight into the culture of the region. Students will learn the basics of the language and be able to build up enough knowledge to read and write at a basic level. Given the subtle differences between eastern and western cultures, it is beneficial to the students to be aware of such differences which are embedded in the language.

**701108: Arabic Islamic Civilization****(3 Credit Hours)**

This course is designed as an introduction to Islamic civilization and thought and requires no prior knowledge of Islam or Middle Eastern History. It will focus on the political, social and religious institutions that shaped Islamic civilization as well as on the intellectual and scholarly traditions which characterized the Muslim world from the foundation of Islam onwards. Beginning with the geographical, cultural and historical context of the rise of Islam, the life of the Prophet, the Qur'an, it will extend through modernity and beyond, with a special emphasis on texts.

## Electives

### **701107: History of Oman (3 Credit Hours)**

This course deals with the history of Oman history in the Islamic and modern periods. In the first period, it addresses the entry of Islam to Oman and Oman's political and cultural conditions during the Amawi and Abbasi periods. It also discusses the emergence of the Ibadhi Imamate and its stand against the ambitions regional powers during the same period until the sixteenth century AD /the tenth century AH. The second period focuses on the history of Oman in the modern era, starting from the establishment of the State Eliearbi and the struggle against foreign powers and the establishment of the State of Al-Said and its internal and external policies as well as the role of Oman in the human civilization during the periods in question.

### **701109: Islamic Culture (3 Credit Hours)**

This course aims to establish the concept of Islamic culture and its position among the other international cultures, its position in the Muslim life, its sources, its bases and its characteristics. It also the fields of Islamic culture in faith, worship, relations, morals, knowledge, the clash between cultures in addition to Globalization, Human Rights, Woman Rights, Democracy and other contemporary issues

### **701110: Environment & Society (3 Credit Hours)**

Society and the Environment is an examination of the interactions between people and the environment. The course examines the concepts, actors, and processes of environment and society, an assessment of environmental and political philosophies, models for action, social movements, and the problems and prospects of creating sustainable societies. Each semester selected case studies will be examined.

### **701112: Omani Society (3 Credit Hours)**

This course aims to enlighten students with the reality contemporary Omani society focusing on the of the Renaissance and the path to modernization and comprehensive development, through descriptive and analytical study of the following: the general features of the Omani society; the administrative organization of the state; the Omani contemporary economy; the Oman village in the context of agricultural development; industrial development; education and human resource development; and social welfare policies and their evolution.

### **701113: Communicational Culture (3 Credit Hours)**

This offers a broad overview of the conceptual vocabularies and critical strategies that scholars use to study communication. The goal here is to provide students with the ability to recognize and discuss these various perspectives, and thus begin to develop the tools needed to become an intelligent observer of human communication as well as an effective participant in contemporary culture.

### **701114: Islamic Economic (3 Credit Hours)**

This Course allows the student to develop a critical understanding of the development of Islamic economic and finance theory and become more appreciative of the contributions made by Muslim thinkers. Other than referring to the Quran and Sunnah as the key referral materials, this module also discusses the related theories from the conventional perspective.

**701117: Introduction to Psychology (3 Credit Hours)**

Psychology can be defined as the scientific study of mental processes and behavior. While psychology is most often associated with clinical issues (i.e. abnormal, personality), this makes up only a small portion of the field. Other specialties within the field include, to name a few, physiological, social, organizational, and developmental psychology. We cannot understand ourselves or the individuals around us without looking at how we develop, how we behave in a social context, or the physiological components of our behavior. Thus, this course will serve as an overview of the major fields within psychology with an emphasis on developing an understanding of psychology as the science of human thought and behavior. We will also learn to critically evaluate "common sense" knowledge about how people function.

**701118: Introduction to Library Sciences (3 Credit Hours)**

An overview of the history, philosophy, purpose, functions and processes, users, collections and evaluation of academic, public, school and special libraries and information centers; of the history and trends of books and other media, publishing, and information technology; of the principles and basic elements of the collection development process; of relevant legal and ethical topic intellectual property (copyright), access, confidentiality of records, intellectual freedom and censorship; and of current professional issues.

**7011120: Physical Education (3 Credit Hours)**

The purpose of this course is to provide students with the knowledge, skills and values they need to become healthy and physically active for a lifetime. This course addresses both the health and skill related components of fitness which are critical for students' success. Activities in this course may include, but are not limited to the following: Health-related fitness components, fitness/wellness concepts, nutrition, goal setting, spinning, stability balls, Pilates, steps, aerobics, circuit training, weight training, resistance bands, jump ropes, walking, wellness center equipment.

**7011122: Human Right Issues (3 Credit Hours)**

This course offers philosophical, legal, and political perspectives on human rights. After a short historical introduction to international human rights, it surveys international human rights treaties, courts, and institutions. Next it turns to topics in human rights theory, covering some contemporary philosophical theories of human rights. The final section explores some human rights problems and controversies such as economic and social rights, group rights, and cultural relativism.

## **Department Requirements**

**501100 Introduction to Computer Science (3 Credit Hours)**

This course covers a general introduction to computer systems, technology and applications, Computer application package such as word processing, database management systems, power point, Internet etc.

**502105 Programming in a Selected Language (3 Credit Hours)**

This course covers the basic concepts, properties, data representation, and syntax of a selected programming language. Students will learn how to use the structured programming approach. The course also covers the basic foundations of object-oriented programming.

**502101 Calculus I (3 Credit Hours)**

This course covers the following topics: Sets, inequalities, area, functions, mathematical inductions analytic geometry, polynomials, limit, continuity, differentiation.

**502103 Discrete Mathematics (3 Credit Hours)**

This course gives a description to the following topics: Set, statements, logic, set operations, truth tables, venn diagram, Boolean functions, relations, mathematical inductions, trees.

**502202 Data Structures (3 Credit Hours)**

This course covers the following; Logical and Physical representation of data, algorithms, complexity and efficiency, data structure operations, dense lists, and matrix representations, linked lists and their different variations, string storage representation and manipulation, queues and stacks and their applications, tree structures and their different variations, graphs and networks, sorting techniques, searching techniques.

**502301 Object Oriented Programming (3 Credit Hours)**

Concepts, object-oriented way of thinking, classes and methods, messages, instances and initialization, inheritance, static and dynamic binding, replacement and refinement, polymorphism, visibility and dependency, implementation issues, case studies and examples. The course could be structured around on of the object-oriented languages: such as Smalltalk, C++, Objective C, Object Pascal, etc.

**502302 Database Management Systems (3 Credit Hours)**

This course covers the following: Concepts, database architecture, relational algebra, the relational model and the normalization process, functional dependencies, database integrity and security, concurrent operations on databases, distributed database systems architecture, object-oriented database approach, and deductive databases.

**503401 Operating Systems (3 Credit Hours)**

This course covers the following: Operating system structure and services, processor scheduling, concurrent processes, synchronization techniques, Deadlocks, memory management, virtual memory, input/output, secondary storage management, and file systems

**503407                  Multimedia Systems    (3 Credit Hours)**

This course covers the following: Multimedia concepts and terminology, interactive multimedia technology, multimedia data types and formats (graphics, images, animation, audio, video, etc.), desktop publishing, hypermedia, presentation media, integrated multimedia authoring techniques, techniques for designing and producing multimedia applications, using multimedia authoring tools, industry standards, future directions in interactive multimedia technology.

**502102                  Calculus II    (3 Credit Hours)**

This course covers the following: Trigonometric functions, derivatives, velocities, tangent lines, rules of differentiation, rates, mean value theorem, local extremes, integrals, area under a curve, mean value theorem for integrals, indefinite integrals, derivations of inverse functions, general logarithms, exponential function, hyperbolic functions.

**502104                  Probabilities    (3 Credit Hours)**

The course covers the basic principles of the theory of probability and its applications. Topics include combinatorial analysis used in computing probabilities, the axioms of probability, conditional probability and independence of events; discrete and continuous random variables; joint, marginal, and conditional densities, moment generating function; laws of large numbers; binomial, Poisson, gamma, univariate, and bivariate normal distributions.

**502203                  Algorithms Analysis and Design    (3 Credit Hours)**

This course covers the following topics: Complexity analysis of algorithms, design and analysis of computer algorithms such as; divide and conquer, greedy method, trees, graphs, NP-complete problems.

**503200                  Programming in Java Language    (3 Credit Hours)**

The course includes the following topics: Java Applications, Java Applets, Control Structures, Methods, Arrays, Object-Based Programming: Inheritance, Polymorphism, Strings and Characters, Exception Handling and Files and Streams.

**503201                  Assembly Language Programming    (3 Credit Hours)**

Topics include number systems and their rules for arithmetic; basic central processing unit (CPU) organization concepts such as registers, data paths, the arithmetic and logic unit (ALU), and the interface to random access memory (RAM); instruction formats, addressing modes and their uses with a variety of data structures; and parameter passing techniques including the use of a stack frame. The use of good programming methodologies to develop and document algorithms at the assembly language level is emphasized.

**503202                  Computation Theory    (3 Credit Hours)**

This course covers the following: Languages and their representation, grammars, finite automata; deterministic and non-deterministic. Regular languages, regular expressions. Context-Free languages, push down automata, computability and complexity.

**503203 Applications Software Packages (3 Credit Hours)**  
This course is designed for developers who are moving to Visual Basic with some understanding of basic programming concepts. Student will learn Visual Basic syntax, event-driven programming, and how to compile an application with the native code compiler. You will learn the VBA language, handle run-time errors, debug, work with forms and controls, and add simple database support to your applications.

**503205 System Programming (3 Credit Hours)**  
This course covers the following: Design and implementation of systems programs, including text editors, file utilities, monitors, assemblers, relocating linking loaders, I/O handlers, schedulers, programming language definitions, design of interpreter programs.

**503207 Information Technology (3 Credit Hours)**  
This course covers the following: Data processing technologies, I/O and storage technologies, multimedia technologies, emerging telecommunications and network technologies, IT applications (such as: electronic mail, electronic publishing, e-commerce, e-learning, e-government, money transfer and banking systems, robotics and factory control systems), selecting hardware and software criteria, the software and hardware market, societal and global issues of IT, future trends.

**503209 File Structures (3 Credit Hours)**  
This course covers the following: File concepts, basic file operations, physical file organization and compression techniques, sequential file structures, hashing and direct organization structures, indexed structures, list file structures (inverted, multi-key, etc.), tree structures (B trees, B+ trees...etc.), external sorting techniques, searching techniques.

**503210 Digital Logic Design (3 Credit Hours)**  
This course covers the following: Numbering Systems, conversion methods, binary and complement arithmetic, Boolean algebra, circuit minimization techniques, Combinational circuits: Adders, Decoders, Encoders, Code Converters, ROMs, PLAs, Sequential Circuits: flip-flops, counters, registers, synchronous sequential circuits.

**503301 Systems Analysis and Design (3 Credit Hours)**  
The course presents foundations for systems development-topics like system development tools, cost benefit analysis, prototyping, alternate system design strategies, designing human interface, rapid application development and CASE tools are presented, System development lifecycle, systems planning and selection, system analysis, system design, system implementation and operation.

**503302 Building Systems Using 4GLs (3 Credit Hours)**  
This course covers the following: High level languages vs. 4GLs, software Engineering life cycle, selecting a 4GL, applying features of 4GLs (including: data dictionary, nonprocedural language interactive query facilities, report generator, screen formatter, data analysis and modelling tools, macros, reusable code, backup and recovery, security and privacy safeguards, links to other DBMS, links to HL languages, records and file maintenance, etc.), system portability, application and program generators. Examples of 4GLs and application case studies.



**503303** Prolog Language Programming **(3 Credit Hours)**  
This course covers the following: The use of functional and logic based approaches to artificial intelligence (AI) programming problems. The course will introduce the theory of functional and logic based approaches. Prolog programming languages will be explained.

**503304** Artificial Intelligence **(3 Credit Hours)**  
This course covers the following: Overview of Artificial Intelligence (AI), knowledge representation, Prolog and other AI programming languages, symbolic logic, structured knowledge, search strategies, matching techniques, expert systems, natural language processing, pattern recognition and image processing.

**513305** Computer Graphics **(3 Credit Hours)**  
This course covers the following: Introduction of Computer graphics and applications graphic, systems hardware components and software utilities, graphics primitives (point, lines, circles, ...etc), two dimensional graphics, three dimensional graphics, graphics arts and animations, graphics (Transformation and viewings) libraries such as open GL.

**503402** Compilers Design **(3 Credit Hours)**  
This course covers the Basic concepts, compiler components, lexical analysis, symbol tables handling, parsing techniques, error handling and recovery, syntax-directed translation, type checking, run time organization, intermediate code generation, code generation, code optimization.

**503403** Computer Architecture **(3 Credit Hours)**  
This course covers the following: Instruction set architecture, processor performance and design; data path, control (hard wired, micro programmed). Memory organization with cache, virtual memory. Pipelines techniques, the architecture of RISC, and CISC machines, I/O channels and I/O processors, parallel processing.

**503404** Data Communications and Networks **(3 Credit Hours)**  
This course covers the following: Design and evaluation of computer networks using current trends in hardware and software. Various types of computer buses, local area networks, and long haul networks are defined. Case studies of popular networks are presented. Layered network models are studied. The design and installation of a local area and/or long haul networks where a network operating system such as the latest windows version.

**503405** Software Engineering **(3 Credit Hours)**  
This course covers the following: Concepts and terminology, the software development process, software planning and management, software requirements specifications, system modelling, software prototyping, quality specifications, program specifications, system and software design This course covers the following: approaches (function-oriented design, object-oriented design, distributed systems design), software engineering CASE tools.

**503416 Internet Programming (3 Credit Hours)**

This course covers the following: Basic concepts of the internet and internet browsers, internet Applications (Operating System dependent vs. Operating System independent), Web page creation tools and languages, Basic HTML (Text, fonts, colors, images, lists, and tables), Advanced HTML (Frames, Forms), Scripting and Scripting Languages, Web pages and Web site Creation case studies.

**503417 Data Security (3 Credit Hours)**

This course will provide students with an introduction to computer information security and privacy. Topics to be covered include: the use of forensic tools, understanding how to go about gathering, handling, transporting, and using computer forensic evidence, image analysis, and email analysis, data acquisition and analysis, network and hard drive analysis, security, and protection. Course will also include procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence, forensic tools and resources for system administrators and information system security officers, ethics, law, policy, and standards concerning digital Evidence. It will also cover some details about some of the available hardware and software security and forensics tools for the different operating systems.

**503418 Object Oriented Design and Analysis (3 Credit Hours)**

Object-oriented design concepts, features and problems of complex systems, evolution the object-oriented model, foundations and elements of the object-oriented model, classes and objects, relationships among classes, relationships among objects, interplay of classes and objects, approaches to identifying classes and objects, object-oriented design methodologies, methodology notation (elements of UML or any other selected notation, class and object diagrams, interaction diagrams, state transition diagrams, process and module diagrams, etc.), the object-oriented software development process (analysis, design and implementation), code reusability, management issues, applications and case studies, CASE tools.

**502201 Microprocessors and Microcomputers (3 Credit Hours)**

This course covers the following items: The evolution of microprocessor systems, their characteristics and applications, machine instructions and addressing modes, microprogramming and assembly languages, pint functions, asynchronous data transfer, decoding, programming in DMA and PIC controllers, 16-bit and 32-bit families.

**503204 Operation Research (3 Credit Hours)**

Introduction: (Evolution or OR models, methodology of OR in problem solving the role of quantitative analysis in decision making process), linear programming, transportation and assignment, forecasting models, project scheduling (PRT, CPM), inventory models, queuing models, computer applications.

**503206 Human Computer Interaction (3 Credit Hours)**

This course covers the following: Concepts, human information processing (cognition, perception, movement, culture, communication, human diversity, motivation for computer interaction, human performance models, etc.), user interface design principles, information presentation, visual, auditory and tactile displays, speech communication, data entry, controls, tools and feedback, human factors in computer programming, workspace design, environmental and legal considerations.

**503208 Simulation Techniques (3 Credit Hours)**

This course covers the following: Concepts of simulation, the use of simulation in information systems, simulation methodologies, elements of discrete simulation, gathering statistical observations in simulation, collection and analysis of results, simulation languages (with concentration on GPSS or SIMSCRIPT)

**503307 Functional Programming (3 Credit Hours)**

This course introduces the functional programming paradigm and the implementation technology for functional programming languages. It aims to develop a broad understanding of the benefits of the functional programming style, together with an understanding of implementation issues that are relevant not only to functional languages but also to other systems that require automatic dynamic memory management. understand the basics of the lambda calculus and combinatory and how they are used in the implementation of functional languages; understand the main features of a modern lazy functional language; write non-trivial functional programs; understand the computation, synchronization and memory management issues affecting the sequential and parallel implementation of lazy functional languages; read and understand the research and technical literature on functional programming.

**503308 Programming Language Technique and Methodologies (3 Credit Hours)**

This course covers the following: Concepts, design and evaluation criteria, language components, syntax and semantics historical review, evolution of major imperative programming languages, language taxonomy, data types and objects, expressions and statements, subprograms, modules and packages, scope rules and visibility, passing parameters, activation records and call management, concurrent programming, exception handling, functional programming languages, logic programming, object-oriented programming.

**503406 Information Retrieval Systems (3 Credit Hours)**

This course covers the following: Functional view of information retrieval, types of IRS, design issues of IRS (Keyword based retrieval, file structures, thesaurus construction, etc.), IR data structures and algorithms (lexical analysis, stemming, term weighting, associative indexing, Boolean operation, string searching and matching techniques, etc.) relevance feedback and query modification, applications and case studies.

**503408 Expert Systems (3 Credit Hours)**

This course covers the following: concepts, the typical issues of knowledge representation (particularly representing human knowledge in a machine manipulatable form), reasoning and uncertainty, expert systems technology (knowledge acquisition, design and diagnosis), software tools and architecture (tools and environment for building expert systems). Case studies of available systems.

**503410            Parallel Processing And Programming            (3 Credit Hours)**

Concepts and foundation of parallel processing, parallel processing applications, computational models, parallel algorithms, parallel software characteristics and requirements (languages, compilers, and operating systems), parallel computer architecture, highly parallel computers, structured parallel programming, algorithmic skeletons, performance of parallel systems.

**503415            Natural Languages Processing            (3 Credit Hours)**

This course covers the following topics: Syntactic processing, semantic interpretation and strategies, context and world knowledge, response generation systems (question-answering systems, natural language generation), typical application issues (e.g. machine translation), Arabic applications.

**503419            Advanced Topics In Computer Science            (3 Credit Hours)**

Introducing a course on an advance topic related to computer science of the selection of the instructor and approval of the department.

**103202: Methods of Research            (3 Credit Hours)**

Research, development, and presentation of programming proposal for a large scale Computer Science project.