KVIS

KAMNOETVIDYA

SCIENCE ACADEMY

Department of Mathematics and Computer Science

Subject : **Computer Science**

Grades : 10 – 12

Curriculum: 2559 Regulation, Version 1.3

Dr. Ferdin Joe John Joseph

CONTENTS

Subjects Taught

Odd Semester : May - September

Grade : 10

S.No	Course Code	Course Name	Credits	Class Periods
1	CCS001	Object Oriented Programming and C++	1	40

Grade : 11

S.No	Course Code	Course Name	Credits	Class Periods
Electives as per students' choice			1	40

Grade : 12

S.No	Course Code	Course Name	Credits	Class Periods
Electives as per students' choice			1	40

Even Semester : November - February

Grade : 10

S.No	Course Code	Course Name	Credits	Class Periods
1	CCS002	Object Oriented Programming with Java	1	40

Grade : 11

S.No	Course Code	Course Name	Credits	Class Periods
Electives as per students' choice			1	40

Grade : 12

S.No	Course Code	Course Name	Credits	Class Periods
Electives as per students' choice			1	40

List of electives

Elective Courses				
S.No	Course Code	Course Name	Credits	Class Periods
1	ECS001	Web Designing	1	40
2	ECS002	Data Structures	1	40
3	ECS003	Software Engineering	1	40
4	ECS004	Free and Open Source Software	1	40
5	ECS005	Computer Networks	1	40
6	ECS006	Database Management Systems	1	40
7	ECS007	Data Warehousing	1	40
8	ECS008	Algorithm Design	1	40
9	ECS009	Data Mining	1	40
10	ECS010	Programming for Robotic Applications	1	40
Olympiad Preparatory Courses				
1	OCS001	Design and Analysis of Algorithms	1	40
2	OCS002	Discrete Mathematics for Computing	1	40

Number of class periods per week = 2 x credits allotted for the subject. This formula applies for both main and elective courses. Maximum strength of each elective subject shall not exceed 18. Allocation of Computer Science electives is based on availability of seats.

Compatibility to International Curriculum

Compulsory Courses M4

- Object Oriented Programming using C++
- Object Oriented Programming with Java

AP and A level Electives M5 & M6

- Web Designing
- Computer Networks
- Algorithm Design
- Data Structures
- Database Management Systems

Other Electives M5 & M6

- Software Engineering
- Free and Open Source Software
- Data Warehousing
- Data Mining
- Programming for Robotic Applications

Source: IGCSE Computer Science Curriculum of 2017 - 19
http://www.cie.org.uk/images/203951-2017-2019-syllabus.pdf

Cambridge IGCSE Curriculum		
Sections	Topics	Subject code in KVIS *(Ref: Page 3, 4)*

Section 1 Theory of computer science 60%	1.1 Data representation
	  1.1.1 Binary systems
	  1.1.2 Hexadecimal
	  1.1.3 Data storage
	1.2 Communication and Internet technologies
	  1.2.1 Data transmission
	  1.2.2 Security aspects
	  1.2.3 Internet principles of operation
	1.3 Hardware and software
	  1.3.1 Logic gates
	  1.3.2 Computer architecture and the fetch execute cycle
	  1.3.3 Input devices
	  1.3.4 Output devices
	  1.3.5 Memory, storage devices and media
	  1.3.6 Operating systems
	  1.3.7 High- and low-level languages and their translators
	  1.4 Security
	  1.5 Ethics
		
		ECS005
		ECS005
		ECS005
		
		ECS005
		ECS005
		ECS005
		
		CCS001
		ECS005
		
		ECS005
		ECS005
		ECS005
		
		ECS005
		CCS001
		
		ECS005
		ECS005

Section 2 Practical problem-solving and programming 40%	2.1 Algorithm design and problem-solving
	  2.1.1 Problem-solving and design
	  2.1.2 Pseudocode and flowcharts
	2.2 Programming
	  2.2.1 Programming concepts
	  2.2.2 Data structures; arrays
	2.3 Databases
		
		ECS008
		
		ECS008
		
		CCS001 and CCS002
		ECS002
		ECS006

International Baccalaureate (IB) needs the whole IGCSE curriculum and web designing elective in addition.

Syllabus

Course Code	Course Name	Credits	Class Periods
CCS001	**Object Oriented Programming and C++**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Understand the concepts of object oriented programming.

Develop applications involving object oriented programming using C++.

Concepts to be covered

Introduction – Types of Programming – Why Object Oriented Programming (OOP) and OOP concepts

Data Types – Operators, Expressions, Variables – Control Statements – Arrays and Strings – Pointers – Structures and Unions – Dynamic memory allocation

Data Hiding and Member functions – Object creation and destruction – Polymorphism data abstraction – Iterations and Containers

Templates, Inheritance and exceptions

Text Book

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", McGraw Hill, 2003.

References

- Bjarne Stroustrup, "The C++ Programming Language", Pearson Education, 2004.
- E. Balagurusamy, "Object Oriented Programming with C++", Mc Graw Hill, 2013.

Course Code	Course Name	Credits	Class Periods
CCS002	**Object Oriented Programming with Java**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Develop applications involving object oriented programming using Java.

Develop applets and server side scripting using servlets.

Concepts to be covered

Data types, variables and arrays, operators, control statements

Classes, objects, methods – Inheritance – Packages and Interfaces, Exception handling

Multithreaded programming, Strings, Input/Output – Servlets – Applets

Text Book

1. Herbert Schildt, "The Java 2: Complete Reference", Fourth edition, McGraw Hill, 2002.

References

- E. Balagurusamy, "Programming With Java: A Primer", 3rd Edition, McGraw Hill, 2008.
- P. Deitel and H. Deitel, "Java How to Program", 10/e (Early Objects), Deitel Publishers, 2015.

Course Code	Course Name	Credits	Class Periods
ECS001	**Web Designing**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Develop static web pages.

Get familiar with the functioning and deployment of websites.

Concepts to be covered

Hyper Text Markup Language (HTML)

Cascading Style Sheets (CSS)

Extensible Markup Language (XML)

Java Script and website deployment

Text Book

Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", 2007

References

- www.w3schools.com

Course Code	Course Name	Credits	Class Periods
ECS002	**Data Structures**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Gain knowledge about various abstract datatypes and problem solving mechanisms.

Get more knowledge about binary and balanced search trees

Concepts to be covered

Problem Solving Techniques – Abstract Data Types – Arrays and Linked List

Stack, Queue, Trees

Binary Trees – Binary Search Trees – Balanced Search Trees

Text Book

E. Balagurusamy, "Data Structures Using C", McGraw Hill, 2013.

References

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 1996.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press, 2009.

Course Code	Course Name	Credits	Class Periods
ECS003	**Software Engineering**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Know the process of software development.

Learn the models used for every phase of software development.

Concepts to be covered

Introduction – Software Development life cycle – waterfall model – incremental model – win win model

Software Testing – White box and black box testing

Testing Paradigms – validation testing, regression testing, unit testing, load testing and functionality testing

Text Book

Materials provided by course teacher

References

- Roger S. Pressman, "Software Engineering – A Practitioner's approach", 6th Edition, McGraw Hill, 2010.

Course Code	Course Name	Credits	Class Periods
ECS004	**Free and Open Source Software**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Know the merits of Free and Open Source Softwares (FOSS).

Develop websites using PHP and know to use wordpress, an open source software for content management system.

Concepts to be covered

Introduction – Need for FOSS – PHP – Declarations – Variables – Datatypes.

Windows Apache MySQL PHP (WAMP) server for developing websites with intranet.

Wordpress hands – on deployment and management

Virtualisation using Virtual Box

Text Book

Materials provided by course teacher

Course Code	Course Name	Credits	Class Periods
ECS005	**Computer Networks**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Know the protocols of wired and wireless networks.

Learn about routing and transmission protocols.

Get basic knowledge on network security.

Concepts to be covered

Protocols and layers of computer networks – Network topologies – Wireless Network Protocols – IEEE 802.11 – Infra Red – Bluetooth – Wifi and LTE

Transmission Control Protocol – Flow Control – Retransmission – Congestion Control – Routing – Email POP3, IMAP, SMTP, MIME

Network Security – Confidentiality – Integrity –Availability – Threats for information security

Basic Computer Architecture – Binary and Hexadecimal number system – Logic Gates – Input and Output devices – Operating Systems – Process cycle – Fetch and Execute.

Text Book

Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill, 2012.

Course Code	Course Name	Credits	Class Periods
ECS006	**Database Management System**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Learn the queries for data processing and database management

Use Oracle and develop code for database actions

Concepts to be covered

Purpose of Database System – SQL – DDL – DML – DCL – TCL – Static and Dynamic SQL

Transaction processing – locking mechanisms – deadlock

PL/SQL

All the above concepts to be taught using oracle.

Text Book

Materials provided by course teacher

References

Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", (6th Edition), Pearson Education, 2010.

Course Code	Course Name	Credits	Class Periods
ECS007	**Data Warehousing**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Learn parts of a data warehouse.

Know the functionalities of multidimensional data model.

Concepts to be covered

Data warehousing Components –Building a Data warehouse.

Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines

Classification of Data Mining Systems – Data Mining Task Primitives.

Text Book

Materials provided by course teacher

References

- Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", McGraw – Hill Edition, Tenth Reprint 2007.
- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

Course Code	Course Name	Credits	Class Periods
ECS008	**Algorithm Design**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Analyze time complexity of algorithms.

Gain knowledge about various searching and sorting algorithms.

Concepts to be covered

Algorithm Analysis – Time Complexity

Linear and Binary Search – Quick Sort, Insertion Sort, Merge Sort, Heap Sort, Bubble Sort

Text Book

E. Balagurusamy, "Data Structures Using C", McGraw Hill, 2013.

References

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 1996.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press, 2009.

Course Code	Course Name	Credits	Class Periods
ECS009	**Data Mining**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Learn Data Mining and apply classification and clustering algorithms on high dimensional data.

Concepts to be covered

Data Mining – Concepts - Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Classification and Prediction - Basic Concepts – Categorization of Major Clustering Methods - K- means – Partitioning Methods – Hierarchical Methods.

Outlier Analysis – Data Mining Applications.

Text Book

Materials provided by course teacher

References

- Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", McGraw – Hill Edition, Tenth Reprint 2007.
- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

Course Code	Course Name	Credits	Class Periods
ECS010	**Programming for Robotic Applications**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Learn python programming and interface with microcontrollers.

Gain basic knowledge about Arduino microcontrollers.

Develop robotic applications using Arduino microcontrollers and Raspberry Pi.

Concepts to be covered

Python programming – program structure – conditionals – looping – functions – errors and exceptions

Arduino microcontrollers and its applications

Installation and setup of Raspberry Pi – GPIO – Reading to and Writing from GPIO data – controlling DC motors using GPIO

Demo and Hands on training on keyboard controlled robot

Text Book

Materials provided by course teacher

Course Code	Course Name	Credits	Class Periods
OCS001	**Design and Analysis of Algorithms**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Design algorithm for any application.

Analyze the capacity of algorithms.

Concepts to be covered

Introduction - Notion of Algorithm - Fundamentals of Algorithmic Solving - Important Problem types - Fundamentals of the Analysis Framework - Asymptotic Notations and Basic Efficiency Classes.

Analysis of Non-recursive and Recursive Algorithms - Brute-force - Divide and conquer - Transform and conquer - Dynamic Programming - Greedy Techniques.

Backtracking - n-Queen's Problem - Hamiltonian Circuit problem - Knapsack problem - Traveling salesman problem.

Text Book

- Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press, 2009.

Course Code	Course Name	Credits	Class Periods
OCS002	**Discrete Mathematics for Computing**	**1**	**40**

Course Objective:

By the end of this course, the students will be able to:

Use mathematical logic to apply in computing concepts for problem solving.

Concepts to be covered

Introduction – Propositional Logic –Predicates and Quantifiers – Nested Quantifiers– Rules of inference – Pigeon hole principle – permutations and combinatons – Graphs and graph models – graph connectivity – Boolean Algebra

Text Book

- Materials issued by the course teacher.