K. C. E. Society's
Moolji Jaitha College
An 'Autonomous College' Affiliated to
K.B.C. North Maharashtra University, Jalgaon.
NAAC Reaccredited Grade - A (CGPA : 3.15 - 3rd Cycle)
UGC honoured "College of Excellence" (2014-2019)
DST(FIST) Assisted College

KNOWLEDGE IS POWER
ESTD. 1945

के. सी. ई. सोसायटीचे
मूळजी जेठा महाविद्यालय
क.ब.चौ. उत्तर महाराष्ट्र विद्यापीठ, जळगाव संलग्नित
'स्वायत्त महाविद्यालय'
नॅकद्वारा पुनर्मानांकित श्रेणी – 'ए' (सी.जी.पी.ए. : ३.१५ – तिसरी फेरी)
विद्यापीठ अनुदान आयोगाद्वारा घोषित 'कॉलेज ऑफ एक्सलन्स' (२०१४-२०१९)
डी.एस.टी. (फीस्ट) अंतर्गत अर्थसहाय्य प्राप्त

Date :- 01/08/2024

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc. in Comp. Scie (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 27/07/2024.

The Syllabi of B. Sc. in Comp. Scie (First and Second Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2024 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2024-25.

Copy of the Syllabi Shall be downloaded from the College Website (www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

To :

1) The Head of the Dept., M. J. College, Jalgaon.
2) The office of the COE, M. J. College, Jalgaon.
3) The office of the Registrar, M. J. College, Jalgaon.

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समर्थ कॉलनी जवळ, जळगांव – ४२५ ००२. (महाराष्ट्र, भारत) । दूरध्वनी क्र. : +९१ २५७–२२३७३६३, २२३४२८१ । ई–मेलः mjcollege@kces.in । वेबसाईटः mjcollege.kces.in

Khandesh College Education Society's

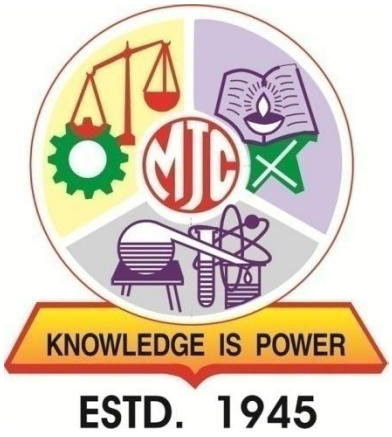
Moolji Jaitha College, Jalgaon

An "Autonomous College"

Affiliated to

Kavayitri Bahinabai Chaudhari

North Maharashtra University, Jalgaon 425001



STRUCTURE AND SYLLABUS

B.Sc. Honors/Honors with Research (F.Y.B.Sc. Computer Science)

Under Choice Based Credit System(CBCS)

and

as per NEP-2020 Guidelines

[w.e.f.AcademicYear:2024-25]

Preface

Skilled human resources is a prerequisite in higher education, and it is necessary to acquire a thorough knowledge of theoretical concepts and hands-on laboratory methods. The Moolji Jaitha College (Autonomous) has adopted a department-specific modelas per the guidelines of UGC, NEP-2020 and the Government of Maharashtra. The Board of Studies in Computer Science of the college has prepared the syllabus forthe first-year undergraduate ofComputer Science. The syllabus cultivates theoretical and practical know-how in different fields of Computer Sciecne.

The main aim of this course is to develop the technical skills of the candidate and make them experts in the process of using computers and other computer-related technologies. The course initially educates the candidates about all the basic fundamentals of the computer to strengthen their core so that they will find it easy to understand other complicated subjects that are there in the course.

Candidates with a graduate degree in computer science are getting a lot of job opportunities from different sectors. Businesses are using new advanced technologies for the smooth running of different operations, but with more advanced technology, different functions are becoming more sophisticated and complicated, this is when organizations need a computer science graduate to make this upgrading procedure simple and easy ensuring the smooth running of the business.Companies are hiring more computer science graduates in recent years to deal with the complex and complicated evolving of different technologies. A computer science graduate makes sure that all the computer facilities of the business are properly managed and handled by the workforce.

This course creates IT professionals who have done expertise in dealing with different technical problems. This course develops and upgrades the candidate's skills in different IT areas with term exams, practical learning, arranging summer internships for giving an IT workforce experience, and also organizing seminars with IT professionals so that the candidates can interact with the experts and clarify their doubts.The curriculum strongly emphasises imparting hands-on skills, with more experiments that run hand-in-hand with theory. The detailed syllabus of each paper is appended with a list of suggested readings.

Program Outcomes (PO) for B.Sc. Program:

Program outcomes associated with a B.Sc. degree are as follows:

1. Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
2. Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
3. Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
4. Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
5. Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
6. Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
7. Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to continuously learn, adapt to new technologies and advancements in their field, and stay updated with current research.

Program Specific Outcome PSO (B.Sc. Computer Science):

After completion of this course, students are expected to learn/understand the following:

1	Database Management System and store the data in adequate form.
2	Object oriented programming languages such as C++ , Java Programming.
3	Various web technologies used for website development.
4	Core concepts in Computer Science
5	Different front end framework tools
6	Latest technologies such as Node js, PowerBI etc.

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	**Qualification Title**	**Credit Requirements**		**Semester**	**Year**
		Minimum	**Maximum**		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours **Or** Bachelor's Degree- Honours with Research	160	176	8	4

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

F.Y. B.Sc.

Year (Level)	**Sem**	**Subject-I (M-1)**	**Subject-II (M-2)**	**Subject-III (M-3)**	**Open Elective (OE)**	**VSC, SEC (VSEC)**	**AEC, VEC, IKS**	**CC, FP, CEP, OJT, RP**	**Cumulative Credits/Sem**	**Degree/ Cumulative Credit**
I (4.5)	I	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	OE-1(2T)	---	AEC-1(2T) (Eng) VEC-1(2T) (ES) IKS(2T)	CC-1(2T)	22	**UG Certificate**
	II	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	OE-2(2T) OE-3(2P)	---	AEC-2(2T) (Eng) VEC-2(2T) (CI)	CC-2(2T)	22	
	Cum. Cr.	**8**	**8**	**8**	**6**	**---**	**10**	**4**	**44**	
Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										

S.Y. B.Sc.

Year (Level)	**Sem**	**Subject-I (M-1) Major***		**Subject-II (M-2) Minor #**	**Subject-III (M-3)**	**Open Elective (OE)**	**VSC, SEC (VSEC)**	**AEC, VEC, IKS**	**CC, FP, CEP, OJT/Int/RP**	**Cumulative Credits/Sem**	**Degree/ Cumulative Credit**
		Mandatory (DSC)	**Elective (DSE)**	**(MIN)**							
2 (5.0)	III	DSC-5(2T) DSC-6(2T) DSC-7(2P)	---	MIN-1(2T) MIN-2(2T) MIN-3(2P)	---	OE-4(2T)	SEC-1(2T)	AEC-3(2T) (MIL)	CC-3(2T) CEP(2)	22	**UG Diploma**
	IV	DSC-8(2T) DSC-9(2T) DSC-10(2P)	---	MIN-4(2T) MIN-5(2P)	---	OE-5(2T)	SEC-2(2T) SEC-2(2P)	AEC-4(2T) (MIL)	CC-4(2T) ۞ FP(2)	22	
	Cum . Cr.	**12**	**---**	**10**	**---**	**4**	**6**	**4**	**8**	**44**	
	Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major & Minor.										

***** Student must choose one subject as a Major subject out of M-1, M-2 and M-3 that he/she has chosen at First year

#Student must choose one subject as a Minor subject out of M-1, M-2 and M-3 that he/she has chosen at First year (Minor must be other than Major)
۞ OJT/Internship/CEP should be completed in the summer vacation after 4th semester

T.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major		Subject-II (M-2) Minor	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
3 (5.5)	V	DSC-11(2T) DSC-12(2T) DSC-13(2T) DSC-14(2P) DSC-15(2P)	DSE-1A/B (2T) DSE-2A/B (2P)	---	---	---	VSC-1(2T) VSC-2(2P)	---	OJT/Int (4)	22	UG Degree
	VI	DSC-16(2T) DSC-17(2T) DSC-18(2T) DSC-19(2T) DSC-20(2T) IKS DSC-21(2P) DSC-22(2P)	DSE-3A/B (2T) DSE-4A/B (2P)	---	---	---	VSC-3(2T) VSC-4(2P)	---	---	22	
	Cum. Cr.	**24**	**8**	---	---	---	**8**	---	**4**	**44**	
	Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										

Fourth Year B.Sc. (Honours)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-25(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	---	22	UG Honours Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-29(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	OJT/Int (4)	22	
	Cum. Cr.	**28**	**8**	**4**	---	---	---	**4**	**44**	
Four Year UG Honors Degree in Major and Minor with 176 credits										

Fourth Year B.Sc. (Honours with Research)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	RP(8)	22	
	Cum. Cr.	**20**	**8**	**4**	---	---	---	**12**	**44**	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC**- Department Specific Course, **DSE**- Department Specific Elective, **OE/GE**- Open/Generic elective, **VSC**- Vocational Skill Course, **SEC**- Skill Enhancement Course, **VSEC**- Vocation and Skill Enhancement Course, **AEC**- Ability Enhancement Course, **IKS**- Indian Knowledge System, **VEC**- Value Education Course, **T**- Theory, **P**- Practical,**CC**-Co-curricular **RM**- Research Methodology, **OJT**- On Job Training, **FP**- Field Project, **Int**- Internship, **RP**- Research Project, **CEP**- Community Extension Programme, **ENG**- English, **CI**- Constitution of India, **MIL**- Modern Indian Laguage

- Number in bracket indicate credit
- The courses which do not have practical 'P' will be treated as theory 'T'
- If student select subject other than faculty in the subjects M-1, M-2 and M-3, then that subject will be treated as Minor subject, and cannot be selected as Major at second year.

Details of F.Y. B.Sc. (Computer Science)

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/ Week			Marks			
					T	P	Total	Internal		External	
								T	P	T	P
Semester I, Level – 4.5											
DSC-1	DSC	CS-DSC-111	Object Oriented Programming using C++-I	2	2	---	2	20	---	30	---
DSC-2	DSC	CS-DSC-112	Practical on C++-I	2	---	4	4	---	20	---	30
OE-1	OE	CS-OE-111	Word Processing Tools	2	2	---	2	20	---	30	---
Semester II, Level – 4.5											
DSC-3	DSC	CS-DSC-121	Object Oriented Programming using C++-II	2	2	---	2	20	---	30	---
DSC-4	DSC	CS-DSC-122	Practical on C++-II	2	---	4	4	---	20	---	30
OE-2	OE	CS-OE-121	Data Visualization and Analysis Tools	2	2	---	2	20	---	30	---
OE-3	OE	CS-OE-122	Practical on Data Visualization and Analysis Tools	2	---	4	4	---	20	---	30

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
    - External examination will be of 1½ hours duration
    - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
    - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
    - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

i. Individual Assignments
ii. Seminars/Classroom Presentations/Quizzes
iii. Group Discussions/Class Discussion/Group Assignments
iv. Case studies/Case lets
v. Participatory & Industry-Integrated Learning/Field visits
vi. Practical activities/Problem Solving Exercises
vii. Participation in Seminars/Academic Events/Symposia, etc.
viii. Mini Projects/Capstone Projects
ix. Book review/Article review/Article preparation
x. Any other academic activity
xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the

total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT.

The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations.

The subject teachers must communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Where an incubation condition is required, a practical examination shall be conducted for 2 consecutive days for 2 hours/day.
- There shall be 05 marks for journal and viva voce. A certified journal is compulsory to appear for practical examination.
- The external practical examination of SEC will be of 25 marks, and there will be no internal exam for SEC practical.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by the department as per the schedule given.
- For internal practical examination, students must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details, refer to internal theory examination guidelines.
- Finally, 40 (10+30) marks of performance of the student will be converted into 20 marks.

F.Y.B.Sc.
(Computer Science)
Semester I

F.Y. B.Sc. (Computer Science)
SEMESTER-I
CS-DSC-111: Object Oriented Programming using C++ – I

Total Hours: 30 **Credits: 2**

Course objectives	• To understand the basic object oriented concepts. • To make the student aware of control structures in programming language. • To acquaint concepts of classes and objects. • To understand the polymorphism concept in C++.	
Course outcomes	After successful completion of this course, students are expected to: • apply object oriented concepts for problem solving. • solve real life prpblems using programming languages. • use different functions for solving large problems. • assign additional meaning to existing operators.	
Unit	**Content**	**Hours**
Unit I	**Introduction to OOPs and Basics of C++ Programming** • **Object Oriented Programming** o Overview of Procedure Oriented Programming and Object Oriented Programming o BasicConceptsofOOPS, o Benefitsand Applicationof OOPS • **Basics of C++ Programming** o Overview of C++ o Structure of C++ program o Simple Program (Preprocessor Directives, Header Files, input output statements) o Data types, Tokens, keywords and variables in C++ o Operators and manipulators in C++	**7**
Unit II	**Control Structures and Functions** o Conditional statements (if, if-else, Nested if, switch) o Control Structures (while, Do-while, for) o Function and its needs, Function Prototype, Call by value and Call by reference o Types of functions (Inline Function, Friend functions, Recursive functions)	**8**
Unit III	**Classes and Objects** o Simple classes and object creation (Class specification, class members accessing) o Defining member functions (inside, outside) o Passing object as an argument, Returning object from functions, o Array of object, Pointer to object, Array of pointer to object, this pointer o Constructors and Destructors	**7**
Unit IV	**Polymorphism – Overloading** o Function overloading, operator overloading o Rules for overloading Operators o Overloading Unary Operator	**8**

	○ Overloading Binary Operator ○ Overloading Binary Operator using Friend function	
Study Resources	• Balagurusamy E. (2017), Object-oriented programming C++, 3rd Ed., Tata McGraw-Hill • Rumbaugh J., Blaha M., Premerlani W., Eddy F., and Sorensen, W., Object-Oriented Modeling and Design, 3rd Ed, Prentice Hall of India • Stevens A., (2003), C++ Programming, 7th Ed., Wiley India Pvt Ltd	

F.Y. B.Sc. (Computer Science)
SEMESTER-I
CS-DSC-112: Practical on C++-I

Total Hours:60 **Credits: 2**

Course objectives	• To get practical knowledge of the C++ Programming. • To get hands on practical knowledge for classes & objects in C++ Programming. • To get basic practical knowledge about the basic object oriented concepts. • To acquaint concepts of classes and objects.	
Course Outcomes	After successful completion of this course, students are expected to: • aware about basic concepts of C++. • apply object oriented concepts for problem solving.	
Sr. No.	**Content**	**Hours**
1	Using simple program demonstrate structure of C++ Program.	**4**
2	Write a program to demonstrate arithmetic operators in C++.	**4**
3	Write a program to demonstrate conditional operator in C++.	**4**
4	Writeaprogram todemonstratedynamicmemoryallocation operators.	**4**
5	WriteaC++programtodemonstratetheconceptofdefiningmemberfunction (inside, outside the class using) i) Student Information ii) Employee Information	**4**
6	Write a C++ program to demonstrate conditional statements in C++.	**4**
7	Write a C++ program to demonstrate control structures.	**4**
8	WriteaC++program to demonstrate thearrayofobjects.	**4**
9	WriteaC++programthatdemonstrates theuseoffunctionwithdefault argument.	**4**
10	WriteaC++program todemonstrate inlinefunction.	**4**
11	WriteaC++programtodemonstratefriendfunction.	**4**
12	WriteaC++programtodemonstratefollowingconstructorsanddestructori)Default constructor ii)Parameterized constructor iii)Copy Constructor	**4**
13	Writeanobject-orientedprogramtodemonstrateconstructor and destructor	**4**
14	WriteaC++programtodemonstrate functionoverloading.	**4**
15	WriteaC++programtodemonstrateoperatoroverloading (Unary &Binary).	**4**
Study Resources	• Balagurusamy E. (2017), Object-oriented programming C++, 3rd Ed., Tata McGraw-Hill • Rumbaugh J., Blaha M., Premerlani W., Eddy F., and Sorensen, W., Object-Oriented Modeling and Design, 3rd Ed, Prentice Hall of India • Stevens A., (2003), C++ Programming, 7th Ed., Wiley India Pvt Ltd	

Note: At least 12 experiments should be performed.

F.Y. B.Sc. (Computer Science)
SEMESTER-I
CS-OE-111: Word Processing Tools

Total Hours: 30 **Credits: 2**

Course objectives	• To create new document and save the data. • To format the text in the document using different formatting tools. • To arrange the text into columns and insert different objects into the text document. • To use mail merge on common document.	
Course outcomes	After successful completion of this course, students are expected to: • aware different word processing tools and have hands on one of them. • learn different formatting options for text and document. • embed the object into text document. • create document with effective graphics and formatting.	
Unit	**Content**	**Hours**
Unit I	**Launch any Word processing tool and navigate the editing screen.** o Launch Word. o Identify the components of the Word window. o Edit a document. o Save a document. o Preview and print a document. o Close a document. o Locate and open an existing document. o Create a new document. o Close the Word application. o Use Print Preview. o Print a document	**7**
Unit II	**Create, edit a Text document and apply formatting** o Create a letter. o Select text. o Cut, copy, and paste text. o Find and replace text. o Change fonts and font sizes. o Apply font styles, character styles, and special character effects. o Change the case of text. o Highlight text in a document. o Insert symbols and special characters. o Add bullets, numbering, borders, and shading. o Set line and paragraph spacing. o Align and indent paragraphs. o Insert page breaks. o Create and modify headers and footers. o Apply paragraph styles. o Create outlines.	**8**
Unit III	**Work with columns, pictures, diagrams, charts and tables.** o Create and use newspaper columns. o Insert pictures. o Create diagrams.	**8**

	○ Create and modify a data chart ○ Create basic tables. ○ Create and format tables. ○ Modify tables. ○ Customize tables. ○ Use special table features. ○ Use table styles. ○ Use tab stops in a table. ○ Convert text to a table. ○ Merge and split table cells.	
Unit IV	**Use the mail merge wizard, work with drawing objects and graphics** ○ Explain the steps of the mail merge process. ○ Define the main document. Select the data source. ○ Merge the maindocument and data source. ○ Create drawing objects. ○ Add decorative page borders. ○ Use WordArt special text effects. ○ Insert, position, and delete pictures. ○ Insert and edit text boxes. ○ Create and edit an organization chart. ○ Create an equation.	**8**
Study Resources	• Frandsen T., (2010), Microsoft Office Word 2007, BookBoon • Curtis F.(2007), Microsoft Office Word 2007 Step by Step • https://testbook.com/computer-awareness/microsoft-office • https://documentation.libreoffice.org/assets/Uploads/Documentation/en/GS5.0/PDF/GS5001-IntroducingLibreOffice.pdf • https://www.teachmint.com/tfile/studymaterial/b-com/ccc/libreofficecalcpdf/e66b485b-3992-44c9-8972-209158129d10	

F.Y.B.Sc.
(Computer Science)
Semester II

F.Y. B.Sc. (Computer Science)
SEMESTER-II
CS-DSC-121: Object Oriented Programming using C++ – II

Total Hours: 30 **Credits: 2**

Course objectives	• To understand reusability concept in OOPS. • To study concept of virtual function. • To handle runtime errors. • To apply generic programming concepts.	
Course outcomes	After successful completion of this course, students are expected to: • apply reusability concepts in OOPS • use virtual functions wherever required. • deal with different runtime errors. • create generic programs for various applications.	
Unit	**Content**	**Hours**
Unit I	**Inheritance** o Overview o Defining Derived Class o Types of Inheritance o Constructors in Derived Classes	**7**
Unit II	**Virtual function** o Need of Virtual function o Virtual function o Rules for defining and declaring virtual function o Pure Virtual Functions	**8**
Unit III	**Exception Handling** o Basics of ExceptionHandling o Exception handling mechanism o Throwing mechanism of exception o Catching mechanism of exception o Re-throwing exception o Specifying exception	**7**
Unit IV	**Templates** o Class Template o Class template with multiple parameters o Function Template o Function template with multiple parameters o Overloading of template functions	**8**
Study Resources	• Balagurusamy E. (2017), Object-Oriented Programming C++, 3rd Ed., Tata McGraw-Hill • Rumbaugh J., Blaha M., Premerlani W., Eddy F., and Sorensen, W., Object-Oriented Modeling and Design, 3rd Ed, Prentice Hall of India • Stevens A., (2003), C++ Programming, 7th Ed., Wiley India Pvt Ltd	

F.Y. B.Sc. (Computer Science)
SEMESTER-II
CS-DSC-122: Practical on C++-II

Total Hours:60 **Credits: 2**

Course objectives	• To acquaint concepts of generic programming. • To apply reusability concepts in OOPS.	
Course Outcomes	After successful completion of this course, students are expected to: • apply reusability concept in solving real life problem using OOPs. • apply generic programming concepts and increase the effeiciency of program.	
Sr. No.	**Content**	**Hours**
1	Write a C++ program to demonstrate simple inheritance	**4**
2	Write a C++ program to demonstrate multilevel inheritance	**4**
3	Write a C++ program to demonstrate multiple inheritance	**4**
4	Write a C++ program to demonstrate hybrid inheritance	**4**
5	Write a C++ program to demonstrate hierarchical inheritance	**4**
6	WriteaC++program to demonstrate theconcept ofvirtualfunction.	**4**
7	WriteaC++program to demonstrateall typesofInheritances.	**4**
8	WriteaC++ programtodemonstrate theconceptoffunction template.	**4**
9	WriteaC++program to demonstratetheconceptofclass template.	**4**
10	WriteaC++ programto demonstratetheconceptofException handling.	**4**
11	WriteaC++program to demonstratetheconceptof template with multiple parameters.	**4**
12	WriteaC++program to demonstratetheconceptof virtual base class.	**4**
13	WriteaC++program to demonstratetheconceptof abstract class.	**4**
14	WriteaC++ program to demonstratetheconceptof constructors in derived classes	**4**
Study Resources	• Balagurusamy E. (2017), Object-Oriented Programming C++, 3rd Ed., Tata McGraw-Hill • Rumbaugh J., Blaha M., Premerlani W., Eddy F., and Sorensen, W., Object-Oriented Modeling and Design, 3rd Ed, Prentice Hall of India • Stevens A., (2003), C++ Programming, 7th Ed., Wiley India Pvt Ltd	

F.Y. B.Sc. (Computer Science)
SEMESTER-II
CS-OE-121: Data Visualization and Analysis Tools

Total Hours: 30 **Credits: 2**

Course objectives	**Student will be able to:** • customise the formatting of charts. • create and use labels and names in a workbook. • protect data in worksheets and workbooks. • create and edit a PivotChart.	
Course outcomes	**After successful completion of this course students are expected to :** • demonstrating the basic mechanics and navigation of an spreadsheet. • learning the use and utility of functions and formulas on spreadsheet. • using clip art to enhance ideas and information in worksheets. • analyzing data using Pivot Tables and Pivot Charts.	
Unit	**Content**	**Hours**
Unit I	**Excel Basics** o Getting Started with Excel, o Understanding OneDrive o Creating and opening workbooks, o Saving and sharing workbooks, o Cell basics, modifying Columns, Rows, and Cells, Formatting Cells.	**8**
Unit II	**Working with Sheets** o Understanding Number Formats o Working with Multiple Worksheets, o Hide or unhide worksheets, o Hide or unhide columns and rows, o Customize the quick access toolbar, o Modify document properties, o Using find &replace, o Checking spelling, o Page layout and printing	**7**
Unit III	**Formulas and Functions** o Introduction to formulas, o Creating more complex formulas, o Relative and absolute cell study resources, o Functions: mathematical, statistical, logical, date and time, etc.	**8**
Unit IV	**Working with Data** o Freezing panes and view options, o Sorting data, filtering data, o Groups and subtotals, o Tables, o Charts, o Conditional formatting, o Track changes and comments, o Inspecting and protecting workbooks, o Introduction to pivot tables, o Doing more with pivot tables.	**8**

Study Resources	• Frandsen T., (2010), Microsoft Office Excel 2007, BookBoon • Curtis F.(2007), Microsoft Office Word Excel Step by Step • https://testbook.com/computer-awareness/microsoft-office • https://documentation.libreoffice.org/assets/Uploads/Documentation/en/GS5.0/PDF/GS5001-IntroducingLibreOffice.pdf • https://www.teachmint.com/tfile/studymaterial/b-com/ccc/libreofficecalcpdf/e66b485b-3992-44c9-8972-209158129d10

F.Y. B.Sc. (Computer Science)
SEMESTER-II
CS-OE-122 :Practical on Data Visualization and Analysis Tools

Total Hours: 60 **Credits: 2**

Course objectives	• Understanding the scope and applications of advanced Excel functions. • Creating and applying custom data formats for numbers, dates, and times. • Utilizing advanced fill options such as fill series, flash fill, and custom fill sequences.
Course Outcomes	• Manipulate data efficiently using advanced Excel functions and features. • Customize data formats according to specific requirements. • Implement advanced conditional formatting techniques to highlight important data points. • Utilize form controls to create interactive and user-friendly Excel applications.

Sr. No.	Content	Hours
1	Demonstrate Data Manipulation in Excel using Data Names and Ranges.	4
2	Create Tabular sheet in Excel. Apply different page formats and orientation for the same.	4
3	Opening Data from External Sources	4
4	Demonstrate the use of data validation	4
5	Convert given text into number of columns. e.g Patil SagarSamadhan must be converted as Patil | Sagar | Samadhan	4
6	Demonstrate the use of header and footer to the document.	4
7	Create a simple database and apply filter on different column.	4
8	Create a simple database and sort it using different consitions.	4
9	Apply Basic Formulas and Use Functions in Excel.	4
10	Demonstarte different charts in Excel.	4
11	Calculate Measure of central tendency: Mean, median, mode for height coloumn of student data	4
12	Measure of dispersion: variance, standard deviation, Coefficient of variation	4
13	Demonstate the use of freeze pane option in Excel.	4
14	Apply different tools on PivotTables: Data Slicer, Timeline Filter and	4
15	Demonstrate different PivotTable Styles	4

Study Resources	• Frandsen T., (2010), Microsoft Office Excel 2007, BookBoon • Curtis F.(2007), Microsoft Office Excel 2007 Step by Step • https://testbook.com/computer-awareness/microsoft-office • https://documentation.libreoffice.org/assets/Uploads/Documentation/en/GS5.0/PDF/GS5001-IntroducingLibreOffice.pdf • https://www.teachmint.com/tfile/studymaterial/b-com/ccc/libreofficecalcpdf/e66b485b-3992-44c9-8972-209158129d10