

**SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF SCIENCE AND HUMANITIES
DEPARTMENT OF MATHEMATICS
MINUTES OF BOARD OF STUDIES MEETING**

DATE: 26.6.2020

TIME: 4.00 P.M. TO 5.30 P.M.

ONLINE MEETING: ZOOM

**Board of Studies meeting through ZOOM was held on 26/6/ 2020 at 4. p.m.
(Meeting ID: 94688789754).**

❖ **Dr. M. Nirmala, Head of the Department greeted the external members**

**Dr. V. Kumaran, Professor,
Department of Mathematics,
NIT, Trichy.**

**Dr. Krishnamoorthy Somanchi
Professor and Head,
Department of Applied Mathematics,
Defence Institute of Advanced Technology,
Giri Nagar, Pune**

and the internal staff members of Board of Studies.

❖ **The Board members reviewed B.Sc Mathematics syllabus and approved the following new courses as electives.**

- 1. Cryptography, Mathematical Modeling, Professional Communication, Actuarial Mathematics and LaTeX Theory**
- 2. Graph Theory can be included as an Elective course**
- 3. Approved the new courses **Data Analytics, Data Analytics Lab, MATLAB for Numerical Methods and SPSS lab****
- 4. Both Operations Research I and Operations Research II were merged to a single course Operations Research**

Board members reviewed M.Sc Mathematics syllabus and approved the following changes and introduction of new courses

1. Ordinary and Partial Differential equations courses were merged into a single course, Differential equations
 2. New courses Advanced Data Analytics, R for Data Analytics lab and MATLAB Programming lab were introduced
- ❖ All the suggestions discussed in the meeting were noted down and will be incorporated the changes in the syllabus.
- ❖ The meeting ended with vote of thanks by Dr. M. Nirmala.

SIGNATURE OF THE MEMBERS

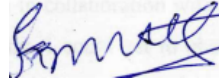
1. Dr. V. KUMARAN

Department of Mathematics,
NIT, Trichy



2. Dr. KRISHNAMURTHY SOMANCHI

Professor and Head,
Department of Applied Mathematics,
Defence Institute of Advanced Technology,
Giri Nagar, Pune



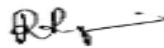
3. Dr. M. NIRMALA

Associate Professor & Head
Department of Mathematics,
Sathyabama Institute of Science and Technology
Chennai



4. Dr. R. RAJESWARI

Professor
Department of Mathematics,
Sathyabama Institute of Science and Technology
Chennai



5. **Dr. R. PARAMESWARI**



Assistant Professor

Department of Mathematics,

Sathyabama Institute of Science and Technology

Chennai

6. **Dr. C. KAVITHA**



Assistant Professor

Department of Mathematics,

Sathyabama Institute of Science and Technology

Chennai

SCSA5109	OBJECT ORIENTED PROGRAMMING	L	T	P	CREDIT
		3	0	0	3

Course Objective:

Identify the significance of object-oriented programming and the differences between structured and object-oriented programming.

- Understand the object oriented programming concept in connection with C++.
- Be familiar with concepts like abstraction, inheritance, polymorphism.
- Learn how to read from and write to files.
- To introduce the concepts of templates and exception handling.

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING**9 hrs.**

Object Oriented Programming Paradigms - Comparison of Programming Paradigms – Object Oriented Languages - Benefits of Object Oriented Programming - Comparison with C - Overview of C++ -Pointers- Functions - Scope and Namespaces - Source Files and Programs.

UNIT II CLASSES AND OBJECTS**9 hrs.**

Working with classes – Classes and objects – Class specification-Class objects-Accessing class members-Defining class members-Inline functions-Accessing member functions within class-Data hiding-Class member accessibility - Empty classes,

UNIT III CONSTRUCTORS AND OVERLOADING**9 hrs.**

Default constructors - Parameterized constructors - Constructor overloading-Copy constructors - new, delete operators-"this" pointer-friend classes and friend functions -Function overloading- Unary Operator overloading -Binary Operator overloading.

UNIT IV INHERITANCE**9 hrs.**

Base class and derived class relationship-Derived class declaration-Forms of inheritance-Inheritance and member accessibility- Constructors in derived class-Destructors in derived class-Multiple inheritance-Multi level inheritance-Hybrid inheritance-Virtual base classes-Member function overriding-Virtual functions-Abstract classes-Pure Virtual functions.

UNIT V I/O AND LIBRARY ORGANIZATION**9 hrs.**

I/O Stream - File I/O - Exception Handling - Templates - STL – Library Organization and Containers – Standard Containers - Overview of Standard Algorithms - Iterators and Allocators.

Max Hrs: 45 hrs.

Course Outcome: At the end of the course, learners would acquire competency in the following skills.

CO1	Demonstrate object-oriented problem-solving and programming principles.
CO2	Outline the C++ programming language's most important features and aspects.
CO3	Use concepts such as class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism to solve problems.
CO4	In complex programming situations, use virtual and pure virtual functions.
CO5	Using the techniques covered in the course, analyze, write, debug, and test basic C++ programs.
CO6	Able to address a variety of problems using various object-oriented concepts.

REFERENCE BOOKS:

1. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill,4th Edition,2010
2. Venu Gopal.K.R, Ravishankar.T, and Raj kumar, "Mastering C++", Tata McGraw Hill,1999.
3. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, 3rd Edition,1998.
4. John R Hubbard, "Programming with C++", Schaums Outline Series, McGraw Hill, 2nd edition, 2009.
5. James Martin & James J.Odell,"Object Oriented methods-A foundation",Prentice Hall,1997.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks: 100****PART A: 6 Questions each carrying 5 marks without choice****PART B: 2 Questions from each unit of internal choice, each carrying 14 marks****Exam Duration: 3 Hrs****30 MARKS****70 MARKS**

	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	CREDIT
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SCSA6103					
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Course Objective:

- To understand the fundamental concepts of object oriented programming.
- Be familiar with concepts like abstraction, inheritance, polymorphism.
- To understand the concept of Classes.

List of Experiments

1. Develop a C++ program to implement a class, object creation, member function invocation concept.
2. Develop a C++ program to implement the various constructors and destructor concept.
3. Develop a C++ program to implement a friend function, Inline function.
4. Develop a C++ program to implement an operator (Unary & Binary) overloading concept.
5. Develop a C++ program to implement a function overloading concept.
6. Develop a C++ program to implement a run time polymorphism.
7. Develop a C++ program to implement the following inheritance types.
 - a. Single
 - b. Multiple
 - c. Multilevel
 - d. Hierarchical
 - e. Hybrid
8. Develop a C++ program to implement an Abstract class concept.
9. Develop a C++ program to implement a Virtual function.
10. Develop a C++ program to find the number of characters in a file.
11. Develop a C++ program to handle the exceptions.

Case Study

1. Categorization of living beings as humans, animals, birds, insects, etc..., using inheritance.
2. Develop user defined manipulator for the **following named**
 a) Rupees for displaying Rs. and sets the precision to 2.

Course Outcome: At the end of the course, learners would acquire competency in the following skills.

CO1	Develop and object-oriented paradigm with concepts of streams, classes, functions, data and objects.
CO2	Develop a Program to initialize and destroy objects using Constructor, destructor function
CO3	Build a program using the concept of function overloading and operator overloading
CO4	Implement Inheritance concept in real time applications
CO5	Construct a program using Abstract Class and Virtual function
CO6	Create an application using C++ for implementing File and Exceptional Handling

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max . Marks: 100****Exam Duration: 2 Hrs****CAE****Model Practical Exam****50 Marks****ESE****End Semester Practical Exam****50 Marks**

	ADVANCED DATA ANALYTICS	L	T	P	CREDIT
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SMTA5204		3	0	0	3
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Course Objective: The objective is to enable the students to learn, understand and practice R, which include the study of data standardization, Z score, probability distribution, focusing on time series by understanding through real-world statistical applications. Then Identify an appropriate probability distribution for a given discrete or continuous random variable

UNIT I Introduction to R **9**
Hrs

Introduction: Introduction to R – Downloading and Installing R –. Getting Data into R: First Step in R: Typing in Small Datasets – Concatenating Data with c Function – Combining Variables with the c, cbind, rbind Functions - Vector Function –Matrix - data frame – List - Importing Excel Data – Accessing Data from other Statistical Packages – Accessing the Database. Functions - The Attach Function – Exporting Data - The Tapply Function – The Supply and Lapply Function – The Summary and Table Function.

UNIT II Data standardizing **9**
Hrs

Data standardizing – Z Score – Negative Z Score – Continuous Distributions - Compute proportions – Relative Frequency histogram - Normalized Distribution using Z table.

UNIT II Probability Distribution **9**
Hrs

Probability Distributions - Probability of mean – location of mean distribution - Sampling Distributions — Klout Sampling Distribution – Understanding Shape of Distribution – Standard Error - Standard Deviation of sampling distribution – Ratio of Sampling Distribution - Central Limit Theorem R – Mean of sample means Advanced Analytics Regression Analysis – Simple Regression Analysis - – Logisitc Regression.

UNIT IV Introduction to time series **9**
Hrs

Introduction to time series data - application of time series from various fields -Modelling time series as deterministic function plus IID errors - Components of a time series (trend, cyclical and seasonal patterns, random error) Decomposition of time series - Estimation of trend: free hand curve method, method of moving averages, fitting various mathematical curves and growth curves.

UNIT V Analysis of time-series **9**
Hrs

Analysis of time-series: Different components of a time series. Determination of trend by free hand smoothing. Method of moving average and by fitting of a mathematical curve. Determination of seasonal indices by method of trend ratios and ratios to moving averages.

Max Hrs: 45
Hrs

REFERENCE BOOKS

1. Chatfield C. (1980): The Analysis of Time Series – An Introduction, Chapman & Hall.
2. Brockwell and Davis (2010): Introduction to Time Series and Forecasting (Springer Texts in Statistics), 2nd Edition
3. Johnson, R.A. And Wichern, D.W. (2007): Applied Multivariate Analysis, 6th Edn., Pearson & Prentice Hall
4. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002): Fundamentals of Statistics, Vol. I, 8th Edn. The World Press, Kolkata.
5. Hadley Wickham, ggplot2: Elegant graphics for data analysis, Springer (2009)
<http://www.springerlink.com.proxy.lib.umich.edu/content/978-0-387-98140-6/contents/>

6. Phil Spector, Data Manipulation with R, Springer, (2008)
<http://www.springer.com/statistics/computational+statistics/book/978-0-387-74730-9>
7. Leland Wilkinson, The Grammar of Graphics, Springer (2005),
<http://www.springerlink.com.proxy.lib.umich.edu/content/978-0-387-24544-7/contents/>

Course Outcome: At the end of the course, learners would acquire competency in the following skills.

CO1	To identify the characteristics of datasets and compare the trivial data
CO2	To understand the concept of the probability distribution of a continuous random variable and how it is used to compute probabilities and to illustrate normally distributed random variables.
CO3	To examine how the changes associated with the chosen data point, compare to shift in other variables over the same period and future values of the time series variable.
CO4	To analyze a sequence of data points collected over an interval of time.
CO5	To evaluate all the information necessary to recreate the output, expression passed to it as argument.
CO6	To integrate mathematical and statistical tools with technologies

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs

PART A: 6 Questions each carrying 5 marks without choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 marks

70 Marks

SMTA6201	R FOR DATA ANALYTICS – LAB	L	T	P	CREDITS
		0	0	4	2

Course Objective: The objective is to enable the students to understand the fundamental concepts of R including matrix operations, logical operators and computation of probabilities. To explore the statistical analysis techniques using R programming.

LIST OF EXPERIMENTS

1. **Basic fundamentals, installation and use of software**
2. **Data editing, use of R as a calculator**
3. **Functions and matrix operations, missing data and logical operators**
4. **Conditional executions and loops, data management with sequences.**
5. **Data management with repeats, sorting, ordering and lists.**
6. **Vector indexing, factors, Data management with strings, display and formatting.**
7. **Data management with display paste, split, find and replacement, manipulation with alphabets, evaluation of strings, data frames.**
8. **Handling of bivariate data through graphics, correlations, programming and illustration with examples.**
9. **Computation of Probabilities (Binomial, Poisson and Normal). Simple Correlation and Simple Regression.**
10. **Test of Significance (t test, F test, Z test and Chi square test). One way ANOVA and Two way ANOVA.**

References

1. Introduction to Statistics and Data Analysis – with exercises , Solutions and Applications in R by Christian Heumann, Michael Schomaker and Shalabh, Springer 2016.
2. The R Software-Fundamentals of Programming and Statistical Analysis – Pierre Lafaye de Micheaux, Remy Drouihet, BenoitLiquet, Springer2013.
3. A Beginner’s Guide to R (Use R) by Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.

Course Outcome: At the end of the course, learners would acquire competency in the following skills.

CO1	Able to list operations, operators and fundamentals of R
CO2	To understand the concept of Conditional executions, loops, data management with sequences, Data management with repeats, sorting, ordering and lists.
CO3	To examine program with examples.
CO4	To analyze binomial, poisson and normal probabilities
CO5	To evaluate one way and two way ANOVA
CO6	Create visualizations using R

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max . Marks: 100

CAE

Model Practical Exam

Exam Duration: 2 Hrs

50 Marks

ESE

End Semester Practical Exam

50 Marks