NAME OF DEPARTMENT: Computer Applications

Subject Name: Programming with .Net C# **Subject Code:** TBS 601

Course Name: Bachelor of Science (Hons.) in Computer Science.

1 Contact Hours: 48 **L** 3 **T** 1 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 4

5 Semester: ☑ **Autumn** ☐ **Spring** ☐ **Both**

6 Pre-Requisite: Basic knowledge of programming

7 Subject Area: Computer Science

8 Objective: To develop correct, well-documented programs using the C# programming language

9 Course Outcome:

CO 1 Design and implement applications on the .NET platform.
CO 2 Describe and apply object-oriented programming in application development.
CO 3 create solutions to programming problems using the C# programming language
CO 4 Explain concept of custom interfaces by designing C# applications.
CO 5 Compose queries for data driven apps
CO 6 Apply .NET Framework to solve the problems in different domains.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	**Introduction to 4.6 .NET framework**: What is .NET Platform?, What is .NET Framework, .NET Framework, Languages, and Tools, .NET Framework Major Components, Common Language Runtime (CLR), Compilation and Execution in .NET, Understand the .NET Framework 4.6 stack, Introduction to .NET Core	**8**
2	**Introduction to C# 7.0:** Features of C#, C# Compilation and Execution, General Structure of a C# Program, Creating and Using a DLL, Data Types in C#, Value Types and Reference Types, Boxing and UnBoxing, Single Dimensional, Multi-Dimensional & Jagged arrays, Nullable Types, Implicitly Typed Local variables, Var vs dynamic, Is and As operator, Ref vs out keywords,The 'object' base class in .Net, Equals() vs ==, String vs StringBuilder, Various String class methods, Default parameters, named parameters, Parse() vs TryParse() vs Convert Class methods	**10**
3	**OOP with C#:** Structures and Enums, The architecture of a class in C#, Instance, Class & Reference variables, Access Modifier, Abstract Classes, Constructors, Destructors, The GC, .NET Base class library, Inheritance in C#,	**10**

	Method Overloading , Method Overriding, Operator Overloading, Method Hiding, Access modifies : private, pubic, ,protected, internal, protected internal, new, Anonymous methods and anonymous types, Abstract classes, Sealed classes, Creating Interfaces, Implementing Interface inheritance, Declaring properties within Interfaces, Namespaces, Creating and using Generic classes	
4	**Using Microsoft Visual Studio Community:** Overview of Visual Studio, Tracing, Debugging, Build, Using break points, Using break conditions, Using watch and output window, Creating multiple projects within one solution **Exception Handling:** Exceptions in C#, Exception class hierarchy, Try block, Multiple catch blocks, Finally block, Purpose of throw keyword, Purpose of inner exception , Creating Custom Exception	**10**
5	**ADO.NET Architecture:** .NET Data Providers, DB Connectivity , Architectures in .NET , Elements of .NET Data Providers, Introduction to SQL Server , Namespaces in ADO.NET, Using server explorer window, Connection class, Command class, Direct Command execution against database, Using Parameters in command, Performing CRUD operations , Connected Vs disconnected Architecture, Data reader class, The dataset and dataset Architecture , Comparison ADO & ADO.NET on disconnected Data architecture, Implementing Disconnected Data Architecture, Performing CRUD operations in disconnected architecture, Entity Framework introduction.	**10**
	TOTAL	**48**

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	Pro C# 7: With .NET and .NET Core, Edition 8 - By Andrew Troelsen, Philip Japikse – "APRESS"	2017
2	C# 7.0 in a Nutshell: The Definitive Reference - Joseph Albahari, Ben Albahari, - "O'Reilly Media, Inc."	**2017**
3	Professional C# 7 and .NET Core 2.0.: Edition 7, Christian Nagel, "John Wiley & Sons"	**2018**
4	Illustrated C# 7: The C# Language Presented Clearly, Concisely, and Visually, Edition 5, Daniel Solis, Cal Schrotenboer, "Apress"	**2018**
5	Head First C#, Andrew Stellman, Jennifer Greene, "O'Reilly Media, Inc."	**2007**

NAME OF DEPARTMENT: Computer Applications

Subject Name: Cloud Computing **Subject Code:** TBS 602

Course Name: Bachelor of Science (Hons.) in Computer Science.

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☑ **Autumn** ☐ **Spring** ☐ **Both**

6 Pre-Requisite: Introductory knowledge of networking and distributed systems.

7 Subject Area: Computer Application

8 Objective: **To introduce the students with the idea of cloud computing and its application**

9 Course Outcome: A student who successfully fulfills the course requirements will be able to

a. Understand Cloud deployment models and services
b. Describe various storage architectures.
c. Describe the concepts of virtualization.
d. Explain the various vendors of a secure Cloud model.
e. Describe security concerns for cloud.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Cloud computing Fundamentals – Short history of cloud computing, Cloud Storage, Pros and Cons of cloud computing, Benefits from cloud computing. Basic and Essential characteristic of cloud computing model. Use and application of Cloud computing.	**10**
2	**Cloud Platform Architecture**: NIST cloud reference architecture, Cloud Computing and service Models: IAAS, PAAS, SAAS, Cloud Deployment models, public, private, hybrid and community models and their comparative study.	**10**

3	**Storage Architectures:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Prevalent Storage technologies like DAS, RAID, NAS and SAN architectures, Data centers for Cloud Computing.	**10**
4	**Virtual Machines and Virtualization :** Introduction, brief history of virtualization, Need for virtualization, Concept of hypervisor and its types, Virtualization architecture, pros and cons of virtualization, Types of Virtualization, Hardware Virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization Network Virtualization	**7**
5	**Security Recommendations and Software Environments:** Cloud Security Recommendations ,Virtualization Security Recommendations, Introduction to AWS, Key Amazon offerings, Google App Engine	**8**
	TOTAL	**45**

11 Suggested Books:

Sl. NO.	**NAME OF AUTHERS/BOOKS/PUBLISHERS**	**YEAR OF PUBLICATION**
1	J. W. Rittenhouse and J. F. Ransome "Cloud Computing, Implementation, Management, and Security", CRC Press.	2010
2	A. S. Tanenbaum,"Modern Operating Systems, 3rd Edition", by Andrew S. Tanenbaum, Prentice Hall.	2007
3	G. Reese, "Cloud Application Architectures", O.Reilly	2009
4	D.S. Linthicum "Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide", Addison Wesley	2009

NAME OF DEPARTMENT: Computer Applications

Subject Name: Programming using Python **Subject Code:** TBS603

Course Name: Bachelor of Science (Hons.) in Computer Science.

1 Contact Hours: 48 **L** 3 **T** 1 **P** 0

2 Examination Duration (Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 4

5 Semester: ☑ **Autumn** ☐ **Spring** ☐ **Both**

6 Pre-Requisite: Basic knowledge of object-oriented programming.

7 Subject Area: Computer Science

8 Objective: To enhance the programming skills.

9 Course Outcome:

CO 1 Master an understanding of scripting and the contributions of scripting languages.
CO 2 Master an understanding of Python especially the object-oriented concepts,
CO 3 Master an understanding of the built-in objects of Python,
CO 4 Be exposed to advanced applications such as TCP/IP network programming, multithreaded programming, Web applications, discrete-event simulations.
CO 5 Understand the concept of Simple Graphics and Image Processing in Python.
CO 6 Integrate the various libraries.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	**Introduction to Python**: Where is Python used in the Real World? Installation of Python in Windows, Linux and Osx, Using Interactive shell. Creating, Saving and Running a Python Script.	8
2	Intro to Python's data types: String, Lists, Dictionaries, Tuples, Files, Variables, Assignments; Immutable variables; Numerical types; Arithmetic operators and expressions; Dynamic Programming.	10
3	**Functional Programming:** Understanding If-Else, While, For, Iterations. Functions Basics, Scopes and Argument Passing. Advanced Functions. Modules creation and Managing Code with modules.	10
4	Object oriented programming with Classes. Classes basics and Operator Overloading. Exception Handling: Basics, passing Custom data to Exceptions.	10
5	**Essential Python Libraries:** "NumPy " & "Pandas". **NumPy Basics:** Arrays and Vectorized Computation, Data Processing	10

	Using Arrays. Getting Started with pandas.	
	TOTAL	**48**

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	"Learning Python" by Mark Lutz	
2	"Python Essential Reference" by David Beazley	
3	"Python Cookbook" by David Beazley	
4	"Python for Data Analysis" by Wes Mckinney	

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NAME OF DEPARTMENT: Computer Applications

Course Name: Bachelor of Science (Hons.) in Computer Science.

Subject Name: Optimization Techniques **Subject Code:** TBS 604(2)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration (Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ **Autumn** ☑ **Spring** ☐ **Both**

6 Pre-Requisite: Knowledge of graphs and algorithms.

7 Subject Area: Mathematics

8 Objective: To familiarize students with the Optimization of the resources through mathematical models.

9 Course Outcome: A student who successfully fulfills the course requirements will be able to-

- **a.** Ability to formulate a wide range of management problems that can be solved to optimality by classical combinatorial optimization techniques.
- **b.** The knowledge of alternative solution approaches such as metaheuristics that can find nearly optimal solutions.
- **c.** Understand the concept of game theory
- **d.** Understand the concept of PERT and CPM
- **e.** Understand the time Estimation in critical path analysis.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Meaning, Significance and scope of Operation Research, Management Applications of Operations research, Features of Operation Research, Quantitative technique of Operation Research, Role of Computers in Operation Research.	9
2	Formulation of Linear programming problems, Graphical Solution of LP problems, Simplex Method, Two phase method, Big M method, Transportation, Assignment, and Travelling-Salesman problems.	10

3	**Theory of Games**: Types of games, Pure Strategy and mixed strategy.	9
4	**Sequencing**: Processing n jobs through 2 machines, Processing n jobs through 3 machines, Processing 2 jobs through n machines, Processing n jobs through m machines.	7
5	**PERT and CPM**: Application of PERT/CPM Techniques, Basic steps in PERT/CPM techniques, Network diagram representation, Time Estimates in critical path analysis, Project time cost trade off, Updating of project, resource allocation, project monitoring.	10
	TOTAL	**45**

11 Suggested Books:

Sl. NO.	**NAME OF AUTHERS/BOOKS/PUBLISHERS**	**YEAR OF PUBLICATION**
1	S.D. Sharma, Operation Research, Kedar Nath Ram Nath	2001
2	Ravinder Philips and solberg, Operation Research Principles and Practice John Willy & Sons.	2003
3	H.A. Taha, Operation Research, prentice Hall of India	2004
4	Rounetran , Phillips,solberg: Operation Research: Willy DreamTech India Pvt Ltd.	2002

Name of Department- Computer Application

Course Name: BSc (H) in Computer Science

1. **Subject Name:** Internet of Things **Subject Code: TBS 605**
2. **Contact Hours: 45** **L: 3** **T: 0** **P: 0**
3. **Examination Duration(Hrs): Theory** 0 | 3 **Practical** 0 | 0
4. **Relative Weightage: CWE** 25 **MTE** 25 **ETE** 50
5. **Credits:** 0 | 3
6. **Semester:** [v] **Autumn** [ ] **Spring** [ ] **Both**
7. **Pre-Requisite:** : Basic knowledge of networking, protocols and Internet**.**
8. **Subject Area:** Computer Science
9. **Objective:** To understand the concepts of Internet of Things and able to build IoT applications
10. **Course Outcomes:** On successful completion of the course, the student will be able to:
    - I. Explain what IoT is, evolution of IoT from internet
    - II. Describe key technologies in Internet of Things.
    - III. Identify components needed to provide a solution for certain applications.
    - IV. Understand the challenges as well as application domains of IoT
    - V. Analyze security requirements in an IoT system.
    - VI. Design IoT applications in different domain.

11. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit - I	Introduction to Internet of Things: History of IoT, From Internet to Internet of Things, Overview and Motivations. Internet of Things: Definitions and Frameworks and Architecture, General Observations, ITU-T Views, Links to Current and Historical State of the Art.	**8**
Unit - II	Physical Design of IoT– IoT Protocols, IoT communication models, IoT Communication APIs. IoT and M2M – Machine to Machine, Difference between IoT and M2M Functional blocks of IoT, IoT Hardware, IoT Software IoT enabling Technologies– Wireless Sensor Networks, Cloud	**9**

	Computing, Big data analytics, Communication protocols, Embedded Systems.	
Unit – III	Resource Management In The Internet Of Things: Clustering, Synchronisation and Software Agents Potential Application Domains: Home automation, healthcare applications, Industry applications, Transportation, Traffic management, Surveillance applications, Other IoT applications.	**9**
Unit – IV	Iot Protocols I: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART, Z-Wave, Bluetooth Low Energy, Zigbee Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS)	**10**
Unit – V	IoT Protocols II: Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT Service Layer -oneM2M, ETSI M2M, OMA, BBF Challenges in IoT: Design challenges, Development challenges, Security & Privacy challenges, Other challenges.	**9**
	Total	**45**

Reference Books

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer
3. Parikshit N. Mahalle& Poonam N. Railkar, "Identity Management for Internet of Things", River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).
4. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Willy Publications