Sant Gadge Baba Amravati University, Amravati

Part A

Part A

Faculty: Science and Technology

Programme: Bachelor of Computer Application (BCA)

Part B

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester: III

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
3BCA1	Operating Systems	60 Periods

COs:

1 Understand the general concept of operating systems
2 Know about types of system software and their functions
3 Understand different types and structures of operating systems
4 Understand different functions of operating systems
5 Know about open-source operating systems

Unit	Content
Unit I	History of computer operating systems , what is an operating system?, **Types of operating systems:** Batch, multi programming, multitasking/time-sharing, real time, distributed, network, mobile **System software types:** Operating system, device driver, firmware, translator, utility **Brief introduction to open-source OS:** Linux and Android**(12 periods)**
Unit II	**Operating system services:** program execution, I/O operations, file systems, communications, resource allocation, accounting, error detection, protection and security **Operating system interfaces:** Command interpreter, GUI, System calls: process control, file manipulation, device manipulation, information maintenance, communication and protection **Structure Types:** Monolithic, layered, microkernels, client-server model, virtual machines.**(11 periods)**
Unit III	**File System:** File concept, file operations, file types, file structure, file accessing methods, directory and disk structure **File system implementation:** partitions and mounting, virtual file systems , directory implementation: linear list, hash table **Disk management:** create, delete, format partitions**(11 periods)**
Unit IV	**I/O devices:** I/O devices, Device controllers, DMA controllers, DMA operation modes **Memory Hardware:**Basic memory hardware, address binding, logical and physical address space, address calculation **Memory management strategies:** Contiguous memory allocation, swapping, paging, page replacement algorithms: first in first out, optimal page replacement, least recently used, **Segmentation:** - virtual memory segmentation, simple segmentation, fragmentation**(11 periods)**
Unit V	**Process concept, Process states:** primary process states, additional process states, process control block, process state transitions **Process scheduling:** scheduling queues, schedulers- Long-term(Job), short-term(CPU), medium-term(swapping) **Process scheduling algorithms:** FCFS , SJF, shortest remaining time, priority, round robin , multilevel queue **Process context:** Context switch, process synchronization, deadlocks. **(11 periods)**
***SEM A**ssignment, Class test, Attendance, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	

COs: 1. Ability to apply CPU scheduling algorithms to manage tasks. 2. Initiation into the process of applying memory management methods and allocation policies. 3. Knowledge of methods of prevention and recovery from a system deadlock.	
**Activities	1. Executing Linux commands 2. Learning OS Scheduling Algorithms 3.Learning Memory management techniques **(4 periods)**

Course Material/Learning Resources

Text books:

1. Operating System Concepts: Silberschatz, Galvin and Gagne.

Reference Books:

1. Operating Systems: Design and Implementation: Andrew S. Tanenbaum.
2. Fundamentals of Operating Systems: A.M. Lister, R.D. Eager
3. An Introduction to Operating Systems Concepts and Practice (GNU/LINUX): Pramodchandra P. Bhatt

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2. https://onlinecourses.swayam2.ac.in/cec20_cs06/preview
3. https://onlinecourses.swayam2.ac.in/aic20_sp24/preview

Weblink to Equivalent Virtual Lab if relevant:

1. https://hansalshah007.github.io/osvirtuallab/index.html
2. https://www.vlab.co.in/

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. https://www.youtube.com/watch?v=bkSWJJZNgf8&list=PLxCzCOWd7aiGz9donHRrE9I3Mwn6XdP8p
2. https://www.youtube.com/watch?v=WJ-UaAaumNA
3. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O

IMPORTANT NOTES:

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***SEM needs to be designed only for Courses in all UG Programmes**

****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

Identify Employability Skills for SEM/SEC		
☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
☐ Personal Qualities	☐Communication Skills	☐ Applied Academic Skills
☐ Resource Management	☐Systems Thinking	☐Critical Thinking Skills

Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

Workplace Skills	Resource Management Information Use Communication Skills Systems Thinking Technology Use

Applied Knowledge	Applied Academic Skills Critical Thinking Skills

Sant Gadge Baba Amravati University, Amravati

Part A

Faculty: Science and Technology

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Part B

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester III

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
3BCA2	Core Java Programming	60 Periods

Cos

1. Understand the fundamental concepts of Pure Object Oriented Programming.
2. Knowledge and ability to implement the control structures to get desired output.
3. Analyze the power of Classes, objects and methods to implement overloading and overriding.
4. Ability to create Interface, Package and Threads for strong and secure programming.
5. Acquire the basic knowledge of Web Programming.

Unit	Content
Unit I	Java Evolution: History, Features, System Requirements, Java Environment Overview of Java Language: Introduction, Program Structure, tokens, JVM, Command line argument, Simple java programs. **(12 Periods)**
Unit II	Constant, variable, data types, operators, expression, Decision Making and Branching: Simple if statement, if...else statement, Nesting of if...else statement, Else...if ladder, switch statement. Decision Making and Looping: The While statement, The Do statement, The For statement, jumps in loop. **(11 Periods)**
Unit III	**Classes, Objects and Methods:** Introduction, defining a class, declaration of fields, methods, object creation, accessing class members, constructor, method overloading, overriding methods, Final class, abstract methods and classes, Arrays and String: Introduction, array one dimensional array, multi dimensional array, strings **(11 Periods)**
Unit IV	**Interfaces:** Introduction, defining interfaces, Extending interfaces, Implementing interfaces, accessing interface variable **Packages:** Introduction, Java API Package, Using System Package, Naming conventions, Creating packages, Accessing Package, Using Package **Multithreaded Programming**: Introduction, creating Threads, Extending the Thread, Life cycle of Thread, Thread Exception, priority, Synchronization, Runnable Interface **(11 Periods)**
Unit V	**Errors and Exceptions:** Introduction, types of Errors, Exceptions, multiple catch statement, Finally statement **Applet Programming:** Introduction, Applet Life Cycle, Creation of Applet, Designing a web page, Running the Applet, passing parameters to Applet, getting Input from users, Event Handling. **(11 Periods)**
***SEM: Assignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
COs: 1. Understand the fundamental concepts of Pure Object Oriented Programming. 2. Knowledge and ability to implement the control structures to get desired output. 3. Analyze the power of Classes, objects and methods to implement overloading and overriding. 4. Ability to create Interface, Package and Threads for strong and secure programming. 5. Acquire the basic knowledge of Web Programming.	
**Activities	1. Simple programs to implement OOPs concept 2. Implementation of control structures. 3. Implementation of Matrix 4. Implementation of Applet **(4 Periods)**

Course Material/Learning Resources

Text books:

1. Programming with Java A Primer, Fourth Edition- E. Balguruswami (McGraw Hill)
2. Let Us Java 4th edition –Yasvant Kanetkar

Reference Books:

1. Java - The Complete Reference 11th edition - Herbert Schildt (McGraw Hill)

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Weblink to Equivalent Virtual Lab if relevant:

1. https://java-iitd.vlabs.ac.in/

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

2. https://www.youtube.com/watch?v=hBh_CC5y8-s
3. https://www.youtube.com/watch?v=UmnCZ7-9yDY
4. https://www.youtube.com/watch?v=ZFnRvpxpnOc

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****Activities/Assignments/tasks/projects (individual/group)**

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☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
☐ Personal Qualities	☐Communication Skills	☐ Applied Academic Skills
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Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

Workplace Skills	Resource Management Information Use Communication Skills Systems Thinking Technology Use

Applied Knowledge	Applied Academic Skills Critical Thinking Skills

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Semester IV

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Hours)
3BCA3	**Fundamental of Open Source Software**	**60**

Course Objectives (Cos)

1. Introduce the concept of open source software.
2. Understand the difference between open source software and commercial software.
3. Demonstrate the common open source software licenses, open source project structure, distributed team software development, and current events in the open source world.
4. Working on an open source project and will be expected to make a significant contribution.

Unit	Content
Unit I	Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project. Methodologies Open Source History, Initiatives, Principle and methodologies. **(12 Hours)**
Unit II	Philosophy: Software Freedom, Open Source Development Model Licenses and Patents: What Is A License, Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copy lefts, Patents Economics of FOSS : Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization. Apache web server, GNU/Linux, Android, Mozilla (Firefox), Drupal, wordpress, GCC, GDB, github, Open Office. **(11 Hours)**
Unit III	Models: Understanding the developmental models, licensing, mode of funding, commercial/non-commercial use. Open Source Hardware, Open Source Design, Open source Teaching. Open source media. Collaboration, Community and Communication Contributing to Open Source Projects Introduction to github, interacting with the community on github, Communication and etiquette, testing open source code, reporting issues, contributing code. **(11 Hours)**
Unit IV	Introduction to wikipedia, contributing to Wikipedia Or contributing to any prominent open source project of student's choice. Starting and Maintaining own Open Source Project. Understanding Open Source Ecosystem Open Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies **(11 Hours)**
Unit V	Open source cloud, Social and Financial impacts of open source technology, Shared software, Shared source **(11 Hours)**
***SEM** Assignment, Class test, Attendance, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
1. COs: To be able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges 2. Cos: To assess the curricular skills acquired by students at college level through Assignments, Unit test, Internal Test, Group Discussion/Seminar/Mini Project, Study Tour	

**Activities	2. Identify, install and run Linux operating system. 3. Install and manage applications. 4. Identify, install open source web technologies Apache, MySql, PHP. 5. Develop web applications using LAMP. 6. Write session control PHP code for a website. **(4 Hours)**

Course Material/Learning Resources

Text books:
1. Fundamentals Of Open Source Software by M.N. Rao, PHI publishers.
2. Code Reading: The Open Source Perspective By DiomidisSpinellis.

Reference Books:
1. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill Education, 2006
2. The official Ubuntu Book, 8th Edition

Weblink to Equivalent MOOC on SWAYAM if relevant:

https://www.careers360.com/courses-certifications/tcs-ion-digital-learning-hub-free-and-open-source-software-foss-course

https://www.legallyindia.com/blogs/swayam-from-open-source-to-proprietary-software-for-india-s-moocs

https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Weblink to Equivalent Virtual Lab if relevant:

https://www.classcentral.com/course/open-source-software-development-methods-12599

https://www.coursera.org/learn/open-source-software-development-methods

https://www.careers360.com/courses-certifications/articles/20-online-courses-become-open-source-programming-maverick

https://www.rit.edu/study/free-and-open-source-software-and-free-culture-minor

https://www.sonatech.ac.in/research/free-open-source-software.php

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

https://www.youtube.com/watch?v=QQzBACyX12M

https://www.youtube.com/watch?v=SpeDK1TPbew

https://www.youtube.com/watch?v=TEttd0Qkqnc

https://www.youtube.com/watch?v=4bNcvtf-JOc

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****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

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Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

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Applied Knowledge	Applied Academic Skills Critical Thinking Skills

Sant Gadge Baba Amravati University, Amravati

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester 3

Code of the Course/Subject	**Title of the Course/Subject** (Laboratory/Practical/practicum/hands-on/Activity)	**(No. of Periods)**
3BCALAB1	**Operating System and Programming Lab**	**3 periods**

COs

1. Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Analyze important algorithms eg. Process scheduling and memory management algorithms
3. Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.C5.
4. Demonstrate the ability to perform OS tasks.

List of Practical/Laboratory Experiments/Activities etc.

Sr. No.	**Name of Practical/Experiment**
1	To study about the basic commands of UNIX
2	To study various UNIX editors such as vi, ed, ex and EMACS.
3	To write C Programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
4	To write C programs to simulate UNIX commands like cp, ls, grep.
5	Write a Shell program to find the factorial of a number
6	Write a Shell program to swap the two integers
7	To write a C program for implementation of Priority scheduling algorithms.
8	To write a C program for implementation of Round Robin scheduling algorithms.
9	To write a C program for implementation of FCFS and SJF scheduling algorithms.
10	To write a C-program to implement the producer – consumer problem using semaphores.
11	To write a c program to implement IPC using shared memory.
12	To write a C program to implement algorithm for deadlock detection.
13	To write a c program to implement Threading and Synchronization Applications.
14	To write a C program for implementation memory allocation methods for fixed partition using first fit.
15	To write a c program to implement Paging technique for memory management.
16	To write a c program to implement LRU page replacement algorithm.
17	To write C program to organize the file using single level directory.
18	To write C program to organize the file using two level directory
19	To write a C program for sequential file for processing the student information.
20	To write a C program for random access file for processing the employee details.

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Programme: Bachelor of Computer Application (BCA)

Semester III

Code of the Course/Subject	**Title of the Course/Subject**	**(Total Number of Hours/Periods)**
3BCA4	**Python Programming**	**60 Periods**

COs

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. Infer the Object-oriented Programming concepts in Python.

Unit	**Content**
Unit I	Parts of Python Programming Language, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement, Functions, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.**(12Periods)**
Unit II	Strings, Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement.**(11Periods)**
Unit III	Dictionaries, Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozenset.**(11Periods)**
Unit IV	Files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, Regular Expression Operations, Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.**(11Periods)**
Unit V	Object-Oriented Programming, Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.**(11 Periods)**
***SEM A**ssignment, Class test, Attendance, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	

COs 1. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. 2. Express proficiency in the handling of strings and functions. 3. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. 4. Identify the commonly used operations involving file systems and regular expressions. 5. Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	
**Activities	1.Download and install python. 2.Write and execute python program which prints "Welcome to Python" **(4 Periods)**

Course Material/Learning Resources

Text books:

1. "Introduction to Python Programming", 1st Edition, by Gowrishankar S, Veena A

Reference Books:

1. "Python Data Science Handbook: Essential Tools for Working with Data", by Jake VanderPlas,
2. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", by Aurelien Geron
3. "Core Python Applications Programming", 3rd Edition, by Wesley J Chun
4. "Flask Web Development: Developing Web Applications with Python", 2nd Edition, by Miguel Grinberg,

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
3. https://www.classcentral.com/course/swayam-python-for-data-science-14266

Weblink to Equivalent Virtual Lab if relevant:

1. https://python-iitk.vlabs.ac.in/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html
3. https://www.vlab.co.in/broad-area-computer-science-and-engineering

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1. https://www.youtube.com/watch?v=daefaLgNkw0
2. https://www.youtube.com/watch?v=W8KRzmHUcc
3. https://www.youtube.com/watch?v=gfDE2a7MKjA

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****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

Identify Employability Skills for SEM/SEC

☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
☐ Personal Qualities	☐Communication Skills	☐ Applied Academic Skills
☐ Resource Management	☐Systems Thinking	☐Critical Thinking Skills

Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

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Programme: Bachelor of Computer Application (BCA)

Semester 3

Code of the Course/Subject	**Title of the Course/Subject** (Laboratory/Practical/practicum/hands-on/Activity)	**(No. of Periods)**
3BCALAB2	**Java Programming Lab**	**3 periods**

COs

1. Able to use Java compiler and eclipse platform to write and execute java program.
2. Understand and Apply Object oriented features and Java concepts.
3. Able to apply the concept of multithreading and implement exception handling.
4. Able to access data from a Database with java program.
5. Develop applications using Console I/O and File I/O,GUI applications*

List of Practical/Laboratory Experiments/Activities etc.

Sr. No.	**Name of Practical/Experiment**
1	Write a program to print “Welcome to JAVA”
2	Write a program to check whether a number is Armstrong or not
3	Write a java program to find the Fibonacci series using recursive and non recursive functions
4	Write a program to show the concept of Constructors.
5	Write a program to show the concept of method overloading
6	Write a program to show the concept of Inheritance
7	Write a program to show various string operations.
8	Write a program to show how to use interface in java
9	Write a program to show the concept of packages.
10	Write a program to show the concept of threads.
11	Write a program to show exception handling in java.
12	Write a program to show the concept of Applets.
13	Write a java program to implement method overloading and constructors overloading.
14	Write a java program to implement method overriding.
15	Write a java program to multiply two given matrices.
16	Write a java program to check whether a given string is palindrome
17	Write a java program for sorting a given list of names in ascending order
18	Write a java program to represent Abstract class with example.
19	Write a java program to implement Interface using extends keyword
20	Write a java program to create inner classes.
21	Write a java program for creating multiple catch blocks.
22	Write a java program for producer and consumer problem using Threads.
23	Write a java program to display File class properties.
24	Write a java program to represent ArrayList class.

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Semester III

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
3BCALAB3	**Lab 3 Python Programming**	**3 periods**

COs

1. To implement Python programs with conditionals and loops.
2. Use functions for structuring Python programs.
3. Represent compound data using Python lists, tuples, and dictionaries.
4. Read and write data from/to files in Python.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Experiment/Practical
1	Write a program to demonstrate different number data types in python.
2	Write a program to perform different arithmetic operations on numbers in python.
3	Write a program to demonstrate basic data type in python.
4	Write a Program for checking whether the given number is an even number or not. Using a for loop.
5	Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
6	Write a program to create, concatenate and print a string and accessing substring from a given string.
7	Write a python script to print the current date in following format “Sun June 26 02:26:23 IST 2022”
8	Write a python program to create, append and remove lists in python.
9	Python program to check if a substring is present in a given string.
10	Write a program to demonstrate working with tuples in python.
11	Write a program to demonstrate working with dictionaries in python.
12	Write a python program to find largest of three numbers.
13	Write a python program to convert temperature to and from Celsius to Fahrenheit.
14	Write a python program to construct the following pattern using nested for loop
15	Write a python program to print prim numbers less than 20
16	Write a python program to find factorial of a number using recursion.
17	Python program to map two lists into a dictionary.
18	Python program to count the frequency of words appearing in a string using a dictionary.
19	Python program to create a dictionary with key as first character and value as words starting With that character.
20	Python program to read the contents of a file in reverse order.

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Syllabus Prescribed for 3 Year BCA UG/PG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
4BCA1	**Data Communication and Networking**	**60 Periods**

Course Objectives (Cos)

1. To Focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To Focus on different coding schemes.
4. Brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices,etc.

Unit	Content
Unit I	Digital Communication: Advantages; Data Transmission: Modes: Parallel, Serial: Asynchronous, Synchronous, Isochronous; Transmission Media: Guided and unguided; Modulation: Amplitude, Phase Shift, Frequency; Multiplexing: FDM, WDM, TDM, STDM, CDM; Switching: Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; Network Reference Models: OSI: Layered Architecture and Services, TCP/IP: Layered Architecture and Services **(12 Periods)**
Unit II	Application Layer: Principles of Application Layer Protocols; Processes: Client-Server Model, Socket Interface; Services required by Application Layer; HTTP: Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; FTP: Service Model, FTP Commands; Electronic Mail; SMTP; DNS: Services and working **(11 Periods)**
Unit III	Transport Layer: Transport-Layer Services and Principles; Multiplexing and Demultiplexing Applications; Connectionless Transport – UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols; 6 GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principles of Congestion Control; Approaches towards Congestion Control; TCP Congestion Control **(11 Periods)**
Unit IV	Network Layer: Introduction; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing **(11 Periods)**
Unit V	Data Link Layer: Introduction; Services; Error Detection and Correction; Multiple Access Protocols and LANs; LAN Addresses and ARP; Ethernet; Hubs, Bridges and Switches; Wireless LANs: IEEE 802.11; The Point-to-Point Protocol; ATM, X.25 and Frame Relay. **(11 Periods)**
***SEM :** Assignment, Class test, Attendance, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
COs: 1. Ability to understand the concept of data communication & transmission 2. Ability to get the knowledge about Transmission media. 3. Ability to get the knowledge about various layer of network model. 4. Ability to get the knowledge about various protocols used in Data communication	
**Activities	1.To learn functions of OSI model 2. To learn advantages of datacommunication 3. To learn different Services and Principles Transport Layer **(4 periods)**

Course Material/Learning Resources

Text books:

1. Computer Networking – James F. Kurose and Keith W. Ross (AddisonWesley)

Reference Books:

1) Data Communication and Networking – Behrouz A. Forouzan (McGraw Hill) 2) Computer Network & Internet - Douglas E. Comer (Pearson)
3) Data and Computer Communication – William Stallings (Pearson)
4) Computer Networks - Andrew S. Tanenbaum (PHI)

Weblink to Equivalent MOOC on SWAYAM if relevant:

1 https://onlinecourses.nptel.ac.in/noc20_cs23/preview

2 https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

3 https://www.classcentral.com/course/swayam-computer-networks-13951

4

Weblink to Equivalent Virtual Lab if relevant:

1 http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

2 http://vlabs.iitkgp.ernet.in/ant/

3 https://www.cs.unc.edu/Research/geni/geniEdu/v03-VCN.html

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1 https://www.youtube.com/watch?v=L3ZzkOTDins

IMPORTANT NOTES:

Note: Please use Times New Roman 10 point font

(After filling the Table, *select the Table—Table Properties- Borders and Shading—None*, so that all Border Lines will get vanished)

***SEM needs to be designed only for Courses in all UG Programmes**

****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

Identify Employability Skills for SEM/SEC		
☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
☐ Personal Qualities Academic Skills	☐Communication Skills	☐ Applied
☐ Resource Management Skills	☐Systems Thinking	☐Critical Thinking

Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

Workplace Skills	Resource Management Information Use Communication Skills Systems Thinking Technology Use

Applied Knowledge	Applied Academic Skills Critical Thinking Skills

Sant Gadge Baba Amravati University, Amravati

Part A

Faculty: Science and Technology

Programme: Bachelor of Computer Application (BCA)

Part B

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
4BCA2	Web Technologies	60 Periods

Cos

1. Knowledge about actual working of WWW.
2. Ability to create web page by integrating multimedia.
3. Get familiar to plan a responsive website.
4. Knowledge to Publish site with Search Engine Optimization.
5. Acquire the professional knowledge of Web Programming required for Industry.

Unit	Content
Unit I	Introduction to Web Publishing, Anatomy of Website, Wireframming your website, web hosting, HTML & CSS **(12 Periods)**
Unit II	Creating Web Pages, Basics of HTML, organizing information with lists, working with Links, Formatting Text with HTML and CSS, Using CSS to Style a Site, Using images on web pages, Building tables **(11 Periods)**
Unit III	Using CSS to position elements on the page, Designing Forms, Structuring page with HTML 5, Integrating Multimedia: Video and Sound, Advance CSS: Page layout in CSS, Using Responsive Web Design **(11 Periods)**
Unit IV	Introducing JavaScript, JQuery, Use of JavaScript, working with Frames & Linked Windows, Designing for the Mobile Web, Designing for user experience. **(12 Periods)**
Unit V	Live on the Web, Publishing the site, Taking advantage of Server, Search Engine & Search Engine Optimization **(10 Periods)**
***SEM: A**ssignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
COs: 1. Knowledge about actual working of WWW. 2. Ability to create web page by integrating multimedia. 3. Get familiar to plan a responsive website. 4. Knowledge to Publish site with Search Engine Optimization. 5. Acquire the professional knowledge of Web Programming required for Industry.	
**Activities	1. Introducing HTML and CSS 2. Use of CSS to style a site 3. Browser as a programming environment 4. How to Publish your Site **(4 Periods)**

Course Material/Learning Resources

Text books:

1. Mastering HTML, CSS & JavaScript Web Publishing by Laura Lemay, Rafe Colburn, Jennifer Kyrnin (BPB)

Reference Books:

1. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites-Robin Nixon (O'REILLY)

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.swayam2.ac.in/cec21_lb01/preview
2. https://onlinecourses.swayam2.ac.in/nou22_cs03/preview

Weblink to Equivalent Virtual Lab if relevant:

1. https://html-iitd.vlabs.ac.in/Course%20Alignment.html

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. https://www.youtube.com/watch?v=3Xly2W1Cisc
2. https://www.youtube.com/watch?v=QEtWL4lWlL4
3. https://www.youtube.com/watch?v=uUhOEj4z8Fo

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****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

Identify Employability Skills for SEM/SEC		
☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
☐ Personal Qualities	☐Communication Skills	☐ Applied Academic Skills
☐ Resource Management	☐Systems Thinking	☐Critical Thinking Skills

Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

Workplace Skills	Resource Management Information Use Communication Skills Systems Thinking Technology Use

Applied Knowledge	Applied Academic Skills Critical Thinking Skills

Sant Gadge Baba Amravati University, Amravati

Part A

Faculty: Science and Technology

Programme: Bachelor of Computer Application (BCA)

Part B

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
4BCA3	**Advanced Java Programming**	**60 Periods**

Cos

1 To introduce the concepts and working of JDBC, AWT, RMI & Servlets.

2 To learn JSP Programming.

3 To learn socket programming.

4 To learn and understand advanced concepts of Java Programming

5. Create network based applications.

Unit	Content
Unit I	**Event handling:** Event Delegation model, Event classes, Event Listener Interfaces, Handling Mouse and Keyboard events, Adapter classes. **AWT :** AWT concept, AWT class hierarchy , components, Containers, Frames , Panels,Window,Dialog, Event Delegation Model, Listeners & Interfaces, AWT Controls : Button, Label, TextField, TextArea,Choice, List, CheckBox, CheckBox Group,Scrollbar, Dialog Boxes, Menu, Layout managers. **(12 Periods)**
Unit II	**JFC & Swings:** Introduction to JFC, Features, Overview of Swing, Model-view Controller (MVC) Architecture, Swing Feature, Difference between AWT and Swing, Swings class hierarchy, Components & Containers. **Swing Controls:** JApplet, Icons & Labels, Text fields, JPasswordField, Buttons, Check Boxes, Radio Button, Combo boxes, JSlider, Tabbed Panes, Scroll Panes, Trees, Tables, JToggleButton ,Exploring Swing **(11 Periods)**
Unit III	**RMI:** RMI concept, Architecture, RMI Components, Stubs & Skeleton, RMI classes & Interfaces, Writing simple RMI application. **Networking with Java:** Network Basics,java.net-Networking Classes and Interfaces, Implementing TCP/IP based Server and Client, Datagrams: Datagram packet, Datagram Servers and Client.URL Connection **(11 Periods)**
Unit IV	**JDBC:** JDBC concept, JDBC Architecture, JDBC API, Types of JDBC Drivers, Steps to create JDBC Application, Java SQL packages, Inserting & Updating, selecting, modifying Records. **(12 Periods)**
Unit V	**Servlet:** Servlet concept, Features of Servlet ,Servlet Life cycle, Servlet Development Kit, Step of Writing Servlet Programs, Servlet API, Handling http Requests & Response, Using Cookies, Session Tracking. **Introduction to JSP:** Simple JSP concepts, Advantage of JSP over Servlet, JSP Architecture, The Components of JSP, Request-time expressions, Advanced JSPs: Scripts. Conditionals, loops,Try-Catch. **(10 Periods)**
***SEM: A**ssignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
COs: 1. Understand the fundamental concepts GUI Programmings. 2. Knowledge and ability to implement Event get desired output. 3. Analyze the power of JDBC for communication between client and server 4. Ability to create Servlet,JSP and socket programming. 5. Acquire the basic knowledge of Web Programming.	
**Activities	1. Simple programs to implement AWT concept 2. Implementation RMI programs. 3. Implementation of JDBC programs 4. Implementation of Swings **(4 Periods)**

Course Material/Learning Resources

Text books: s

1. . The Complete Reference Java- 5th edition – Herbert Schildtand Patrick Naughton- Tata McGraw Hill
2. Dietel & Dietel , Java How to Program, Pearson Education

Reference Books:

1.Steven Holzner, Java2 Programming Black Book, DreamTech Press

2. D.R. Collaway, Inside Servlets, Pearson Education

3. Phillip Hanna Osborne , Complete Reference JSP, McGraw-Hill

4. Larne Pekowasky, Java Server Pages, Pearson Education (LPE)

5. SubhramanyamAllamaraju, Cedric Buest. Professional Java Server Programming, Apress publication

6.KanikaLakhani , Advance Java, Katson Publications

Weblink to Equivalent MOOC on SWAYAM if relevant:

https://onlinecourses.nptel.ac.in/noc19_cs84/preview

https://onlinecourses.nptel.ac.in/noc22_cs47/preview

https://nareshit.com/advanced-java-online-training/

Weblink to Equivalent Virtual Lab if relevant: http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/bots_with_dots/labs/exp1/posttest.html

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

https://www.youtube.com/watch?v=mDxEGtMNPtA

https://www.youtube.com/watch?v=E8lZD3O2a68

https://www.youtube.com/watch?v=dGvVPdpeP4U

https://www.youtube.com/watch?v=dGvVPdpeP4U

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****Activities/Assignments/tasks/projects (individual/group)**

Some Tips to extract and mine skill components from the Course (for ready reference)

What do you expect Students to LEARN or EXPERIENCE in the SEM/SEC?

Identify Employability Skills for SEM/SEC		
☐ Interpersonal Skills	☐ Information Use	☐ Technology Use
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☐ Resource Management	☐Systems Thinking	☐Critical Thinking Skills

Employability Skills Categories

Effective Relationships	Interpersonal Skills Personal Qualities

Workplace Skills	Resource Management Information Use Communication Skills Systems Thinking Technology Use

Applied Knowledge	Applied Academic Skills Critical Thinking Skills

Sant Gadge Baba Amravati University, Amravati

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application

Semester 4

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
4BCALAB1	**Web Technologies**	**3 periods**

COs

1. To learn the basics involved in publishing content on the World Wide Web.
2. To learn the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function
3. To understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting.
4. To make the students to design, experiment, analyze, interpret in the core field with the help of other multi disciplinary concepts wherever applicable.
5. Able to create and Link web page documents.
6. Learn and understand the different CSS.
7. Implement decision statements in Javascript
8. Able to create a web page using HTML & Javascript.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Practical/Experiment
1	Write a HTML program to design a form which should allow to enter your personal data (Hint: make use of text field, password field, e-mail, lists, radio buttons, checkboxes, submit button)
2	Create an html page with red background with a message “warning” in large size blinking. Add scrolling text “read the message” below it.
3	Create an html page with 7 separate lines in different colors. State color of each line in its text.
4	Design a table and display it in tabular format.
5	Write a HTML code to generate multiple frames.
6	Create an html page with all the different text styles (bold, italic and underlined) and its combinations on separate lines. State style of each line in its text.
7	Write a HTML code to generate following output. Create an html page with following specifications a. Title should be about mycollege, b. Put the image in the background, c. Place your College name at the top of the page in large text followed by address in smaller size, d. Add names of courses offered each in a different color, style and typeface, e. Add scrolling text with a message of your choice
8	Design the HOME PAGE (The static home page must contain three frames) required for an online book store web site.
9	Design the LOGIN PAGE required for an online book store web site.
10	Design the CATOLOGUE PAGE (The catalogue page should contain the details of all the books available in the web site in a table.)
11	Design the REGISTRATION PAGE required for an online book store web site.
12	Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site.
13	Develop and demonstrate the usage of inline, internal and external style sheet using CSS.
14	Write a program to design registration form for students by using HTML and CSS.
15	Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color,bold and font size).
16	Write a program to design registration form for students by using HTML, CSS& Java Script and perform following validations: all fields mandatory, phone number and email address validation.
17	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. **Input:** Click on Display Date button using onclick( ) function **Output:** Display date in the textbox
18	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. **Input:** A number n obtained using prompt **Output:** Factorial of n number using alert
19	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. **Input:** A number n obtained using prompt **Output:** A multiplication table of numbers from 1 to 10 of n using alert
20	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problem. **Input:** A number n obtained using prompt and add another number using confirm **Output:** Sum of the entire n numbers using alert

Sant Gadge Baba Amravati University, Amravati

Part A

Faculty: Science and Technology

Programme: Bachelor of Computer Application(BCA)

Part B

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Hours)
4BCA4	.Net Technologies and C#	60 periods

Course Objectives (Cos)

1.The main objective of the course is to introduce students with fundamental concepts and theory of .Net Technologies and C#.
2. It provides the basics of class, object, inheritance and polymorphism.
3. It provides the basics of exception handling

Unit	Content
Unit I	Understanding .net: The C# environment: origins of .net technology, .net framework, the common language runtime, framework base classes, user and program interfaces, visual studio .net, .net languages, benefits, c# and .net **(12 periods)**
Unit II	Overview of C#: namespaces, comments, aliases for namespaces, command-line arguments, program structure; Literals, variables and data types, operators, expressions, Decision making and branching, looping, methods in c#, Array handling, string manipulation, structures and enumerations. **(11 periods)**
Unit III	Classes and objects: Principle of OOP, Access modifiers, constructors, destructors, Nesting of classes; Inheritance and Polymorphism: multilevel inheritance, hierarchical inheritance, overriding, hiding methods, abstract methods and classes, sealed classes and methods; Interfaces: defining, extending and implementing interfaces, interfaces and inheritance, explicit interface implementation, abstract class and interfaces. **(11 periods)**
Unit IV	Operator overloading: unary, binary, comparison, Delegates and events; Console I/O operations: console class, console input output, formatted output. Errors and Exceptions: types of errors, exceptions, exception handling codes, multiple catch statements, exception hierarchy, catch handler, finally statement, nested try blocks. **(11 periods)**
Unit V	Multithreading in c#: Introduction, System. Threading namespace, scheduling, synchronizing threads, thread pooling. File Manipulation: Managing File System, Moving, copying, deleting files, Reading, writing to files, Reading Drive information, File Security **(11 periods)**
***SEM** Assignment, Class test, Attendance, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
1. COs: To be able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges 2. Cos: To assess the curricular skills acquired by students at college level through Assignments, Unit test, Internal Test, Group Discussion/Seminar/Mini Project, Study Tour	
**Activities	1. Understanding the concepts of c # and dot net. 2. Programming concepts in .Net Framework. 3. Implementation of classes, object, inheritance and polymorphism. 4. Implementation of operator overloading. **(4 periods)**

Course Material/Learning Resources

Text books:

1) 1. Programming in C# -E. Balagurusamy, Tata McGraw-Hill Publications
2. Professional C# 2005 with .NET 3.0 - Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner and Karli Watson Wrox Press

Reference Books:
1. Programming C# - J. Liberty, O'Reilly Publications
2. The Complete Reference: C# - Herbert Schildt, Tata McGraw-Hill Publications
3. C# and the .NET Platform -Andrew Troelsen, A! Press

Weblink to Equivalent MOOC on SWAYAM if relevant:

https://www.mooc-list.com/course/c-class-development-coursera-0

https://www.my-mooc.com/en/mooc/programming-c-microsoft-dev204x-2/

Weblink to Equivalent Virtual Lab if relevant:

https://www.studocu.com/in/document/gujarat-technological-university/dotnet-technology/dot-net-technology-2160711-lab-manua-l/18844468

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

https://www.youtube.com/watch?v=fmvcAzHpsk8

https://www.youtube.com/watch?v=gfkTfcpWqAY

https://www.youtube.com/watch?v=SXmVym6L8dw

Sant Gadge Baba Amravati University, Amravati

Syllabus Prescribed for 3 Year BCA UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
4BCALAB2	**Advance JAVA Programming Lab**	**3 Periods**

COs

1. Implement Server side programming.
2. Develop dynamic software components.
3. Develop database application.
4. Design and develop powerful GUI based components.

* List of Practical/Laboratory Experiments/Activities etc.

Sr.No.	Name of Program/ Experiment
1	Implements and create five button and put on different direction and centre by using border layout manager.
2	Implementation of awt to create a dialog box.
3	Implementation of AWT to create menubar.
4	Implementation of AWT to create list
5	Implementation of AWT to create choice
6	Implementation of AWT to create checkbox
7	Implementation of AWT to create scrollbar
8	Implementation of swing to demonstrate of Radiobutton
9	Implementation of swing to demonstrate of JToggleButton
10	Implementation of swing to demonstrate of Tabbed panes
11	Implementation of swing to demonstrate of tree.
12	Implementation of JDBC to insert record in database.
13	Implementation of JDBC to update record of database.
14	Implementation of JDBC to select record from table and display it.
15	Implementation of RMI application
16	Design a Program to Implement a Socket programming where client will send the request and server will then respond.
17	Implementation of servlets for Hello World
18	Implementation of servlets for doGet method
19	Implementation of servlets for doPost method
20	Implementation of JSP to create User ID and Password

Format and template for Practical/Lab Course

Sant Gadge Baba Amravati University, Amravati

Syllabus Prescribed for 3 Year UG Programme

Programme: Bachelor of Computer Application (BCA)

Semester IV

Code of the Course/Subject	**Title of the Course/Subject** (Laboratory/Practical/practicum/hands-on/Activity)	**(No. of Periods/Week)**
4BCALAB3	**ASP .Net with C# Lab**	**3 periods**

COs

1. Display proficiency in C# by building stand-alone applications in the .NET framework using C#.
2. Create distributed data-driven applications using the .NET Framework, C#,
3. Create web-based distributed applications using C#, ASP.NET
4. Understand the concept of Web Applications.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Practical/Experiment
1	Write a simple c# programs to Calculate Hypotenuse of triangle using dynamic initialization of variables
2	Write a simple c# programs to get input from the user and perform calculations
3	Write a simple c# programs to Calculate the quadrant for the coordinates using if..else…ladder
4	Write a simple c# programs to Check whether the alphabet is a vowel or not using switch..case…
5	Write a simple c# programs to understand about for..each loop and strings
6	Write a simple c# programs to print the students list using classes and objects
7	Write a simple c# programs to implement Single Inheritance concepts
8	Write a simple c# programs to implement Multilevel Inheritance concepts
9	Write a simple c# programs to implement Multiple Inheritance concepts
10	Write a simple c# programs to implement Unary operator overloading concept in C#
11	Write a simple c# programs to implement Binary operator overloading concept in C#
12	Write a console application that obtains four int values from the user and displays the product.
13	Write a console application that checks two integers stored in variables var1 and var2 is greater than 10 or not.
14	Write a console application that places double quotation marks around each word in a string .
15	Write an application that uses two command-line arguments to place values into a string and an integer variable, respectively. Then display these values.
16	Write an application that receives the following information from a set of students: Student Id: Student Name: Course Name: Date of Birth: The application should also display the information of all the students once the data is Entered. Implement this using an Array of Structures.
17	Write programs using conditional statements and loops: Generate Fibonacci series.
18	Write programs using conditional statements and loops: Generate various patterns (triangles, diamond and other patterns) with numbers.
19	Write programs using conditional statements and loops: Test for prime numbers.
20	Write programs using conditional statements and loops: Reverse a number and find sum of digits of a number.
21	Write a program to declare a class „staff" having data members as name and post.accept this data 5 for 5 staffs and display names of staff who are HOD.
22	Write a program to declare class „Distance" have data members dist1,dist2 ,dist3. Initialize the two data members using constructor and store their addition in third data member using function and display addition.
23	Write a program to accept a number from the user and throw an exception if the number is not an even number.