JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T. LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)
"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program : BSc

Proposed Course : Information Technology

Semester V

Credit Based Semester and Grading System (CBCS) with effect from the academic year 2020-21

T.Y.BSc. IT
Academic year 2020-2021

Semester V			
Course Code	**Course Title**	**Credits**	**Lectures /Week**
SBIT501	Research Methodology	2	5
SBIT502	Physical Computing and IoT Programming	2	5
SBIT503	Mobile Application Development	2	5
SBIT504	Machine Learning and Deep Learning	2	5
SBIT505	Enterprise Jakarta 8	2	5
SBIT501 PR	Project Dissertation and Implementation	2	3
SBIT502 PR	Physical Computing and IoT Programming Practical	2	3
SBIT503 PR	Mobile Application Development Practical	2	3
SBIT504 PR	Machine Learning and Deep Learning Practical	2	3
SBIT505 PR	Enterprise Jakarta 8Practical	2	3

Course: SBIT501	**Research Methodology(Credits : 02 Lectures/Week:05)**	
	Objectives: ➤ Understand the Research Methodology with respect to the specific procedures or techniques used to identify, select, process and analyze information about a topic. ➤ The methodology section helps students to critically evaluate a study's overall validity and reliability. **Outcomes:** Upon the completion of the course students will be able to: ➤ Students would get an understanding of what are the research concepts and its methodologies. ➤ Select and define appropriate research problems and parameters ➤ Prepare a project proposal ➤ Organize and conduct research in a more appropriate manner ➤ They would also get an understanding of literature reviews, data analysis, applying research concepts and report writing.	
Unit I	**Introduction to Research:** **RESEARCH FORMULATION AND DESIGN** Motivation and objectives – Research methods *vs.* Methodology. Types of research – Descriptive *vs.* Analytical, Applied *vs.* Fundamental, Quantitative *vs.* Qualitative, Conceptual *vs.* Empirical, concept of applied and basic research process, criteria of good research. **Foundation of Research** What is Research? , Objectives of Research , Scientific Research , Research and Theory , Conceptual and theoretical Models, Importance of research methodology in scientific research **Types and Methods of Research** Classification of Research , Pure and Applied Research , Exploring or Formulative Research , Descriptive Research , Diagnostic Research/Study , Evaluation research/Studies , Action Research , Experimental Research , Analytical Study of Statistical Method , Historical Research , Surveys , Case Study , Field Studies **Review of Literature** Need for Reviewing Literature , What to Review and for what purpose , Literature Search Procedure , Sources of Literature , Planning of Review work , Note Taking , Library and documentation	**15 L**

Unit II	**Planning of Research and Identifying the Problem Planning of Research** The planning process , Selection of a Problem for Research , Formulation of the Selected Problems , Hypothesis formation , Measurement ,Research Design/Plan Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis. Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance	**15 L**
Unit III	**Data collection and Analysis Sampling** Sampling Techniques or Methods , Choice of sampling Techniques ,Sample size , Sampling and Non-Sampling errors , Estimation of Population Proportion and Population Mean , Estimation of Standard Error and Confidence Interval **Methods of data collection** Types of Data , Meaning and Importance of Data , Sources of Data , Use of Secondary Data , Methods of Collecting Primary Data , Observation Method , Experimentation, Design of Experiments , Simulation **Statistical Analysis of Data** Statistical Analysis , Measures of Central Tendency , Measures of Dispersion , Measures of Association/Relationship , Probability distributions: Binomial, Poisson, Uniform, Normal and Exponential , Hypothesis Testing, Confidence Interval , Test of Significance , Comparison of Two Proportions , Comparison of Means(z test, t test, two sample t test, paired-t test) , ANOVA , Non-parametric Methods	**15 L**
Unit IV	**Report writing** Types of Reports , Planning of Report Writing , Research Report Format,Principles of Writing ,Documentation , Data and Data Analysis Reporting in a Thesis , Writing of Report, Typing of Report , Briefing	**15 L**

Textbook:
1. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
2. Fundamentals of modern statistical methods by Rand R.wilcox.
3. Design and Analysis of Experiments by Montogomery D.C. (2001), John Wiley

4. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
5. Research in Education, Tenth Edition,Best and Kahn,Pearson

Evaluation Scheme

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

(i) C.A.-I : Test – 20 Marks of 40 mins. duration

(ii) C.A.-II : Case Study- 20 Marks

II. Semester End Examination (SEE)- 60 Marks

Q.1 Answer any two -10 Marks

Q.2 Answer any two -10 Marks

Q.3 Answer any two -10 Marks

Q.4 Answer any two -10 Marks

Q.5 Answer any four -20 Marks

[B] Evaluation scheme for Practical courses

PROJECT

Course: SBIT502	**Physical Computing and IoT Programming (Credits : 02 Lectures/Week: 05)**	
	Objectives: ➢ To learn IP as IoT network layer ➢ How security and privacy is achieved in IoT ➢ Advanced topics in IoT including data analytics and tools for IoT. **Outcomes:** ➢ Students will be well versed with IoT and Programming the Raspberry Pi.	
Unit I	Introduction and system Architecture - What Is IoT?, IoT Impact, Convergence of IT and OT , IoT Challenges, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack, Sensors, Actuators, Sensor Networks, Communications Criteria,IoT Service as a Platform.	**15 L**
Unit II	IP as the IoT Network Layer - The Need for Optimization, Optimizing IP for IoT, Profiles and Compliances. Application Protocols for IoT - The Transport Layer, IoT Application Transport Method. Security and Privacy in the Internet of Things –IoT security overview, security frameworks for IoT, Privacy in IoT networks.	**15 L**
Unit III	Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	**15 L**
Unit IV	Data and Analytics for IoT - An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytic, Network Analytics. IoT physical Servers and cloud offerings **-** Introduction to cloud storage Models and communication APIs, Python web application framework – Django, Designing REST ful Web API, Amazon Web Services for IoT.	**15 L**

Textbook:
1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press.
2. Internet of Things: Hands On Approach by Arshdeep Bahga, vijay Madisetti.
3. Internet of Things Principles and Paradigms by Rajkumar Buyya and Amir Vahid Dastjerdi
4. Designing the Internet of Things Adrian McEwen, Hakim Cassimally WILEY.

<center>**Evaluation Scheme**</center>

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

  (i) C.A.-I : Test – 20 Marks of 40 mins. duration

  (ii) C.A.-II :Mini Project- 20 Marks

II. Semester End Examination (SEE)- 60 Marks

  Q.1 Answer any two -10 Marks

  Q.2 Answer any two -10 Marks

  Q.3 Answer any two -10 Marks

  Q.4 Answer any two -10 Marks

  Q.5 Answer any four -20 Marks

[B] Evaluation scheme for Practical courses

(i) Internal Practical – 20 marks

(ii) External Practical – 30 marks

Course: SBIT503	Mobile Application Development (Credits : 02 Lectures/Week: 05)	
	Objectives: ➢ Students will be introduced to Android programming and learn to develop Android applications. ➢ Topics include installing Android development tools. ➢ creating user interfaces and utilizing location-based services. ➢ Introduction to swift programming and ios application development. **Outcomes:** Install and configure Android application development tools. Design and develop user Interfaces for the Android platform. Save state information across important operating system events. Apply Java programming concepts to Android application development.	
Unit I	**Introduction to Android:** Overview, History, Features of Android, Architecture of Android, Overview of Stack, Linux Kernel, Native Libraries, Android Runtime, Application Framework, Applications SDK Overview, Platforms, Tools – (JDK, SDK, Android Studio, ADT, AVD, Android Emulator), Versions, Creating your first Android Application **Activities, Fragments and Intents:** Introduction to Activities, Activity Lifecycle, Introduction to Intents, Linking Activities using Intents, Introduction to Fragments, Adding Fragments Dynamically, Lifecycle of Fragment, Interaction between Fragments	15 L
Unit II	**Android User Interface:** Understanding the components of a screen, Views and View Groups, Layouts, Scroll View, Utilizing Action Bar, Adding Action Items to the Action Bar, Customizing the Action Items and Application Icon, Listening for UI Notifications. **Designing Your User Interface with Views:** Using Basic Views, Text View, Button, Image Button, Edit Text, Check Box, Toggle Button, Radio Button, and Radio Group Views, Progress Bar View, Auto Complete Text View, Using Picker Views, Time Picker View, Date Picker View, Using List Views to Display Long Lists, List View, Using the Spinner View, Understanding Specialized Fragments, Using a List Fragment, Using a Dialog Fragment, Using a Preference Fragment. **Menus and Services:** Using Menus with Views, Creating the helper methods, Options Menu, Context Menu, Creating your own services, performing long running task in a service, performing repeated task in service, threads using intent service, understanding threading.	15 L

Unit III	**Databases:** Firebase Introduction, Firebase Features, Android Studio, Adding Firebase to App, Firebase Assistance, Firebase Authentication, Real time Database, Setup & Configuration, Data organization, Read and Write, Update and Delete, XML Parsing SAX,XML Parsing DOM, XML Pull Parser JSON Parsing **Messaging and E-mail:** SMS Messaging, Sending SMS Messages Programmatically, Getting Feedback after Sending a Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Sending E-mail **Location-Based Services and Google Map:** Display Google Maps, Creating the project, Obtaining the Maps API Key, Displaying the Map, Displaying the Zoom Control, Changing Views, navigating to a specific location, Adding Markers, Getting the location that was touched, Geo coding and Reverse Geo coding, Getting Location Data, Monitoring a Location.	**15 L**
Unit IV	**Introduction of Interface:** Introduction to X Code IDE, iPhone History & Versions, Views & View Controllers, Storyboard & interface builder, Creating First iOS Application. **iOS UI Controls:** iOS: Label, iOS: Button, iOS: Text Field, iOS: Date Picker, iOS: Slider, iOS: Stepper, iOS: Switch **What is Swift?** History of Swift, Swift Syntax, Swift Data types, Swift Variables, Swift Constants, Swift Literals, Swift vs Objective C, First Swift Program, Swift Operators, Control Statement, Swift Loops, Swift Strings, Swift Functions **iOS Container Views:** iOS: UI View, iOS: Table View, iOS: Collection View, iOS: Scroll View	**15 L**

Textbook:
1. Android 9 Development Cookbook: Over 100 recipes and solutions to solve the most common problems faced by Android developers, 3rd Edition
2. Android Studio 3.5 Development Essentials – Kotlin Edition: Developing Android 10 (Q)Apps Using Android Studio 3.5, Kotl in and Android Jetpack
3. Android Studio 3.5 Development Essentials - Java Edition: Developing Android 10 (Q)Apps Using Android Studio 3.5, Java and Android Jetpack
4. Beginning Android 4 Application Development ,Wrox publication Wei –Meng Lee
5. IOS 10 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics, Matt Neuburg

<h1 style="text-align:center">Evaluation Scheme</h1>

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

  (i) C.A.-I : Test – 20 Marks of 40 mins. duration

  (ii) C.A.-II :Mini Project- 20 Marks

II. Semester End Examination (SEE)- 60 Marks

  Q.1 Answer any two -10 Marks

  Q.2 Answer any two -10 Marks

  Q.3 Answer any two -10 Marks

  Q.4 Answer any two -10 Marks

  Q.5 Answer any four -20 Marks

[B] Evaluation scheme for Practical courses

(i) Internal Practical – 20 marks

(ii) External Practical – 30 marks

Course: SBIT504	Machine Learning and Deep Learning(Credits : 02 Lectures/Week: 05)	

	Objectives:
	  ➢ The syllabus will familiarize students with a broad cross-section of models and algorithms for machine learning.
	  ➢ Understanding key concepts related to Deep Learning.
	Outcomes:
	Upon completion of the course students will be able to:
	  ➢ Students will have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity ,etc.
	  ➢ Students will be able to design and implement various machine learning and deep learning algorithms in a range of real world applications.	

Unit I	Introduction: what is ML; Problems, data, and tools; Visualization, Linear regression with one variable and multiple variable; SSE; gradient descent; closed form; normal equations; features ,Over fitting and complexity; training, validation, test data, Introduction to Mat lab	**15 L**
Unit II	Classification problems; decision boundaries; nearest neighbor methods, Logistic regression, Unsupervised learning: clustering, k-means, hierarchical agglomeration, Advanced discussion on clustering and EM , Latent space methods; PCA, Text representations; naive Bayes and multinomial models; clustering and latent space models, Probability and classification, Bayes optimal decisions, Naive Bayes and Gaussian class-conditional distribution, Linear classifiers -Bayes' Rule and Naive Bayes Model	**15 L**
Unit III	Online gradient descent, Neural Networks, Decision tree, Ensemble methods: Bagging, random forests, boosting, A more detailed discussion on Decision Tree and Boosting, Support Vector Machines, Regularization, In practice: Advice for Applying Machine Learning, Dimensionality Reduction, Anomaly Detection, Recommender Systems	**15 L**
Unit IV	Introduction to Deep Learning, Modular approaches, Back propagation, Optimization, Introduction to Convolutional Neural Networks (CNN)- Introduction to CNN,CNN architectures, Long Short-Term Memory Networks (LSTMs), Stacked Auto-Encoders, Deep Boltzmann Machine (DBM), Deep Belief Networks (DBN),Introduction to Recurrent Neural Networks - Sequence to sequence models, Concepts in natural language processing	**15 L**

Textbook:
1. Understanding Machine Learning:From Theory To Algorithms,2017 By Shai Shalev-Shwartz And Shai Ben-David
2. Introduction To Machine Learning,An Early Draft Of A Proposed Textbook,Nils J. Nilsson Robotics Laboratory Department Of Computer Science Stanford University,Stanford, Ca 94305
3. The Elements of Statistical Learning. Trevor Hastie,Robert Tibshirani and Jerome Friedman.
4. Pattern Recognition &Machine Learning ,Christopher Bishop,Springer

Evaluation Scheme

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

  (i) C.A.-I : Test – 20 Marks of 40 mins. duration

  (ii) C.A.-II :Mini Project - 20 Marks

II. Semester End Examination (SEE)- 60 Marks

    Q.1 Answer any two -10 Marks

    Q.2 Answer any two -10 Marks

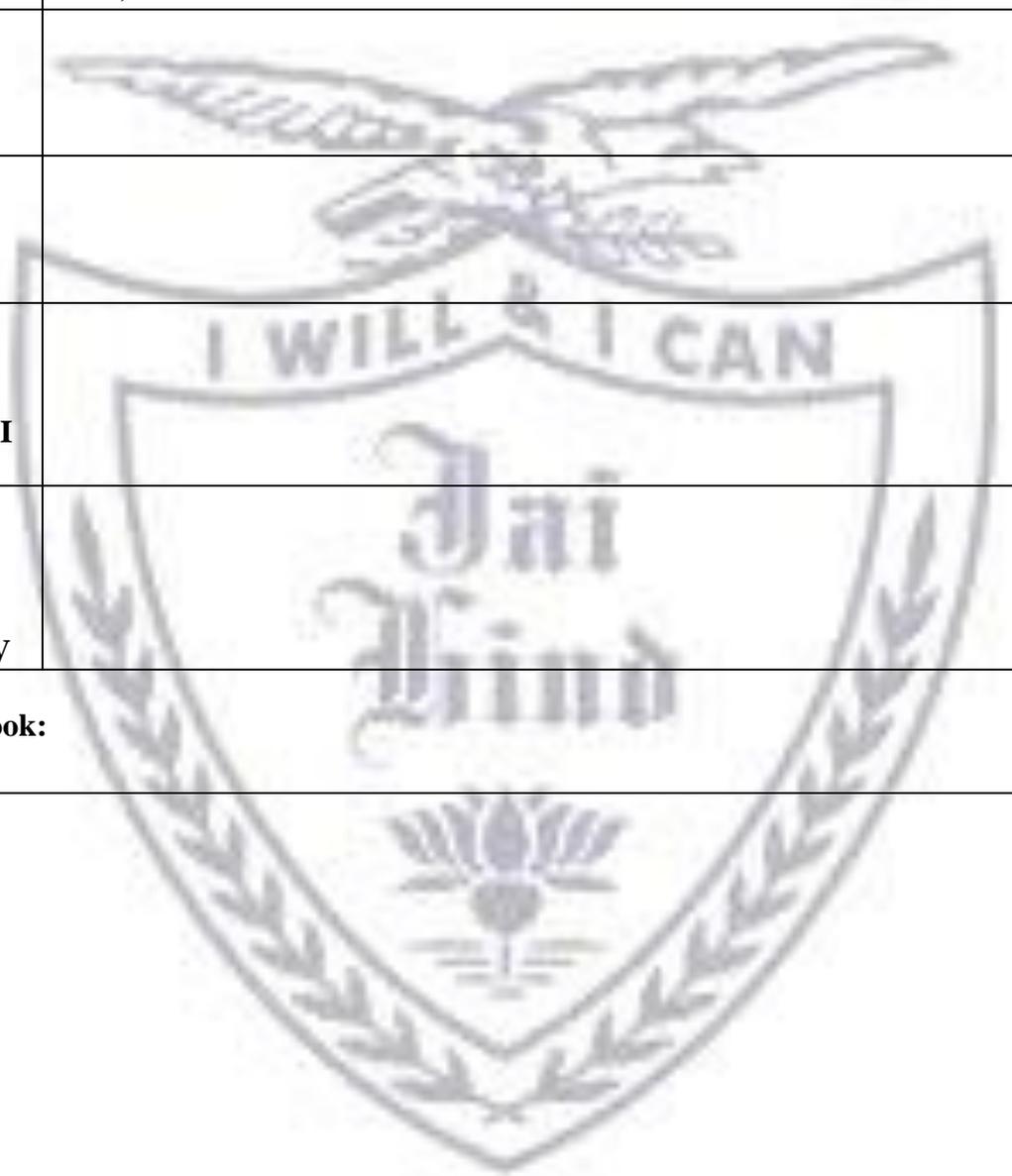   Q.3 Answer any two -10 Marks

    Q.4 Answer any two -10 Marks

    Q.5 Answer any four -20 Marks

[B] Evaluation scheme for Practical courses

(i) Internal Practical – 20 marks
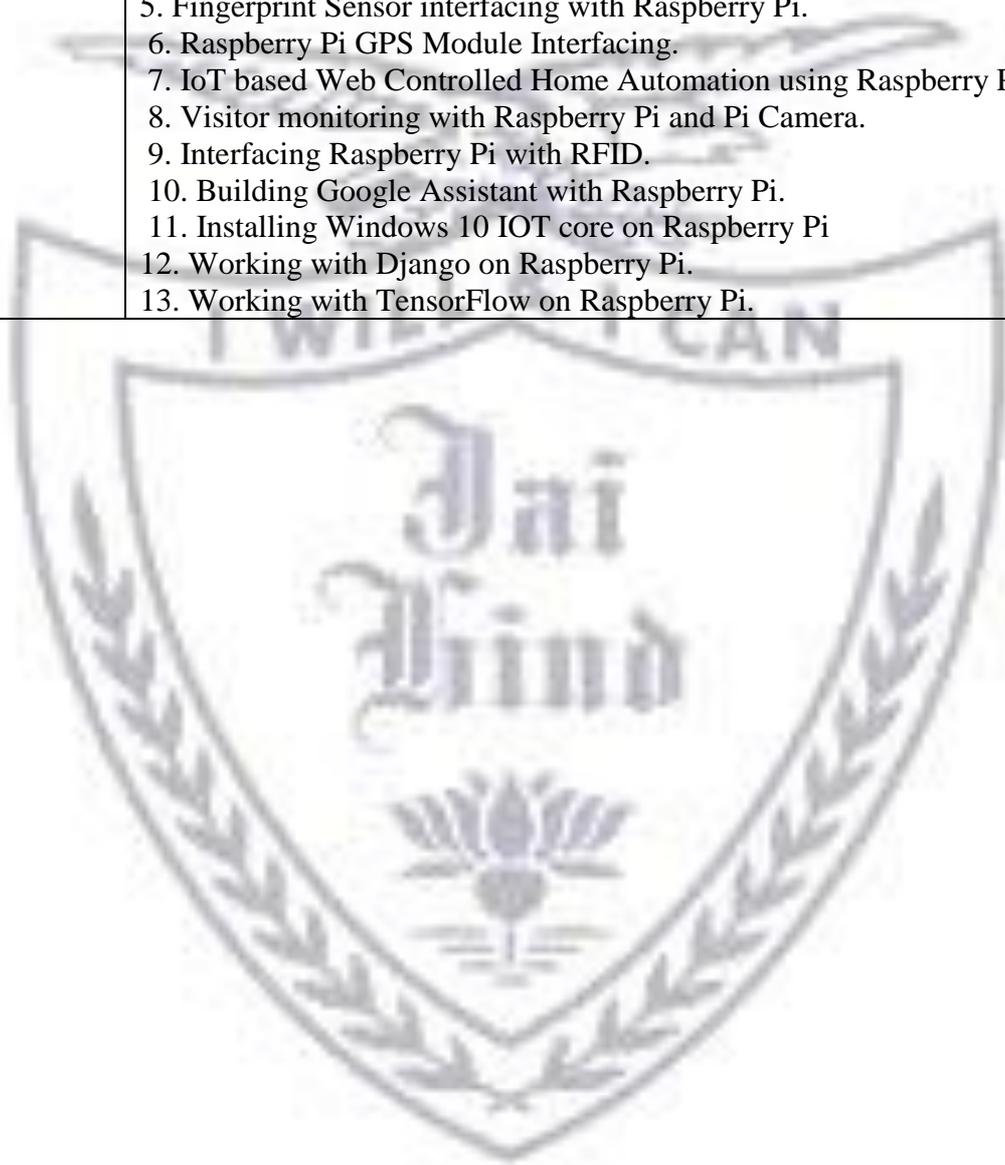
(ii) External Practical – 30 marks

Course: SBIT505	Enterprise Jakarta 8 (Credits : 02 Lectures/Week: 05)	
	Objectives: **Outcomes:** ➢	
Unit I		**15 L**
Unit II		**15 L**
Unit III		**15 L**
Unit IV		**15 L**
Textbook: 1.		

Evaluation Scheme

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

  (i) C.A.-I : Test – 20 Marks of 40 mins. duration

  (ii) C.A.-II : Mini Project- 20 Marks

II. Semester End Examination (SEE)- 60 Marks

  Q.1 Answer any two -10 Marks

  Q.2 Answer any two -10 Marks

  Q.3 Answer any two -10 Marks

  Q.4 Answer any two -10 Marks

  Q.5 Answer any four -20 Marks

[B] Evaluation scheme for Practical courses

  (i) Internal Practical – 20 marks

  (ii) External Practical – 30 marks

Course: SBIT501PR	Project Dissertation and Implementation (Credits : 02Practicals/Week: 03)
	1.1 PROJECT REPORT: Title Page Original Copy of the Approved Proforma of the Project Proposal Certificate of Authenticated work Role and Responsibility Form Abstract Acknowledgement Table of Contents Table of Figures CHAPTER 1: INTRODUCTION 1.1 Background 1.2 Objectives 1.3 Purpose, Scope, and Applicability 1.3.1 Purpose 1.3.2 Scope 1.3.3 Applicability 1.4 Achievements 1.5 Organisation of Report CHAPTER 2: SURVEY OF TECHNOLOGIES CHAPTER 3: REQUIREMENTS AND ANALYSIS 3.1 Problem Definition 3.2 Requirements Specification 3.3 Planning and Scheduling 3.4 Software and Hardware Requirements 3.5 Preliminary Product Description 3.6 Conceptual Models CHAPTER 4: SYSTEM DESIGN 4.1 Basic Modules 4.2 Data Design 4.2.1 Schema Design 4.2.2 Data Integrity and Constraints 4.3 Procedural Design 4.3.1 Logic Diagrams 4.3.2 Data Structures 4.3.3 Algorithms Design 4.4 User interface design 4.5 Security Issues 4.6 Test Cases Design CHAPTER 5: IMPLEMENTATION AND TESTING 5.1 Implementation Approaches 5.2 Coding Details and Code Efficiency 5.2.1 Code Efficiency 5.3 Testing Approach 5.3.1 Unit Testing 5.3.2 Integrated Testing

Course: SBIT502PR	**Physical Computing and IoT Programming Practical** **(Credits : 02 Practicals /Week: 03)**
	1. Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB. 2. Displaying different LED patterns with Raspberry Pi. 3. Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi. 4. Controlling Raspberry Pi with WhatsApp. 5. Fingerprint Sensor interfacing with Raspberry Pi. 6. Raspberry Pi GPS Module Interfacing. 7. IoT based Web Controlled Home Automation using Raspberry Pi. 8. Visitor monitoring with Raspberry Pi and Pi Camera. 9. Interfacing Raspberry Pi with RFID. 10. Building Google Assistant with Raspberry Pi. 11. Installing Windows 10 IOT core on Raspberry Pi 12. Working with Django on Raspberry Pi. 13. Working with TensorFlow on Raspberry Pi.

Course: SBIT503PR	**Mobile Application Development Practical** **(Credits : 02 Practicals /Week: 03)**
	1. (a) Introduction to android and android studio: Activities, Services, Content Providers, Broadcast Receivers, USB debugging mode, Simple "Hello World" program. (b) Programming Resources Android Resources: (Color, String, Drawable, Image) 2. (a) Create android interactive user app using different layouts. Linear,Relative, Frame, List View, Grid View. (b) Create an android app that demonstrates Activity Lifecycle. 3. (a)Develop an application for working with graphics and animation. (b) Develop an application for working with Menus and Screen Navigation. (c) Develop an application to design dialog, dialog fragment. 4.Programs on implicit and explicit intent. 5. Programs on Services, notification and broadcast receivers 6. (a)Programming threads, handles and asynchronized programs (b) Develop an application for working with device camera. 7.Develop an application for working with Firebase 8. (a)Develop an application for connecting to the internet and sending email. (b) Develop an application for working with location-based services 9. (a)Introduction to Xcode and setup of emulator to execute simple "HelloWorld" app. (b) Programs on using UI controls and Outlets. 10. (a)Develop a Temperature converter application. (b) Develop an ios app by using different types of Container Views.

Course: SBIT504PR	**Machine Learning and Deep Learning Practical** **(Credits : 02 Practicals/Week: 03)**

	1. Perform the data classification using classification algorithm
	2. Perform the data clustering using clusteringalgorithm.
	3. Perform the Linear regression on the given data warehousedata.
	4. Perform the logistic regression on the given data warehousedata.
	5. Implement decision tree learning algorithm
	6. Program to create sample data for testing
	7. Regression :
	    a. Perform training and testing of data
	    b. Perform forecasting and predicting of data.
	8. Support Vector Machine:
	    a. Create SVM from scratch
	    b. Program to perform SVM optimization using python.
	9. Implement feed forward back propagation neural network learning algorithm
	10. Implement Naive Bayes' learning algorithm .

Course: SBIT505PR	Enterprise Jakarta 8Practical (Credits : 02 Practicals /Week: 03)