Shri Vaishnav Vidyapeeth Vishwavidyalaya
B.Tech. (Computer Science and Business Systems –TCS)
Choice Based Credit System (CBCS)-2019-20

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCSCS209	**UG**	Operating Systems	**3**	**0**	**2**	**4**	**60**	**20**	**20**	**30**	**20**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES

Student will have ability:

1. To learn the fundamentals of Operating Systems.
2. To study the mechanisms of Operating System to handle processes and threads and their communication.
3. To gain knowledge of process management concepts that includes architecture, Mutual exclusion algorithms, deadlock detection and recovery algorithms.
4. To learn the mechanisms involved in memory management in Operating System.
5. To know the components and management aspects of disc scheduling.

COURSE OUTCOMES

Upon completion of the subject, Students will be able to:

1. Describe the detail structure of Operating System.
2. Design and Implement Process management Techniques in Operating System.
3. Illustrate interprocess communication and deadlock.
4. Understand The Memory Management of Operating System.
5. To elaborate File Management and Disc Scheduling.

SYLLABUS

UNIT I

Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT II

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. **Scheduling algorithms**: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT III

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem. **Deadlocks**: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery. **Concurrent Programming:** Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT IV

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

UNIT V

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed),Free-space management (bit vector, linked list, grouping), directory implementation(linear list, hash table), efficiency and performance. **Disk Management**: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

TEXT BOOKS:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne

REFERENCES:

1. Operating Systems: Internals and Design Principles. William Stallings.
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3. Operating Systems: A Modern Perspective. Gary J. Nutt.
4. Design of the Unix Operating Systems. Maurice J. Bach.
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.

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B.Tech. (Computer Science and Business Systems –TCS)
Choice Based Credit System (CBCS)-2019-20

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
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BTCSCS210	**UG**	Database Management Systems	**3**	**0**	**2**	**4**	**60**	**20**	**20**	**30**	**20**

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COURSE OBJECTIVES

Student will have ability:

1. To understand the dissimilar issues concerned in the intend and implementation of a database system.
2. To learn the physical and logical database design, database modeling, relational, hierarchical, and network models.
3. To understand and develop data manipulation language to query, modernize, and manage a database
4. To expand an understanding of necessary DBMS concepts such as: database security, integrity, and Concurrency.
5. To intend and build a straightforward database system and show competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

COURSE OUTCOMES

Upon completion of the subject, Students will be able to:

1. Describe basic concepts of Database and its architecture.
2. Define the Data Models and Relational Query language.
3. Describe the concept of Query processing and optimization, need for normalization.
4. Design the database schema with the use of appropriate data types for storage of data in database.
5. Describe transaction processing, concurrency control and recovery technique.
6. Understand Database Security.

SYLLABUS

UNIT I

Introduction: Introduction to Database. Hierarchical, Network and Relational Models. **Database system architecture**: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

UNIT II

Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations. **Relational query languages**: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open

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source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

UNIT III

Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design. **Query processing and optimization**: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT IV

Storage strategies: Indices, B-trees, Hashing. **Transaction processing**: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT V

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. **Advanced topics**: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TEXT BOOKS:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

REFERENCES:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe.
3. Foundations of Databases. Serge Abiteboul, Richard Hull, Victor Vianu.

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B.Tech. (Computer Science and Business Systems –TCS)
Choice Based Credit System (CBCS)-2019-20

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BTCSCS211	**UG**	Software Design with UML	**3**	**0**	**2**	**4**	**60**	**20**	**20**	**30**	**20**

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COURSE OBJECTIVES

1. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.
2. Develop software models using UML notations.
3. Introduce concept and methods to analyze and design software.

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COURSE OUTCOMES

1. Able to understand process of software development life cycle.
2. Able to analyze and design software efficiently.
3. Able to demonstrate an ability to use the techniques and tools necessary for engineering practice.

SYLLABUS

UNIT I

Introduction to on Object Oriented Technologies and the UML Method.

- Software development process: The Waterfall Model vs. The Spiral Model.
- The Software Crisis, description of the real world using the Objects Model.
- Classes, inheritance and multiple configurations.
- Quality software characteristics.
- Description of the Object Oriented Analysis process vs. the Structure Analysis Model.

Introduction to the UML Language.

- Standards.
- Elements of the language.
- General description of various models.
- The process of Object Oriented software development.
- Description of Design Patterns.
- Technological Description of Distributed Systems.

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UNIT II

Requirements Analysis Using Case Modeling

- Analysis of system requirements.
- Actor definitions.
- Writing a case goal.
- Use Case Diagrams.
- Use Case Relationships.

Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams.

- Description of goal.
- Defining UML Method, Operation, Object Interface, Class.
- Sequence Diagram.
- Finding objects from Flow of Events.
- Describing the process of finding objects using a Sequence Diagram.
- Describing the process of finding objects using a Collaboration Diagram.

UNIT III

The Logical View Design Stage: The Static Structure Diagrams.

- The Class Diagram Model.
- Attributes descriptions.
- Operations descriptions.
- Connections descriptions in the Static Model.
- Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

Package Diagram Model.

- Description of the model.
- White box, black box.
- Connections between packagers.
- Interfaces.
- Create Package Diagram.
- Drill Down.

UNIT IV

Dynamic Model: State Diagram / Activity Diagram.

- Description of the State Diagram.
- Events Handling.
- Description of the Activity Diagram.
- Exercise in State Machines.

Component Diagram Model.

- Physical Aspect.
- Logical Aspect.
- Connections and Dependencies.
- User face.
- Initial DB design in a UML environment.

UNIT V

Deployment Model.

- Processors.
- Connections.
- Components.
- Tasks.
- Threads.
- Signals and Events.

TEXT BOOKS:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit.

REFERENCES:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
B.Tech. (Computer Science and Business Systems –TCS)
Choice Based Credit System (CBCS)-2019-20

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University	Teachers Assessment*
BTCSIIE212	**UG**	Introduction to Innovation, IP Management and Entrepreneurship	**3**	**0**	**0**	**3**	**60**	**20**	**20**	**0**	**0**

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COURSE OBJECTIVES

1. The major emphasis of the course will be on creating, enhancing the learning system through their innovation and creative thinking skills for effective business process.
2. Acquaint themselves with the special challenges of starting new ventures.
3. Impart the entrepreneur skills in recognizing the new opportunities and styles required in maintaining competitive advantages.
4. Provide the insights of financial aspects in planning and executing the market opportunities into a business plan.
5. Emphasis on the role of IPR as an effective tool to protect their innovations and intangible assets from exploitation.

COURSE OUTCOMES

After completion of the course, the student will be able to

1. Study and understand what and why innovation is required and its process and sources of innovation.
2. Investigate, understand, and internalize the process of building an innovative organization.
3. Recognize the characteristics of different types of entrepreneurship and learn to manage various types of IPR to protect competitive advantage
4. Independently formulate a business plan based on a business idea in technology, plan and understanding the financial implication in entrepreneurship & financial planning.
5. Exceptional in IPR in Indian business perspective and IPR in international context.

SYLLABUS

UNIT I

Innovation: What and Why?

Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.

Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT II

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Building an Innovative Organization

Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture

Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach

UNIT III

Entrepreneurship:

- Opportunity recognition and entry strategies
- Entrepreneurship as a Style of Management
- Maintaining Competitive Advantage- Use of IPR to protect Innovation

UNIT IV

Entrepreneurship- Financial Planning:

- Financial Projections and Valuation
- Stages of financing
- Debt, Venture Capital and other forms of Financing

Intellectual Property Rights (IPR)

- Introduction and the economics behind development of IPR: Business Perspective
- IPR in India – Genesis and Development
- International Context
- Concept of IP Management, Use in marketing

UNIT V

Types of Intellectual Property

- Patent- Procedure, Licensing and Assignment, Infringement and Penalty
- Trademark- Use in marketing, example of trademarks- Domain name
- Geographical Indications- What is GI, Why protect them?
- Copyright- What is copyright
- Industrial Designs- What is design? How to protect?

Class Discussion- Major Court battles regarding violation of patents between corporate companies

TEXT BOOKS:

1. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change
2. Case Study Materials: To be distributed for class discussion

List of Practical's:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

Topic 2- Innovation: Co-operating across networks vs. 'go-it-alone' approach

Topic 3- Major Court battles regarding violation of patents between corporate companies

Shri Vaishnav Vidyapeeth Vishwavidyalaya
B.Tech. (Computer Science and Business Systems –TCS)
Choice Based Credit System (CBCS)-2019-20

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCSIIE213	**UG**	Business Communication and Value Science – III	**2**	**0**	**4**	**4**	**60**	**20**	**20**	**30**	**20**

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 2.5 Hrs./Week	**Semester Examination: 50 marks**	**4**
Practical: 1.5 Hrs. / Week	**Continuous Assessment: Yes**	
Lab: 2 Hrs. / Week	**Term Work: 50 marks**	

Course ID:

1.6 (Year 2 Semester 4)

	Leadership Oriented Learning (LOL)	
Nature of Course	Behavioral	
Pre requisites	Basic Knowledge of English (verbal and written) Completion of all units from Semesters 1, 2 and 3	
Course Objectives:		
1	Develop technical writing skills	
2	Introduce students to Self-analysis techniques like SWOT & TOWS	
	c) Science of Nation building	

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Course Outcomes:
Upon completion of the course, students shall have ability to

C2.6.1	Apply & analyze the basic principles of SWOT & life positions.	[U]
C2.6.2	Understand, analyze & leverage the power of motivation in real life	[AP]
C2.6.3	Identify & respect pluralism in cultural spaces	[AP]
C2.6.4	Understand and apply the concepts of Global, glocal and translocational	[C]
C2.6.5	Analyze cross cultural communication	[U]
C2.6.6	Apply the science of Nation building	[AP]
C2.6.7	Identify the common mistakes made in cross-cultural communication	[E]
C2.6.8	Understand, apply & analyze the tools of technical writing	[U]
C2.6.9	Recognize the roles and relations of different genders.	[AP]
C2.6.10	Understand Artificial intelligence &recognize its impact in daily life	[U]
C2.6.11	Identify the best practices of technical writing	[AP]
C2.6.12	Differentiate between the diverse culture of India	[E]

Course Contents:

Objectives for Semester 4

After completing this semester, learners will be able to:

- Summarize the basic principles of SWOT and Life Positions.
- Apply SWOT in real life scenarios.
- Recognize how motivation helps real life.
- Leverage motivation in real-life scenarios.
- Identify pluralism in cultural spaces.
- Respect pluralism in cultural spaces.
- Differentiate between the different cultures of India.
- Define the terms global, glocal and translocational.
- Differentiate between global, glocal and translocational culture.
- Recognize the implications of cross-cultural communication.
- Identify the common mistakes made in cross-cultural communication.
- Apply cross-cultural communication.
- Differentiate between the roles and relations of different genders.
- Summarize the role of science in nation building.

- Define AI (artificial intelligence).
- Recognize the importance of AI.
- Identify the best practices of technical writing.
- Apply technical writing in real-life scenarios.

Total Hours:	48 hours

Text Books:	
	There are no prescribed texts for Semester 4 – there will be handouts and reference links shared.
Reference Books:	
1	
2	
3	
4	
Web References:	
1	Examples of Technical Writing for Students https://freelance-writing.lovetoknow.com/kinds-technical-writing
2	11 Skills of a Good Technical Writer https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/
3	13 benefits and challenges of cultural diversity in the workplace https://www.hult.edu/blog/benefits-challenges-cultural-diversity-workplace/
Online Resources:	
1	https://youtu.be/CsaTslhSDI
2	https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3	https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4	https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5	https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

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Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C1.6.1	Analyze	SWOT in real life	5
C1.6.2	Analyze	Motivation in real life	4
Summative Assessment based on End Semester Project			
Bloom's Level			
Understand	Written Assessment, project and group discussion		50
Apply			
Analyze			

Lesson Plan

Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			Guest lecture by a renowned personality to kick start this semester.	This will be outside the total hours for this Semester	**90 mins**
1			REUNION Recap activity on the earlier learning after a 6 months break. If we can flash the projects they completed in the last semester…… End with a Quiz in multiple format rounds testing the objectives.	Activity	60 Minutes

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1	**Summarize the basic principles of SWOT and Life Positions.**	2	SWOT and Life Positions Meet Dananjaya: Meet Dananjaya Hettiarachchi The World Champion of Public Speaking 2014 who made the winning speech which was	Lecture and activity	60 Minutes

ni t No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duratio n**
			rated amongst the "Most talked-about speeches of 2014". https://www.youtube.com/watch?v=bbz2boNSeL0&t=24s Debrief on the video. How it relates to SWOT. **Intro activity**: Give story of an individual* and divide people into 4 groups S W O T and ask them to jot down the SWOT. Start with a different nomenclature (demystifying SWOT)		
1	Apply SWOT in real life scenarios.	3	Pat your back activity…strength will be written by others other points by you Create your SWOT	Practical	60 Minutes
1	Apply SWOT in real life scenarios.	3	SWOT Vs. TOWS The Balancing Act Ted talk on biomimicry: (Only first 8 mins): https://www.youtube.com/watch?v=RHrO4t86phA	Lab	120 minutes

			Debrief on the Ted talk in which the facilitator gently guides the group towards the understanding that survival happens only when we seek ideas from the external world to turn the threat into opportunity Research on TOWS and find		

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			out how you can turn your threat into opportunity. Two people mutually identifying opportunities from each other's threats.		
1	Apply SWOT in real life scenarios.	3	Presentation on what are the strengths they have identified to survive in the VUCA World. Group presentations of 10 mins each.	Formative evaluation	90 mins
1	Recognize how motivation helps real life.	1	Motivation Stories YouTube videos on Maslow's Theory	Lecture and activity	90 mins
1	Leverage motivation in real-life scenarios.	3	Scenario based activity on identifying and leveraging motivation	Formative evaluation/Lab	60 mins
1	Recognize how motivation helps real life.	1	Present their findings and approaches as groups. They need to explain the idea of motivation with the help of examples.	Practical	60 mins
Unit 2					

2	Identify pluralism in cultural spaces.	1	Rivers of India a. Divide participants into groups of 5. Each group should assign themselves a name from the Indian Rivers. These groups will continue throughout this Unit. b. Learn and Exchange Group activity in which participants need to learn the following four greetings of a state (different from their own) and exchange it with another group: • Good morning	Activity	90 Minutes

Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			• Thank you • Sorry • Good night Indicative only		
2	Identify pluralism in cultural spaces. Respect pluralism in cultural spaces.	2 3	a. Awareness and respect for pluralism in cultural spaces b. Announce the Rhythms of India activity to be held in the next session. The rules of the activity will be detailed at this point. Teams to prepare for the performance beyond class hours.	Theory/Discussion using Phir Miley Sur Mera Tumhara	90 Minutes
2	Differentiate between the different cultures of India.	2	Rhythms of India (Cultures in India) Group activity: Each group to perform a short dance piece (3 mins) from any of the Indian states (to be decided by lots).	Practical/Discussion	120 Minutes

			They have to present the background and unique features of the dance form (5 min).		
2	• Define the terms global, glocal and translocational. • Differentiate between global, glocal and translocational culture.	1, 2	a. Global, glocal, translocational Use Ted and YouTube videos to show examples b. Announce debate to be held in the next session. They have to come prepared for the debate/discussion.	Lecture/Discussion	60 mins
2	Differentiate between global, glocal and translocational culture.	2	Debate on Global, glocal, tanslocational impacts (topics to be decided by the faculty or suggested by the students). Debate to be held in the presence of an external moderator.	Activity	60 mins

Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			Eight groups will get four topics to debate upon.		
2	• Recognize the implications of cross-cultural communication. • Identify the common mistakes made in cross-cultural communication.	1, 2	Cross-cultural communication A. Verbal and non-verbal communication (approach is through videos). Point out the obvious mistakes. From our perspective…how anyone would feel if someone else made mistakes about our cultures. B. Let participants have a group discussion on the implications of cross cultural communication.	Lecture/Discussion	60 mins

2	Apply cross cultural communication.	3	Suggested long-term activity: A VR game in which learners can visit different locations of the world and overcome challenges by using cross cultural skills.		
2	Identify the common mistakes made in cross-cultural communication	2	Culture shock Group activity to perform skits based on situations provided by the lecturer.	Practical	60 mins
2	Differentiate between the roles and relations of different genders.	2	Gender awareness Participants will view relevant scenarios in the class and then participate in a reflection activity in group. The scenarios can be presented using an Augmented Reality intervention.	Discussion	90 mins

Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
2	Differentiate between the roles and relations of different genders.	2	Gender awareness campaign Groups to present the detailed plan of Gender awareness campaigns with four different themes. • College • Workplace • Family • Friends	Activity	60 mins
2			Quiz Time	Summative Evaluation for Unit	60 Minutes
Unit 3					

3	Summarize the role of science in nation building.	2	Role of science in nation building Introduce the topic and discuss the role of scientists and mathematicians from ancient India. Break the students into groups and give them ten minutes to access internet and get information about ten eminent scientists and mathematicians of ancient India. Groups will be given five minutes to present on the next day. Groups will also frame two questions which they will ask after presenting. This can also be taught through Augmented Reality, where images of the scientists will be put up around the class and they will be able to gather the information by using their phones and AR app.	Theory and lab	90 mins

Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			Groups present their findings. Other groups note down their learning. At the end there will be a quiz to assess their learning.	Activity	90 mins

	Summarize the role of science in nation building.	2	Role of science post-independence Groups to present using multiple formats on any one of the four given topics. • Inventions • Inventors • Institutes • Information technology	Lab and practical	120 mins
	Identify the best practices of technical writing.	1	Introduction to technical writing Basic rules of technical writing through examples.	Lecture (Guest faculty, over webinar)	60 mins
	Identify the best practices of technical writing.	1	Practice activity on technical writing.	Lab	60 mins
	Apply technical writing in real-life scenarios.	3	Assessment on technical writing on the following topic: Explain the following to a visually impaired person: • DNA • Rings of Saturn • Structure of an oxygen atom • Structure of heart	Summative evaluation	60 mins
Unit 4					

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
4	Define AI (artificial intelligence).	1	"Voice of the Future" Activity How will a voice assistant evolve in 25 years from now? Each group will present a skit.	Activity	90 mins
	Recognize the importance of AI.	1	AI in Everyday Life Discussion in groups on given topics and then cross sharing of discussion points amongst the groups.	Lab and Activity	90 mins
	Recognize the importance of AI.	1	Design your college in the year 2090 Groups need to create the college of future with the future teachers, teaching methods, types of students, etc. We will end the session with the question: How will offices/workplaces change in future? Who do you think would be your colleagues?	Lab and Practical	90 mins
	Recognize the importance of AI.	1	Communicating with machines Theory and Ted talk videos	Lecture	60 mins
	Recognize the importance of AI.	1	Debate in the presence of an external moderator. Will machines control us in future?	Discussion	90 mins

	Identify the best practices of technical writing.	1	Applying technical writing in profession Theory with YouTube and Dr Bimal Ray's videos. Dr Bimal Kumar Roy, a former Director of the Indian Statistical Institute, is a cryptologist from the	Lecture	90 mins

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			Cryptology Research Group of the Applied Statistics Unit of ISI, Kolkata.		
	Apply technical writing in real-life scenarios.	3	Scenario-based Assessment on technical writing Each group will make a presentation on the following: a) Sell Analytics and Insight to the local tea seller. b) Explain the concept of Cloud to your 87 year old grandmother. c) Introduce the concept of friendly robots to a class 3 kid. Explain IOT to your helping hand at home	Summative evaluation	60 mins
Project					
			Visit rural area/ underprivileged parts of city to address some of the local issues; if relevant, suggest a practical technology solution to the issues.	Project	10 hours

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University	Two Term Exam	Teachers Assessment*	END SEM University	Teachers Assessment*
BTCSMS214	**UG**	Operations Research	**2**	**0**	**2**	**3**	**60**	**20**	**20**	**30**	**20**

Legends: **L -** Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P** – Practical; **C -** Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES

1. To understand familiarizes students to use quantitative methods and techniques for business planning and effective decisions making in the current business era.
2. To develop and find optimal solutions to transportation and assignment problems.
3. To understand the importance of network analysis and solve problems involved in planning, scheduling and controlling projects using PERT and CPM
4. To familiarize and realize the importance of network analysis and project management & scheduling techniques.
5. Being able to implement various inventory models, queuing, and simulation models in the realworld scenario.

COURSE OUTCOMES

After completion of the course, the student will be able

1. To impart knowledge in concepts, tools of operations research and to understand and apply the theoretical workings method for linear programming and apply various linear programming techniques for optimal allocation of limited resources.
2. To be able to build and solve transportation and assignment problems using appropriate method.
3. To be exceptional to design and solve simple models of project scheduling techniques such as PERT & CPM in develop critical thinking and objective analysis of decision problems.
4. To understand the inventory management elements including the relevant related costs and distinguish various inventory models for developing proper inventory control policies.
5. To examine situations in which queuing problems are generated and appreciate simulation methodology.

SYLLABUS

UNIT I

Introduction to OR:

Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

UNIT II

Linear Programming:

Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP.

Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence/Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex

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set, Convex polyhedron, Extreme points, Basic feasible solutions.
Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy &degeneracy, Sensitivity analysis.
Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.
Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal- dual algorithms.

UNIT III

Transportation and Assignment problems:

TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality(MODI method), degeneracy and its resolution.
AP - Examples, Definitions – decision variables, constraints, formulation, Balanced &unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT IV

PERT – CPM:

Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

Inventory Control:

Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known/unknown stock out situations, models under prescribed policy, Probabilistic situations.

UNIT V

Queuing Theory:

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).
Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

TEXT BOOKS:

1. Operations Research: An Introduction.H.A. Taha.

REFERENCES:

1. Linear Programming. K.G. Murthy.
2. Linear Programming. G. Hadley.
3. Principles of OR with Application to Managerial Decisions. H.M. Wagner.
4. Introduction to Operations Research. F.S. Hiller and G.J. Lieberman.
5. Elements of Queuing Theory. Thomas L. Saaty.
6. Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran.

7. Management Guide to PERT/CPM. Wiest & Levy.
8. Modern Inventory Management. J.W. Prichard and R.H. Eagle

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCSMS215	**UG**	Marketing Research and Marketing Management	**3**	**0**	**0**	**3**	**60**	**20**	**20**	**-**	**-**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Outcome(s):

Students will be able to

- Understand basic marketing concepts.
- Comprehend the dynamics of marketing and analyze how its various components interact with each other in the real world.
- Leverage marketing concepts for effective decision making.
- Understand basic concepts and application of statistical tools in Marketing research.

SYLLABUS

UNIT – I

Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social

Understanding the consumer: Determinants of consumer behavior, Factors influencing consumer behavior

Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

UNIT – II

Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

UNIT – III

Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising

UNIT – IV

Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations

Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis

UNIT – V

Internet Marketing: Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing

Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy

Home Assignments:

1. **Written Analyses of Cases** – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g. "Marketing Myopia"
2. Field visit & live project covering steps involved in formulating Market Research Project
3. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

Text Books:

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Management – V.S. Ramaswamy and S. Namakumari
4. Marketing Research – Rajendra Nargundkar
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindler

Reference Books:

1. Marketing Management – Rajan Saxena
2. Marketing Management – S.A. Sherlekar
3. Service Marketing – S.M. Zha
4. Journals – The IUP Journal of Marketing Management, Harvard Business Review
5. Research for Marketing Decisions by Paul Green, Donald, Tull
6. Business Statistics, A First Course, David M Levine at al, Pearson Publication

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCSIT 216	**UG**	Essence of Indian Traditional Knowledge (Non Credit)	**1**	**-**		**-**	**-**	**-**	**-**	**-**	**50**

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Course Objectives:

1. To get some knowledge about Indian Culture.
2. To Know Indian Languages and Literature religion and philosophy and the fine arts in India.
3. To Explore the Science and Scientists of Ancient, Medieval and Modern India.
4. To Understand education systems in India

Course Outcomes:

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature.
3. Explain the philosophy of ancient, medieval and modern India.
4. Outline the information about the fine arts in India.
5. Analyze the contribution of scientists of different eras.
6. Understand education systems in India.

Syllabus

S.no	Title	Topics to be covered
1	Introduction to Culture	Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.
2	Indian Languages and Literature.	Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature.
3	Religion and Philosophy.	Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only).

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S.no	Title	Topics to be covered
4	Fine Arts in India (Art ,Technology & Engineering).	Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Science and Technology in India, development of science in ancient, medieval and modern India.
5	Education System in India.	Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Text/Reference Books:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978- 8187276333, 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200.
4. Narain, "Examinations in ancient India", Arya Book Depot, 1993.
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
6. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014.

ASSESSMENT COMPONENTS

The students will present a report through seminar, which will be held by a Faculty Coordinator constituted by the concerned department as per norms of the institute. The evaluation through seminar presentation will be based on the following criteria.

a) Quality of material presented.
b) Effectiveness of presentation.
c) Depth of knowledge and skills.