Detailed Syllabus

Course Code	15B1NHS832	**Semester** Even **(specify Odd/Even)**	**Semester** VIII **Session** 2021-2022 **Month from** Feb-June 2022
Course Name	International Studies		
Credits	3	**Contact Hours**	**3(3-0-0)**

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	Dr. Chandrima Chaudhuri

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C402-8.1	Demonstrate an understanding of the basic concepts in the area of international studies	Understanding (C2)
C402-8.2	Compare the changes in India's foreign policy in the Cold War era and the post Cold War era	Applying (C3)
C402-8.3	Analyze the major political developments and events since the 20th century	Analyzing (C4)
C402-8.4	Demonstrate an understanding of the rise of new power centres in the changing world order	Understanding (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Concepts	Balance of power and Collective security National Interest and its instruments	4
2.	An Overview of Twentieth Century International Relations History	World War I: Causes and Consequences Significance of the Bolshevik Revolution Rise of Fascism / Nazism World War II: Causes and Consequences	8
3.	Cold War Politics	Origin of the Cold War Evolution of the Cold War Collapse of the Soviet Union Causes of the End of the Cold War	8
4.	India's foreign policy during the Cold War era	Basic Determinants (Historical, Geo-Political, Economic, Domestic and Strategic) India's Policy of Non-alignment	6
5.	India's foreign policy in the Post-Cold War era	India and SAARC India and the Look East policy Impediments to regional co-operation: river water disputes; illegal cross-border migration; ethnic conflicts and insurgencies; border disputes	8
6.	Emergence of Other Power Centres	European Union Rise of Asia Powers- Russia, China and Japan	8
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project/ Quiz/Attendance)
Total	**100**

Project Based Learning: Each student would form a group of 3-4 and submit projects on India's foreign policy and rise of new power centres. This project would help the students' research about the India's relations- economic, political and diplomatic and also consider a variety of perspectives and interpretations of current world events.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	A. Chatterjee, *International Relations Today*. Noida, India: Pearson, 2019
2.	Appadorai, &M.S.Rajan, *India's Foreign Policy and Relations*. New Delhi, India: South Asian Publisher, 1985
3.	E.H. Carr,*International Relations between the Two World Wars: 1919-1939*. New York, USA: Palgrave, 2009
4.	J. Baylis &S. Smith, Ed. *The Globalization of World Politics: An Introduction to International Relations*. Oxford, UK: Oxford University Press, 2011
5.	P. Calvocoressi, *World Politics: 1945—2000*. Essex, UK: Pearson,2009
6.	P.Zelikow, *The Road less travelled: The secret battle to end the great war,1916-17*. New York, USA: Public Affairs, 2021
7.	R,Cooper, *The Ambassadors: thinking about diplomacy from Machiavelli to modern times*. London,UK: Weidenfeld & Nicolson, 2021

Course Description

Course Code	15B19CI891	**Semester EVEN**	**Semester VIII Session** 2021 -2022 **Month from** Jan to June 2022
Course Name	**Project Part – II (CSE)**		
Credits	12	**Contact Hours**	…

Faculty (Names)	**Coordinator(s)**	Mukesh Saraswat (JIIT128), Prashant Kaushik (JIIT62)
	Teacher(s) (Alphabetically)	Entire Department

COURSE OUTCOMES		**COGNITIVE LEVELS**
C451.1	Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area	Understand Level (Level 2)
C451.2	List out the specific requirements to develop the workable solution for the identified computing problem.	Analyze Level (Level 4)
C451.3	Develop a workable computing solution for the identified problem	Apply Level (Level 3)
C451.4	Evaluate the performance of the developed solution	Evaluate Level (Level 5)
C451.5	Compile the results and findings of the project in written and verbal formats	Create Level (Level 6)

Evaluation Criteria

Components	Maximum Marks
Mid Semester Viva	20
Final Viva	30
Project Report	20
Day to Day Work	30
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Optimization Techniques (16B1NMA831)

Course Description

Course Code	16B1NMA831	**Semester** Even	**Semester** VIII **Session** 2021-2022 **Month from** Jan 2022 to June 2022
Course Name	Optimization Techniques		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Shruti	
	Teacher(s) (Alphabetically)	Dr. Shruti	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C402-2.1	apply generalized, revised and dual simplex method for linear programming problems (LPP).	Applying Level (C3)
C402-2.2	apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory.	Applying Level (C3)
C402-2.3	classify and solve the problems on queuing and inventory models.	Analyzing Level (C4)
C402-2.4	solve and analyze the network scheduling and sequencing problems.	Analyzing Level (C4)
C402-2.5	make use of dynamic programming technique to solve complex linear programming problems.	Applying Level (C3)
C402-2.6	determine numerical solution of nonlinear multidimensional problems.	Evaluating Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Review of Linear Programming	Convex sets, Linear Programming Problems (LPP), graphical and simplex method, Big-M method, Two phase method, generalized simplex method, revised simplex method, Duality theory, dual simplex method.	08
2.	Game Theory	Rectangular Games, Minmax Theorem, Graphical Solution of 2×n, 3×n, m×2, m×3 and mxn Games, Reduction to Linear Programming Problems.	06
3.	Queuing Theory & Inventory Model:	Introduction, Steady-State Solutions of Markovian Queuing Models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited space, M/G/1, Inventory Models.	08
4.	Sequencing & Scheduling	Processing of Jobs through Machines, CPM and PERT.	06
5.	Dynamic Programming	Discrete and Continuous Dynamic Programming, Simple Illustrations.	06
6.	Nonlinear Programming	Unimodal function, One Dimensional minimization problem, Newton's Method Golden Section, Fibonacci Search, Bisection, Steepest Descent Method,	08

		Multidimensional Newton's method.	
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments)
Total	**100**

Project based learning: Each student in a group of 4-5 will analyse literature on mathematical application of discrete and continuous dynamic programming technique to solve complex linear programming problems. To make the subject application based, the students analyze the optimized way to deal with dynamic programming problems.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Taha, H. A., Operations Research - An Introduction, Tenth Edition, Pearson Education, 2017.
2.	Rao, S. S. - Engineering Optimization, Theory and Practice, Third Edition, New Age International Publishers, 2010.
3.	Hillier F., Lieberman G. J., Nag,B. and Basu, P., Introduction to Operations Research, 10th edition, McGraw-Hill, 2017.
4.	Wagner, H. M., Principles of Operations Research with Applications to Managerial Decisions, 2nd edition, Prentice Hall of India Pvt. Ltd., 1980.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**17B1NHS732**	**Semester: Even**	**Semester :8th Session : 2021 -2022 Month:January to June**
Subject Name	**INDIAN FINANCIAL SYSTEM**		
Credits	**3**	**Contact Hours**	**3 (3-0-0)**

Faculty (Names)	**Coordinator(s)**	1. Dr. Mukta Mani (Sec 62) 2. Dr.Sakshi Varshney (Sec 128)
	Teacher(s) (Alphabetically)	2. Dr. Mukta Mani 2. Dr.Sakshi Varshney

NBA Code	Course Outcomes	Cognitive Level
C402-31.1	Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market.	C2
C402-31.2	Analyze ways of fund raising in domestic and international markets	C4
C402-31.3	Understand functioning of Stock market and evaluate securities for investment.	C5
C402-31.4	Apply the knowledge of Mutual Funds and Insurance in personal investment decisions	C3
C402-31.5	Apply knowledge of Income tax for calculation of tax liability of individual.	C3

Module No.	Subtitle of the Module	Topics in the module	No. of Hours
1.	Introduction	Meaning, Importance, and functions of Financial system. Informal and Formal financial system, Financial markets, Financial Institutions, Financial services and Financial instrument	3
2.	Money Market	Features of money market Instruments: Treasury bills, commercial bills, commercial papers, certificates of deposit, call and notice money, Functions of money market,	3

		Linking of money market with Monetary policy in India	
3.	Capital Market	Features of Capital market instrument: Equity shares, Bonds. Fund raising through Initial Public Offering, Rights issue, Preferential allotment and Private Placement. Process of IPO-Intermediaries in IPO, Book building process and allotment of shares	3
4.	Foreign investments in India	Fund raising from foreign market through: Foreign direct investment and foreign institutional investment, ADR, GDR, ECB, and Private equity.	3
5.	Stock Market	Trading in secondary market- Stock exchanges, regulations, demutualization, broker, listing of securities, dematerialization, trading, short selling, circuit breaker, stock market indices- methods of calculation of indices.	3
6.	Stock Valuation and Analysis	Investing basics: Consideration of Risk and Return, Stock Valuation and Analysis-Fundamental analysis: Economy, industry and company analysis; Technical Analysis of stocks using technical charts	7
7.	Investing in Mutual Funds and Insurance	Mutual Funds: Basics, Types of funds, risk and return considerations in selection of funds; Insurance: Basics, Life insurance and health insurance, types of policies	6
8.	Overview of Income Tax	Basics of Income tax- Concept of previous year, assessment year, person, income. Calculation of Income tax liability for individuals: Income from salaries- basic, DA, HRA, leave salary, Gratuity, Pension, Allowances and Perquisites; Income from Capital Gain, Deductions under section 80C to 80U.	14
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Class participation and Attendance)
Total	**100**

Project Based learning: The students will form groups of 4-5 students. They will carry-out stock analysis of a selected company on the basis of fundamental and technical analysis techniques studied in lecture classes. Finally, they will give their recommendation about the performance of stock.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1	Pathak Bharti V, *Indian Financial System*,5th Edition,Pearson Education, 2018
2	Madura Jeff, *Personal Finance*, 6th Ed, Pearson Education, 2017.
3	Machiraju H R, *Indian Financial System*, 4th Ed, Vikas Publication, 2010
4	Bhole L M, *Financial Institutions and Markets*, 4th ed. Tata McGraw Hill Publication, 2006.
5	Singhania & Singhania, Students Guide to Income Tax, Taxmann Publication, 2019.
6	*How to Stimulate the Economy Essay* [Online]Available:https://www.bartleby.com/essay/How-to-Stimulate-the-Economy-FKJP5QGATC
7	Reserve Bank of India, 'Money Kumar & the Monetary Policy', 2007
8	AshiwiniKumar,Sharma,' De-jargoned: Book building process,Live Mint,2015.
9	Madhavan, N. "Pushing the accelerator instead of brakes: Can Subhiksha make a comeback?", Business Today, 28th June 2009.
10	Kaul, Vivek, "Master Move: How Dhirubhai Ambani turned the tables on the Kolkata bear cartel", The Economic Times, July 1, 2011.

Detailed Syllabus

Course Code	18B12BT414	**Semester** Even	**Semester** VIIIth **Session 2021-2022** **Month from** Jan - June
Course Name	Machine Learning tools in Bioinformatics		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	1. Dr. Chakresh Kumar Jain
	Teacher(s) (Alphabetically)	1. Dr. Chakresh Kumar Jain

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-13.1	Explain about the machine learning principle biological complexities and resources	Understand Level (C2)
C402-13.2	Apply Pattern Identification methods for motif discovery	Apply Level (C3)
C402-13.3	Apply machine learning in solving biological problems.	Apply Level (C3)
C402-13.4	Analyzing the use of machine learning in disease-drug discovery	Analyze Level (C4)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Overview of machine learning methods and scope in bioinformatics	Fundamentals of machine learning, algorithms, introduction to biological problem and mapping, gene and genome, Structure, function and organization, biological database, Scope of machine learning in bioinformatics (Genomics, proteomics, transcriptomics etc.)	7
2.	Pattern identification	Pattern and motif, domain, profile in Bioinformatics, Search algorithms, String search, Boyer moore, Robin Karp algorithm KMP algorithm, Dynamics programming and greedy approach etc. case studies	4
3.	Data classification: Clustering and tree algorithm	Gene finding tools, Discrimination analysis ; LDA, Clustering methods: Hierarchical , K mean, Normalization, similarity measure (distances), Basics of tree, suffix tree and its applications in Bioinformatics , validations,	8

		statistical inferences and biological interpretation (Gene ontology and microarray data)	
4.	Basics of ANN and HMM	Fundamental of ANN, Back propagation algorithm, kNN, ANN model, Biological tools like PHD, Intron identifier, splice site prediction etc. Basics of HMM Stochastic algorithm, profile generation, Pfam, protein families, Gibbs sampling, Viterbi algorithm, tools evaluation	10
5.	SVM	Introduction to SVM. Feature selection, kernel methods, case studies(Bioinformatics application ; protein structure and function prediction , data mining in drug discovery etc.)	5
6.	Applications and tools	SVM_light, GIST server, applications of SVM, QSAR prediction, ADMET predictions, case studies, Protein coding region prediction, gene identification, folding problems in protein sequences, network analysis, RNAi Designing, PSORT, Genscan, HMMTOP, DAS, Genemark , Glimmer, etc., case studies	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Quiz, Case study, Project based evaluation)
Total	**100**

PBL: The course covers fundamentals of machine learning methods and tools with its applications into the biological problem. Further PBL component is helping students to familiarise the methods and tools with more explorations towards understanding the disease behaviour

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Papers, Reports, Websites etc. in the IEEE format)

1.	Baldi, Pierre and Brunak, Søren "Bioinformatics: The Machine Learning Approach" , 2nd edition, Rajkamal Electric Press, Delhi, Pp 452. 2003.
2.	Cormen , Thomas H. "Introduction to Algorithms" , 2nd edition McGraw-Hill

	Science,Pp 1056, 2001
3	Yang, Zheng Rong, " Machine :Learning Approaches to Bioinformatics", New Delhi world Scientific, Pp 336, 2017
5	Research papers and manuals

Detailed Syllabus

Lecture-wise Breakup

Course Code	**18B12HS811**	Semester: EVEN	Semester: VIII Session: 2021-22 Month from: Feb-June
Course Name	**Industrial Sociology**		
Credits	3	Contact Hours	(3-0-0)

Faculty (Names)	Coordinator(s)	Shikha Kumari
	Teacher(s) (Alphabetically)	Shikha Kumari

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-38.1	Understand the scope of industrial sociology and major theories on labour and work	Understand (C2)
C402-38.2	Analyzing the contemporary issues related to industry in the post-LPG era	Analyze (C4)
C402-38.3	Evaluating work in its social aspects such as gender, caste, class and unpaid work, as different from its better known economic dimension.	Evaluating (C5)
C402-38.4	Evaluate and interpret information about emerging issues in the industry through various sources like print and electronic media, film, documentary and other information technologies	Evaluate(C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	• Scope and importance of the study of Industrial Sociology • Nature and type of industrial society • Study of industrial relations	3
2.	Theoretical Orientation	• Functional theory of labour (Durkheim) • Conflict/Marxian theory of labour • Weberian Theory of labour	5
3.	Social dimensions of work (I)	• Types of work: Unpaid Domestic and Volunteer work/ Service sector work/ managerial and white collar work/ blue	5

		collar work- Sectors of employment	
4.	Social dimensions of work (II)	• Gendered Organization: Feminization of Labour and Poverty • Discrimination and Harassment (gender, racial, ethnic) • Caste system as a tool to stratify the labour force	8
5.	Industrializatio n in India	• Trade Union: Concept, Functions and Types, History of Trade Union Movement in India Trade • Socialism- LPG era India • Unions and Challenges of Privatization, risks and hazards, Law and work, Decline of Trade Unions, Disputes & Conciliation.	8
6.	Contemporary Issues	• Globalization and Technology: Criteria for measuring Globalization • Automation of work and its Impact (Reference: AI technologies) • Employment trends	8
7.	New initiatives in India	• Indian Endeavors- Make in India/ Start up India, Skills India programme	5
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**

Evaluation Criteria

Components	**Maximum Marks**
T1	20 (Project based)
T2	20
End Semester Examination	35
TA	25 (project/movie review/quiz)
Total	**100**

PBL- Student in a group of 4-5 will submit a project on New initiative in India- (a)make in India/(b)start up India.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Bhattacharjee. S. (2016). *Industrial Sociology*. Aavishkar Publications. Jaipur
2.	Edgell, S. (2006). "Unpaid Work-Domestic and Voluntary work". *The Sociology of Work: Continuity and Change in Unpaid Work.*NewDelhi:Sage
3.	Freeman. C. (2009). 'Feminity and Flexible labour: Fashioning Class through gender on the global assembly line'. Massimiliano Mollona, Geert De Neev and Jonathan parry (eds.)

	Industrial Work And life:An Anthropological Reader.Berg: Oxford
4.	Grint, K.(2005).“Classical Approaches to Work: Marx, Durkheim and Weber”. *The Sociology of Work: An Introduction*. Polity Press. Cambridge.
5.	Mishra. R (2016). *Industrial Sociology*. Laxmi Publications. New Delhi
6.	Prasad. J (2013). *Industrial Sociology*.Vayu Education of India: Delhi
7.	Singh. Y. & Sharma. R (2016). *Industrial Sociology*. AITBS Publishers: Delhi
8.	Sinha, P.N.R. (2006). *Industrial relations, Trade Unions and Labour legislations*. Pearson: New Delhi
9.	Watson, T.J. (2003). *Sociology, Work and Industry.* Routledge: London and New York

Detailed Syllabus

Lecture-wise Breakup

Course Code	18B12HS814	**Semester** Even	**Semester** VIII **Session** 2021 -2022 **Month from** Feb to June	
Course Name	Knowledge Management			
Credits	3		**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Anshu Banwari		
	Teacher(s) (Alphabetically)	Dr. Anshu Banwari		

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-30.1	Demonstrate the way knowledge is embedded in today’s organization and behavioral aspects involved in managing it	Understanding Level (C2)
C402-30.2	Compare and contrast different methods of KM to preserve, nurture, share and manage knowledge	Understanding Level (C2)
C402-30.3	Identify appropriate methods for knowledge integration to gain competitive advantage	Applying Level (C3)
C402-30.4	Identify the legal ramifications arising from knowledge sharing and an insight into the ethical concerns faced by individuals and organizations	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Knowledge Management	Cognition and Knowledge Management, Data, Information and Knowledge, Types of Knowledge, Reasoning and Heuristics, Expert Knowledge, Human thinking and Learning, Knowledge Management myths	4
2.	Life Cycle of a knowledge Management	Challenges in building Knowledge Management Systems, Conventional V/S Knowledge Management System Lifecycle, Knowledge Management System Life Cycle, System Justification, Role of Rapid Prototyping, Selecting	6

	System	an expert, Role of Knowledge developer	
3.	Knowledge Creation and Knowledge Architecture	Models of Knowledge Creation and Transformation, Knowledge Architecture, The people Core, Identifying Knowledge centers, The technical core	5
4.	Capturing Tacit Knowledge	Evaluating the expert, Developing a Relationship with expert, Fuzzy reasoning and the quality of Knowledge capture, Interview as a tool, Knowledge capture techniques	6
5.	Knowledge Codification and System Implementation	Codification Tools and Procedures, The knowledge Developer's Skill set, Quality assurance, Approaches to Logical testing and Acceptance testing, Issues related to deployment	6
6.	Knowledge Transfer and Knowledge Sharing	Transfer strategies, Inhibitors of Knowledge transfer, Role of Internet in Knowledge Transfer	5
7.	Managing Knowledge Workers	Business Roles in the Learning Organizations, Work adjustment and the Knowledge Worker, Technology and the Knowledge worker, Role of the CKO, Managing Considerations, Managing Knowledge Projects	5
8.	Ethical, Legal and Managerial Issues	Knowledge Owners, Legal Issues, Ethical Decision cycle, Major threats to Ethics, The Privacy factor	5
Total number of Lectures			**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Project)
Total	**100**

Project based learning: Students have to form a group (maximum 5 students in each group) and have to identify an organization who has successfully implemented knowledge management. Students have to analyze techniques, tools and methods adopted by organization to preserve, nurture, share and manage knowledge. Understanding of different methods, processes and techniques used by organizations for successful KM implementation enhances the students practical understanding on how knowledge management is integrated into different business functions. These days most of the organizations are using knowledge management in their various endeavors. This subject surely enhances student's employability in all those organizations where knowledge management has been implemented or where they are planning to implement knowledge management.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	**D. Hislop,** Knowledge Management in Organizations, Oxford University Press, 2013
2.	**E. M. Awad and H. M. Ghaziri,** Knowledge Management, Pearson Education, 2007
3.	**S. Warier**, Knowledge Management, Vikas Publishing House, 2011
4.	**Tan, H., Carrillo, P. and Anumba, C.J**., Case study of knowledge management implementation in a medium-sized construction sector firm. Journal of Management in Engineering, 28 (3), pp. 338 – 347, 2012

5.	**RagsdelL, G., Ortoll Espinet, E. and Norris, M.,** Knowledge management in the voluntary sector: a focus on sharing project know-how and expertise. Knowledge Management Research and Practice, 12(4), pp.351–361, 2014
6.	**K. North and G. Kumta,** Knowledge Management, 2nd ed. 2018 ed., Springer, 2018

Course contents and plan

Subject Code	**18B12HS815**	**Semester Even**	**Semester** VIII **Session 2021-22** **Month from** Feb to June 2022
Subject Name	**LITY ISSUES IN ENGINEERING**		
Credits	3 (3-0-0)	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Akarsh Arora
	Teacher(s) (Alphabetically)	Dr. Akarsh Arora

Course Objectives:

1. To implement the principles and concepts inherent in a quality management approach to managing the engineering issues of a manufacturing or service organization.
2. To understand the philosophies of the gurus of quality in order to better evaluate TQM implementation proposals offered by quality management organizations and consultants.
3. To successfully implement process improvement teams trained to use the various quality tools for identifying appropriate process improvements.
4. To assess exactly where an organization stands on quality management with respect to the ISO 9000 quality management standard and various awards criteria.

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-32.1	Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality	Apply Level (C3)
C402-32.2	Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves	Evaluate Level (C5)
C402-32.3	Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment	Evaluate Level (C5)
C402-32.4	Examine the importance of six sigma, various quality standards, awards, certifications	Analyze Level (C4)

Module No.	**Subtitle Of The Module**	**Topics In The Module**	**No. Of Lectures For The Module**

1.	Fundamentals And Evolution Of Quality	Introduction, Dimensions Of Quality, Fundamentals, History Of TQM, Contemporary Influences	6
2.	Quality Tools And The Improvement Cycle	Various Costs, Juran's Coq Accounting Statement, Voice Of Customers: Kano's Model, House Of Quality, QFD Process, Seven Tools For Quality Management	9
3.	Benchmarking	Meaning, Process, Methods	3
4.	Quality Gurus	Contribution of Quality Gurus	3
5.	Six Sigma	Six Sigma, Capability Of A Process/Product/Service, DMAIC Process	6
6.	Lean Concepts	Kaizen, Poka-Yoke, Andon, Kanban, JIT, 5-S, 7 Mudas	3
7.	Statistical Thinking And Applications	Statistical Process Control, Acceptance Sampling, Specification And Control Limits, Control Charts For Variables, Control Charts For Attributes	6
8.	Quality Awards And Certifications	MBNQA, RGNQA, Deming Prize, ISO Standards	3
9.	Quality Strategy For Indian Industry	India's Quality Journey, Quality Management In India	3
Total Number Of Lectures			42

Project-based Learning: Students are required to visit any business organization to observe the brief about the organization; its products; its suppliers; its operations; its processes, Quality control system and techniques followed by the company, Quality standards met by the company, application of quality tools or lean manufacturing system, Sigma capability of products or processes, DMAIC methodology, application and relevance of the quality concepts studied in the course. Collecting information on quality systems, quality standards, quality certifications or awards received, and sigma capability will upgrade students' knowledge and strengthen their skills to tackle multiple quality engineering issues along with employability.

Evaluation Criteria

Components	**Maximum Marks**
T1	20 (Written)
T2	20 (Written)
End Term	35 (Written)
TA	25 (Project Assignment, Quiz)
Total	**100**

Recommended Reading material:

1.	Besterfield D. H., Besterfield-Michna C., Besterfield G. H., Besterfield-Sacre M. *Total quality management*, Prentice Hall, 1999.
2.	Evans, J. R., Dean J. W. *Total quality management, organization and strategy*, Thomson, 2003. 399 p.
3.	Kanji G. K., Asher M. *100 Methods for Total Quality Management*. London: SAGE Publications, 1996.

4.	Oakland G. F. *Total Quality Management*, Oxford, 1995.
5.	Goetsch D. L., Davis S. B. *Quality management. Introduction to TQM for production, processing and services*. New Jersey: Prentice Hall, 2003.
6.	John S. Oakland. *Total Quality Management and Operational Excellence*: Text with cases, Fourth edition, 2014
7.	Dale H. Besterfield. *Total Quality Management*, (Revised Edition). India: Pearson, 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH811	**Semester Even (specify Odd/Even)**	**Semester VIII Session** 2021 -2022 **Month from** January to June
Course Name	Photonics and Applications		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Navneet Kumar Sharma
	Teacher(s) (Alphabetically)	Navneet Kumar Sharma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-3.1	Recall the fundamental properties of light and the processes involved in the generation of light	Remember Level (C1)
C402-3.2	Interpret the theory of fiber optics	Understand Level (C2)
C402-3.3	Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications	Apply Level (C3)
C402-3.4	Compare the operational principles, characteristics and trade-offs of optical detectors and modulators of light	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Lasers	Review of different types of laser systems. LEDs, Semiconductor lasers, Quantum well lasers, Modes of laser cavity, Q-switching and Mode locking in lasers.	8
2.	Fiber Optics	Numerical aperture, Step and graded index multimode fibers, attenuation and dispersion, modes in optical fibers. Single mode fiber, mode cutoff and mode field diameter. Connector and splice losses, Erbium doped fiber amplifier and Characterization techniques including OTDR.	10
3.	Photo detectors	Semiconductor photo detectors.	5
4.	Optical Electronics	Wave propagation in anisotropic media, Electro-optic effect: phase and amplitude modulation. Acousto-optic effect: modulators, deflectors and tunable filters, Magneto-optic effect: modulators.	4
5.	Optical devices	Electro-optical device, Acousto-optical device, Magneto-optical device, Voice communication, Optical communication.	2

6.	Nonlinear Optics	SHG, Sum and Difference frequency generation, parametric amplification, wavelength converters, Self focusing with lasers.	6
7.	Holography	Recording and Reproduction of Hologram, Applications of holography.	4
8.	Applications of Photons in Memory devices	CD, VCD, DVD.	1
		Total number of Lectures	**40**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (07 M), Class Test, Quizzes, etc (07 M), Assignments in PBL mode (06 M) and Internal assessment (05 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R. P. Khare, *Fiber Optics and Optoelectronics*, Oxford University Press.
2.	A. K. Ghatak and K. Thyagarajan, *Optical Electronics*, Cambridge university Press.
3.	A. K. Ghatak and K. Thyagarajan, *An Introduction to Fiber Optics*, Cambridge university Press.
4.	B. B. Laud, *Lasers and Nonlinear Optics*, New Age International.

Project based learning: Each student in a group of 4-5 students will opt a topic and will do the theoretical study in detail. The students will submit their report. To make the subject application based, the students analyze the optical fiber applications, holography applications and use of photons in memory devices. This shall improve the skills and employability of the students in laser and photonic industries.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH812	**Semester: Even**	**Semester: VIII Session :** 2021 -2022 **Month from: Feb to June**
Course Name	**Astrophysics**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Sandeep Chhoker

	Teacher(s) (Alphabetically)	Sandeep Chhoker

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-4.1	Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units	Remembering (C1)
C402-4.2	Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity	Understanding (C2)
C402-4.3	Apply mathematical principles and laws of physics to solve problems related to astrophysical systems	Applying (C3)
C402-4.4	Compare different models of universe and decide which one is logically acceptable and why	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1	Introduction to Astrophysics	Historical development of astrophysics (from mythology to contemporary astrophysics), Mass, length and time scales in astrophysics, sources of astronomical information (effect of discovery of spectroscopes and photography), astronomy in different bands of electromagnetic radiation (e.g. Optical astronomy, infra-red astronomy radio astronomy, X-ray astronomy. Gamma-ray astronomy etc. with specific mention of Hubble space telescope). Kirchoff's law, Doppler effect and Hubble's law.	**8**
2.	Stellar Astrophysics	Classification and nomenclature of stars. Basic equations of stellar structure, main sequence, red giants and white dwarfs, HR diagram, stellar evolution, supernovae, extra solar planets.	**8**
3.	Death of a star	End states of stellar collapse: degeneracy pressure of a Fermi gas, structure of white dwarfs, Chandrasekhar mass limit, neutron stars pulsars and black holes.	**6**
4.	Our galaxy	The shape and size of Milky way and its interstellar mater	**2**
5.	Extragalactic astrophysics	Normal galaxies, active galaxies, cluster of galaxies, large-scale distribution of galaxies.	**6**
6.	GTR and Models of Universe	Qualitative idea of general theory of relativity (without using tensor calculus) and its implications. Different models of universe. Specific attention to the ideas related to big bang, cosmological constants, dark matter and dark energy.	**6**
7.	Astrobiology	Drake equation and related questions.	**2**
8.	Conclusion	Review of the present status of Astrophysics and open questions.	**2**
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20

T2	20
End Semester Examination	35
TA	25 [2 Quizes (10 M), PBL (10 M) and Class performance (5 M)]
Total	**100**

PBL Assignment Astrophysics 2022: Project report (5-7 pages in pdf format indicating Name, Enroll No. and Batch) is to be uploaded in google class room before starting of End Term Exam. Max 5 students can work on one topic given in the list (Dark Matter, Dark Energy, Expanding Space time, Merger of Black holes, Failed stars, Detection of Gravitational Waves, Light cone in GTR, Particle production radiation era, Did big bang happened ?, Discover life: ET etc.**), however, they may prepare different reports. Report should include introduction, definition, mathematics, principle, working, figures, applications etc.**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Astrophysics for Physicists, Arnab Rai Choudhuri, Cambridge University Press, Delhi, 2010.
2.	Astrophysics: Stars and Galaxies, K D Abhyankar, University Press, Hyderabad, 2009.
3.	Facts and Speculations in Cosmology, J V Narlikar and G Burbidge, Cambridge University Press, Delhi, 2009.
4.	The Cosmic Century, Malcolm Longair, Cambridge University Press, Cambridge, 2006.
5.	An Introduction to Astrophysics, BaidyanathBasu, Prentice Hall of India, Delhi 1997.
6.	Fundamentals of Equations of State, S. Eliezer, A Ghatak and Heinrich Hora, World Scientific, Singapore, 2002. Only Chapter 15.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH814	**Semester:Even**	**Semester:**VIII **Session:**2021 -2022 **Month: January to June**
Course Name	Plasma Physics		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Anuraj Panwar
	Teacher(s)	Dr. Anuraj Panwar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-34.1	Define terminology and concepts of plasma physics with various natural phenomena and engineering applications.	Remembering Level (C1)
C402-34.2	Summarize plasma and explain its electric, magnetic, dielectric and thermal properties.	Understand Level (C2)
C402-34.3	Develop magneto-hydrodynamic fluid and kinetic models to explain various phenomena taking place in homogeneous, isotropic and anisotropic plasma conditions.	Apply Level (C3)
C402-34.4	Analyze and formulate mathematical / analytical expressions for various nonlinear processes in plasmas.	Analyze Level (C4)

C402-34.5	Evaluate physical problems, estimate their numerical solutions and draw inferences from the results.	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	**Introduction to the Plasma State**	Elementary concepts, definition of temperature Debye Shielding, plasma parameters, applications of Plasma Physics, Production of Plasmas in the laboratory, Drifts of charged particles under the effect of different combinations of electric and magnetic fields and Mirror Machine.	10
2.	**Fluid description of plasmas**	Relations of Plasma Physics to ordinary electromagnetics, dielectric constant of a plasma, collisions, equation of continuity, macroscopic parameters of plasma, two and one fluid equations for plasma.	04
3.	**Nonlinear Waves in Plasmas**	Plasma oscillations, space charge waves of warm plasma, ion-acoustic waves and electromagnetic waves in magnetized plasma.	08
4.	**Diffusion and Resistivity**	Decay of Plasma by diffusion, diffusion across a magnetic field, single fluid MHD equations, Diffusion in fully ionized Plasmas, Bohm diffusion and Neoclassical diffusion.	06
5.	**Stability of fluid plasma**	The equilibrium of plasma, classification of plasma instabilities, stability analysis: Two stream instability and Gravitational instability or Rayleigh Taylor instability (Plasma supported against gravity by magnetic field).	04
6.	**Nonlinear effects**	Ponderomotive force, Parametric instabilities, decay instability, two plasmon decay, stimulated Raman scattering and stimulated Brillouin scattering, non linear Landau damping.	06
7.	**Controlled thermo-nuclear fusion**	Magnetic and inertial confinement schemes, ITER, TOKAMAK.	02
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+PBL+Attendance+class performance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	F. F. Chen., *Introduction to Plasma Physics*, Springer (2016).
2.	Krall and Trievelpiece, *Principles of Plasma Physics*, McGraw-Hill (1973).
3.	W. L. Kruer, *The Physics of laser plasma interactions*, Addison Wesley (1988).
4.	Liu and Tripathi, *Interaction of electromagnetic waves with electron beams and plasmas*, World Scientific (1994).

Project based Learning (PBL): Students groups may be formed to submit project reports on natural and engineering applications of plasma physics. Students may be asked to make presentations on topics like mirror machine, plasma diffusion, Raman scattering and plasma fusion devices. Students may be asked to present recent published articles on plasma applications. Students may be asked to solve plasma physics problems by using their

expertise computer language

Multi Attribute Decision Making (20B12MA411)

Course Code	**20B12MA411**	**Semester** Even	**Semester VIII Session** 2021 -2022 **Month from**Jan 2022 to June 2022
Course Name	**Multi Attribute Decision Making**		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Pankaj Kumar Srivastava	
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht and Dr. Pankaj Kumar Srivastava	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
CO-1	explain basic steps in decision analysis and decision-making environments.	Understanding Level (C2)
CO-2	apply group decision making methods to reach a collective decision.	Applying Level (C3)
CO-3	develop the concept of multi criteria decision making process and attributes.	Understanding Level (C2)
CO-4	apply elementary methods to solve multi attribute decision making problems.	Applying Level (C3)
CO-5	analyze value based and outranking methods to solve multi attribute decision making problems.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Decision Analysis	Basic Steps in Decision Analysis, Decision-Making Environments, Decision Making Under Uncertainty, Decision Making Under Risk, Utility Theory, Decision Tree.	8
2.	Group Decision Making	GDM Methods, Content-Oriented Methods, and Disadvantages of Non ranked Voting, Preferential Voting System, and Social Choice Functions.	7
3.	Multicriteria Decision Making	Multi-attribute Decision Making, Multi Objective Decision Making, Decision Making Process, Structuring Process, Decision Matrix, Attributes, Normalization, Attribute Weight Assignment Methods.	8
4.	Elementary Methods for MADM	Dominance Relation method, Even-Swap method, Lexicographic method Maximax method, Maximin method, Conjunctive method, Disjunctive method, Median Ranking, Analytic Hierarchy Process, Analytic Network Process.	8
5	Value Based and Outranking Methods	Multi Attribute Value Theory, Simple Additive Weighting, Weighted Product, TOPSIS Outranking Methods.	11
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz and Assignments)
Total	**100**

Project based learning: Students are divided in a group of 4-5 to do a survey on the applications of classical and recent multi attribute decision making techniques in their respective branches. The student recognizes the multi attribute decision making problems arising in real life and solves these problems with the help of MADM techniques learnt in this course.	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Ishizaka, Alessio, and Philippe Nemery. *Multi-criteria decision analysis: methods and software*. John Wiley & Sons, 2013.
2.	Xu, Zeshui. *Uncertain multi-attribute decision making: Methods and applications*. Springer, 2015.
3.	Tzeng, Gwo-Hshiung, and Jih-Jeng Huang. "Multi Attribute Decision Making: Methods and Applications." *USA, CRC Press.* 2016.

Course Description

Subject Code	22B12CS412	**Semester: Odd**	**Semester** 8th **Session** 2021 -2022 **Month from:** Jan **to** June 2022
Subject Name	Digital Forensics and Cyber Laws		
Credits	**3-0-0**	**Contact Hours**	**3**

Faculty (Names)	**Coordinator(s)**	Prof. Charu Gandhi
	Teacher(s) (Alphabetically)	Prof. Charu Gandhi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C433-8.1	To explain the concept of cybercrimes and analyze legal frameworks of different types of cybercrimes	Remember Level (C1)
C433-8.2	Demonstrate a critical understanding of the Cyber law with respect to Indian IT/Act 2008	Evaluate Level (C5)
C433-8.3	Study the different forms in digital forensic investigations and its life cycle	Understand Level (C2)
C433-8.4	Analyze the principles in collecting and analyzing the digital evidence	Apply Level (C3)
C433-8.5	Interpret and apply various digital forensic tools in real time scenario	Analyze Level (C4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Cybercrime	Introduction, Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime, Types of Cybercrime, Classification of Cybercriminals, Tools used in Cybercrime, Challenges to Cybercrime, Strategies to Prevent Cybercrimes	**05**
2.	Cyber warfare and cyber laws	Introduction to Cyber War, Ransomware ,Types of Ransomware, Mode of Infection , Events in Ransomware Attack , , Role of Antivirus Deep Web and Dark Web, Accessing Dark Web, Onion Router—TOR, Introduction to Cyber Laws, Cyber Laws in India and Case Studies, Information Technology Act 2000, Amendments to the Indian Evidence Act 1872 in View of Information Technology Act 2000	**06**

3	Introduction to Digital Forensics	Computer Forensics Investigations , Steps in Forensic Investigation ,Forensic Examination Process , Methods Employed in Forensic Analysis, Forensics classification, Incident and Incident Handling, Disk, Network, Database, Wireless, Malware, Mobile, GPS, Email, Memory forensics, Incident and Incident handling	**06**
4	Digital Evidence	Digital Evidence, Evidence Collection Procedure, Acquisition and Handling of Digital Evidence, from different digital devices, Operating Systems and their Boot Processes ,Storage Medium , File System, Windows Registry, Windows Artefacts , Browser Artefacts, Linux Artefacts ,Whole Disk Encryption or Full Disk Encryption, Evidence from Mobile Devices, Digital Evidence on the Internet, Challenges with Digital Evidence	**06**
	Acquisition and Handling of Digital Evidence	Preliminaries of Electronic or Digital Evidence, Acquisition and Seizure of Evidence, Chain of Custody, Acquisition of Computer and Electronic Evidence, Acquisition Procedure using Target Disk Mode from Apple Macintosh Computer, Mobile Phone and PDA, Optical and Removable Media, Digital Cameras, Handling of Digital Evidence	**06**
5	Analysis of Digital Evidence	Introduction ,Capturing of Forensic Copy of Memory and Hard Drive with Toolkit Forensic Imager , RAM Analysis with Volatility ,Analysing Hard Drive, Working with Autopsy, Email Tracking and Tracing	**06**
6	Forensic Tools	Forensic Tools,Types Cyber Forensic Suite, Free and Open-source Forensic Suite, Proprietary Forensic Suites, Drive Imaging and Validation Tools, Forensic Tool for Integrity Verification and Hashing , Forensic Tools for Data Recovery, Forensic Tools for RAM Analysis Registry Analysis, Encryption/Decryption, Password Recovery, Network Analysis, Forensic Utility for Metadata Processing UNIX System Analysis, Analysis Tools for Mobile Devices Free and Open-source Forensic Tools for Mobile Devices Forensic Tools for Email Analysis	**07**
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance-05, Class Test/ Quiz-05, Internal assessment-05, Project Based Learning - 10)
Total	100

Project Based Learning: The students are grouped into groups of size 2-3 and will be implementing various cyber forensics tools. The student will analyze the requirements and select the required applications. This will help in the employability of students in the cyber security and forensics based industry and public sectors.

	Text Books:
1.	Cyber Forensics by Murugan, S, Oxford University Press.
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

	Reference Books:
1.	Cybercrime and Digital Forensics: An Introduction by Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar, Routledge; 2nd edition, 2017
2.	Digital Forensics and Incident Response: A practical guide to deploying digital forensic techniques in response to cyber security incidents by Gerard Johansen, Packt Publishing Limited, 2017
3	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Syngress; 2nd edition, 2014

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS413	**Semester: EVEN**	**Semester** VIII **Session 2021**-2022 Month from Jan to Jun
Course Name	Data Analytics using R and Python		
Credits	3	**Contact Hours**	**3-0-0**
NBA Code	C433-9		

Faculty (Names)	**Coordinator(s)**	Dr. Megha Rathi (J62) & Dr. Raju Pal(J128)
	Teacher(s) (Alphabetically)	Dr. Megha Rathi (J62) & Dr. Raju Pal(J128)

COURSE OUTCOMES		COGNITIVE LEVELS
C433-9.1	Explain the fundamental concepts of data analytics.	Understand Level (C2)
C433-9.2	Demonstrate the concepts of R & Python for data analytics.	Apply Level (C3)
C433-9.3	Apply advanced methods and their quantitative analysis for real-world problems.	Apply Level (C3)
C433-9.4	Apply statistical methods for hypothesis testing and inference problems.	Apply Level (C3)
C433-9.5	Analyze, visualize and interpret the results for useful insights.	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Data Definitions and Analytical Programming Techniques	Introduction to Data Analytics, Elements, Variables, and Data categorization, Levels of Measurement, Introduction to analytical programming languages R & Python, and Installing Software's & Setting up, Lists & Dictionaries, Functions & Packages, Data frame, Import and Export data	7

		, Data Preprocessing.	
2.	Parametric &Non Parametric Tests	Hypothesis Testing, Assumption Testing, T-Test, Power Analysis, ANOVA, Fitting ANOVA Model in Python & R, Wilcoxon Tests, Mann-Whitney U Test, Fisher Exact Test	6
3.	Correlation &Association Analysis	Pearson Correlation, Spearman Correlation, Kendall Tau Correlation, Affinity Analysis & Market Basket Analysis, APriori Algorithm, Association Rules, Frequent Pattern AnalysisCase Study-I.	7
4.	Data Analysis Techniques	Analysis of Streaming Data, Applications of ML Library in R & Python for Supervised & Unsupervised Learning, Basic Neural Network, Transfer Function Models, Multivariate Time Series Analysis, Case Study-II.	10
5.	Decision Making & Data Visualization	Introduction to decision system, Bayesian Theory, Fuzzy Logic, Building a simple decision system based on Bayesian Theory & Fuzzy Logic, Plotting with R & Python Libraries, Statistical Inference, Volatility Analysis, Case Study-III.	8
6.	Model Evaluation Techniques	Model Evaluation Measures for Classification Task, Decision Cost/ Benefit Analysis, Rationale for measuring Cluster Goodness, Silhoutte Method, Pseudo F-Statistic	4
		Total number of Lectures	**42**

Project based learning:

Each student in a group of 3-4 has to work on a mini-project, in which they will identify a real-life problem and develop the solution by utilizing skills learned throughout the course. The project implementation should be in python or R preferably along with well documentation on different aspects of the software. This enhances the understanding of students towards different concepts of data analytics and also helps them during their employability as data engineer or data analyst.

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (**Attendance and Tut Performance ,Quiz/ Mini-Project/Assignment**)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Book(s)

1.	Haider, M. (2015). Getting Started with Data Science: Making Sense of Data with Analytics. IBM Press.
2.	Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
3.	Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Introduction to Time Series Analysis and Forecasting, Second Ed., Wiley, 2016.
4.	David J. Pine, Introduction to Python for Science and Engineering, CRC Press, 2019.
5.	Jake vanderPlas, Python Data Science Handbook – Essential Tools for Working with Data, O'Really Media, 2017

6.	Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007
7.	Kabacoff, Robert I. R in action: data analysis and graphics with R. Simon and Schuster, 2015.
8.	Fandango, A. (2017). Python Data Analysis. Packt Publishing Ltd.
Reference Books	
1.	Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014).
2.	Gibbons, J.D., Non-Parametric Statistical Inference, 2/e,Marckel Decker, 1985.
3.	Robert Johansson, Numerical Python – Scientific Computing and Data Science Applications with NumPy, SciPy and Matplotlib, Apress, 2019
4.	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016
5.	Nelli, F., Python Data Analytics: with Pandas, NumPy and Matplotlib, Apress, 2018.
6.	Wickham, H., &Grolemund, G. (2016). R for data science: import, tidy, transform, visualize, and model data. " O'Reilly Media, Inc.".

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS414	Semester Even (specify Odd/Even)	Semester: VIIIth Session 2021 -2022 Month from February to June
Course Name	Agile Software Development Process		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Amarjeet Prajapati
	Teacher(s) (Alphabetically)	Dr Amarjeet Prajapati

COURSE OUTCOMES		COGNITIVE LEVELS
C433-10.1	Interpret the trade-offs between traditional and agile software development methods.	Understand level (Level 2)
C433-10.2	Apply appropriate agile software engineering approach for a software development.	Apply Level (Level3)
C433-10.3	Apply refactoring techniques on source code for improved design	Apply Level (Level3)
C433-10.4	Apply appropriate tools for testing agile projects using various testing strategies	Apply level (Level3)
C433-10.5	Estimation and monitoring of agile projects.	Analyze level (level4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Introduction	Traditional software development methods, Introduction to Agile software development methods and Agile development Frameworks. Lean software development	3

2.	Agile Fundamentals	Agile manifesto, Agile principles, Characteristics of Agile processes, an iterative development process, Pros and cons of incremental development and software prototyping.	3
3.	Scrum Framework	Introduction, Scrum - Prioritizing, Estimating, and Planning, The Scrum Experience (hands-on exercise)	5
4.	Extreme Programming (XP)	Extreme Programming Values, Principles and Practices, Pair programming, Embracing change, incremental change	5
5.	Crystal Framework	Crystal methodologies: project categories, complexity, family members, Crystal's seven properties, Crystal clear development process cycle, Crystal yellow, crystal orange and crystal orange web.	4
6.	Kanban Framework	The principles of Kanban, Improving process with kanban, Measure and manage flow, Emergent behavior	4
7.	Feature-Driven Development	Processes of feature driven development, practices and progress in FDD	2
8.	Refactoring in Agile	Bad smells in code, properties of refactoring, refactoring examples, benefits, cost and risk of refactoring	7
9.	Agile Testing	Agile testing strategy, Agile test plan, automated unit test, test driven development (TDD), alpha, beta and acceptance testing. Exploratory testing.	5
10.	Estimation and Monitoring of Agile Projects	Agile estimation, Story point estimation, **Sprint velocity estimation, team capacity, Planning and controlling agile projects.**	4
		Total number of Lectures	42

Evaluation Criteria

Components	Maximum Marks
T1	20
T1	20
End Semester Examination	35
TA	25 Attendance (10) + Assignment/Quiz/Mini-project (15)
Total	100

Project based learning: Each student in a group of 3-4 have to work on a mini-project, in which they will identify a real-life problem and develop the solution by applying their knowledge of search-based software engineering approach. The project implementation can be in any programming language preferably along with well documentation on different aspects of the software. It enhances the understanding of students towards different concepts of search-based software engineering approach and also helps them during their employability.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Books:

1.	Cohn, Mike. Agile estimating and planning. Pearson Education
2.	Beck, Kent. Extreme programming explained: embrace change. Addison-wesley professional
3.	Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall.

Reference Books:	
4.	Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc.".
5.	Schwaber, Ken. Agile project management with Scrum. Microsoft press
6.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc."
7.	Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS419	**Semester: Even**	**Semester: 8th Session** 2021 -2022 January 2022 – June 2022
Course Name	Cryptocurrency Technologies		
Credits	**3**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Dr. Kapil Madan
	Teacher(s) (Alphabetically)	Dr. Kapil Madan

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-5.1	Define the basic terminologies related to Cryptography and Cryptocurrencies.	Remember Level (Level 1)
C434-5.2	Explain the security features and distributed consensus in decentralized networks.	Understand Level (Level 2)
C434-5.3	Determine the feasibility of applying and storing bitcoin in real-world scenarios.	Apply Level (Level 3)
C434-5.4	Examine the strategies of bitcoin mining incentives and anonymity.	Analyze Level (Level 4)
C434-5.5	Compare the different altcoins along with their strengths and weaknesses.	Analyze Level (Level 4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction to Cryptography and Cryptocurrencies – Introduction to cryptographic hash functions; Hash pointers and data structures; Digital signatures; Public keys as identities; A simple cryptocurrency.	3
2.	Bitcoin	How Bitcoin achieves decentralization; Distributed consensus; Consensus without identity using Blockchain; Incentives and Proof of Work (PoW); Attacks on PoW; Advantages and Limitations of PoW; Bitcoin – NG.	3
3.	Mechanics of Bitcoin	Bitcoin transactions; Bitcoin scripts; Applications of Bitcoin scripts; Bitcoin blocks; Bitcoin network; Limitations and improvements;	4
4.	Storing and Using Bitcoins	Simple local storage; Hot and cold storage; Splitting and Sharing Keys; Online wallets and exchanges; Payment services; Transaction Fee; Currency Exchange Markets;	4

5.	Bitcoin as platform	Bitcoin as append only log; Bitcoin as smart property; Secure Multi-party lotteries in Bitcoin; Bitcoin as public randomness source; Prediction markets and real-world data feeds.	5
6.	Bitcoin Mining	The task of Bitcoin miners; Mining Hardware; Energy consumption and Ecology; Mining pools; Mining Incentives and strategies.	4
7.	Community, Politics, and Regulations	Consensus in Bitcoin; Bitcoin software; Stakeholders; Roots of Bitcoin; Governments and Bitcoin; Anti-money laundering; Regulation; New York's Bitcoin License proposal;	4
8.	Bitcoin and Anonymity	Anonymity basics; De-Anonymizing Bitcoin; Mixing – Decentralized Mixing; Zero coin and Zero hash.	4
9.	Alternative mining puzzles	Essential puzzle requirements; ASIC- resistant puzzles; Proof of Useful Work; Non-out-sourceable puzzles; Proof of Stake and virtual mining.	4
10.	Altcoins and the Cryptocurrency ecosystem	Creating a Cryptocurrency – Solidity basics; Meta mask framework; Remix IDE; Ethereum. Altcoins history and motivation; Few Altcoins in detail Dogecoin, ADA Cardano, tether, Stellar, and Monero Ethereum; Relation between Bitcoin and Altcoin; Merge mining; Atomic cross-chain swaps; Bitcoin backed Altcoins; Ethereum and Smart contracts;	7
		Total number of Lectures	42

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25 (Attendance (5), PBL mode (10), Quizzes (10))
Total	**100**

Project-based learning: Each student works on a different case study in tutorials and Assignments. They utilize the concepts taught in the lecture and develop projects in a group of 2-3.

The course emphasized on the skill development for employability in the software industry by engaging students on real-life projects based on Cryptocurrency. Various activities are carried out to enhance the student's skills and real-life problem-solving using Cryptocurrency. Some of them are the study and application of distributed computing in various domains such as transportation, education, energy trading, etc.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Books:

1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
2.	Antonopoulos, Andreas M. "Mastering Bitcoin: unlocking digital cryptocurrencies", O'Reilly Media, Inc., 2014.

3.	Dannen, Chris. "Introducing Ethereum and Solidity", Berkeley: Apress, 2017.
4.	Prusty, Narayan. "Building Blockchain Projects", Packt Publishing Ltd, 2017.
Reference Books:	
5.	S Nakamoto, "Bitcoin: A peer-to-peer cash system", 2009. https://bitcoin.org/bitcoin.pdf
6.	Conti, Mauro, Sandeep Kumar, Chhagan Lal, and Sushmita Ruj. "A survey on security and privacy issues of bitcoin." IEEE Communications Surveys & Tutorials (2018).
7.	Khalilov, Merve Can Kus, and Albert Levi. "A Survey on Anonymity and Privacy in Bitcoin-like Digital Cash Systems." IEEE Communications Surveys & Tutorials (2018).

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS420	**Semester Even (specify Odd/Even)**	**Semester:VIIIth Session** 2021 -2022 **Month : January to May**
Course Name	Software Construction using Microservices & Kubernetes		
Credits	**4**	**Contact Hours**	**4**

Faculty (Names)	**Coordinator(s)**	Dr. Anubhuti
	Teacher(s) (Alphabetically)	Dr. Anubhuti

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-6.1	To design the complete delivery pipeline using DevOps practices.	Understand level (Level 2)
C434-6.2	Understanding monolithic and microservices architecture, and different microservice technologies	Understand Level (Level2)
C434-6.3	To design different microservices using REST architecture, domain drivers and design patterns	Apply Level (Level3)
C434-6.4	Creating security and test strategies for microservices using access tokens and test principles	Create level (Level 6)
C434-6.5	Understanding Kubernetes containerization concepts through kubectl commands and pod concepts	Understand level (level2)
C434-6.6	Creating an application deployment infrastructure by using kubernetes controllers and load balancers	Create level 6 (Level3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to DevOps	Why DevOps, DevOps Stages, Continuos Integration (CI), Continuos Delivery (CD) and Continuons Deployment (CDep), Continuos monitoring, DevOps Tool support.	6
2.	Jenkins and CI/CD pipeline	Introduction to Jenkins (With Architecture) Jenkins Management Adding a slave node to Jenkins Building Delivery Pipeline	6

3.	Why microservices	Monolithic architecture, microservices architecture, service-oriented architecture (SOA), REST architecture, Inter process Communication, microservice transaction management	6
4.	Microservices Design	Microservices design patterns, domain driver design, designing small microservices, designing independent microservices,	6
5.	Microservices security and testing	Importance of security in microservices, microservices security principles and techniques, access tokens, testing strategy for microservices, testing at different levels for microservices	6
6.	Kubernetes fundamentals	Kubernetes core concepts, kubectl commands, Pods concepts, configuring cluster nodes	6
7.	Kubernetes implementation	Kubernetes services and controllers, load balancing and deployment, configuring kubernetes scheduler, deploying an application using dashboard	6
		Total number of Lectures	42

Evaluation Criteria

T1:20

T2:20

T3:35

TA: 25 (Attendance, quizzes, assignments, demonstration)

Total 100

Project based learning: Each student in a group of 4-5 will select an application and will create the entire DevOps process. They will learn to work with tools and technologies such as Docker, Git, Kubernetes, Microservices and Jenkins. DevOps is currently all the rage and the demand for DevOps engineers are high. With a lot of companies focusing on reducing the operational time and costs, DevOps has become an important factor. Working on the project enhances the student's knowledge on of new world data applications and helps in enhancing their employability into related sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Davis, Jennifer.Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale. OriellyPublication. 1st edition. 2016
2.	Gene, Kim. The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win. IT Revolution USA. 3rd edition. 2016
3.	Newman, Sam. Building Microservices: Designing Fine-Grained Systems. OOrielly Publication. 1st edition. 2016

4.	Baier Jonathan. The complete kubernetes guide. Packt publishing house, Ist edition. 2019

Detailed Syllabus
Lecture-wise Breakup

Subject Code	22B12CS422	**Semester: Even**	**Semester** VIII **Session** 2021 -2022 **Month from:** Feb 2022 to June 2022
Subject Name	Cloud computing essentials: Azure and AWS		
Credits	**3**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Deepti (J62), Dr. Shilpa Budhkar (J128)
	Teacher(s) (Alphabetically)	Deepti, Dr. Shilpa Budhkar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-7.1	Examine the fundamentals of Cloud Computing, its applicability and architecture.	Understand (level 2)
C434-7.2	Examine the architecture and services of AWS (Amazon Web Services) cloud platform.	Analyze (level 4)
C434-7.3	Examine the architecture and services of Azure cloud platform.	Analyze (level 4)
C434-7.4	Examine the architecture and services of Google Cloud platform.	Analyze (level 4)
C434-7.5	Develop the applications using appropriate cloud platforms.	Apply (level 3)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Overview of Cloud Computing	Origin of Cloud Computing, Benefits and challenges, Parallel and distributed computing, Grids and HPCs, Data center design and management for clouds, Virtualization: Why virtualization, Benefits and shortcomings, comparison with cloud, Software Defined Networks and Storage (SDN and SDS) Cloud Computing Architecture: IaaS, PaaS, SaaS, Types of cloud, Interoperability and its challenges, Cloud security, stability and fault tolerance methods and challenges, Applications for cloud, Clouds for different applications, Service Level Agreements, Concurrent, high-throughput and data intensive computing	10

2.	AWS Essentials	Introduction to Amazon Web Services, EC2: Compute services, Networking, infrastructure and reliability, Storage and database services, Amazon Elastic Block Store (Amazon EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Relational Database Service (Amazon RDS), Amazon virtual private cloud (VPC), Identity and Access Management (IAM) and Security on AWS.	8
3.	Azure Essentials	Azure core concepts, Azure services, Describe core solutions and management tools on Azure, Describe general security and network security features, Describe identity, governance, privacy, and compliance features, Describe Azure cost management and service level agreements.	8
4.	GCP Essentials	Google Cloud Fundamentals: Core Infrastructure-Google App Engine, Google Compute Engine, Google Kubernetes Engine, Google Cloud Storage, Google Cloud SQL, and BigQuery. Google Cloud Resource Manager hierarchy and Google Cloud Identity and Access Management , Essential Google Cloud Infrastructure: Foundation, Essential Google Cloud Infrastructure: Core Services, Elastic Google Cloud Infrastructure: Scaling and Automation, Reliable Google Cloud Infrastructure: Design and Process	8
5.	Recent trends, Cloud Platforms Comparison & Project based learning	Serverless computing, Microservices, Usage of containers and Dockers, Kubernetes, Comparing the services and efficiency of AWS, Azure and GCP with respect to resource management. Discussing and Implementing a few web applications and system applications on the cloud platforms under different resource management scenarios. Analyzing and evaluating the platforms based on various parameters like security, load balancing, fault tolerance, resilience, cost-effectiveness, etc.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance (10), Mini-Project (5), Tutorial (5) Quiz (5))
Total	**100**

Project based learning: Groups of 2-3 students will choose a project topic. They will use the concepts of cloud technology to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way. The knowledge gained will enhance their employability in the IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

	Text Books
1.	Cloud computing: principles and paradigms by Buyya, Raj kumar | Broberg, James Goscinski, Andrzej.
2.	Web applications on azure by Reagan, Rob.
3.	Building applications in the cloud: concepts, patterns, and projects

4.	Learning Amazon web services (AWS): a hands-on guide to the fundamentals of AWS cloud by Wilkins, Mark.
	Reference Books
1	Cloud computing bible by Sosinsky, Barrie | Shukla,G.D.
2.	Developing applications for the cloud: on the microsoft windows azure platform by Betts, Dominic | Densmore, scott | Dunn, Ryan
3	Cloud application architectures by Reese, George | Hill, Hattie.
4	Cloud data design orchestration, and management using Microsoft Azure by Diaz, Francesco.
5	https://docs.microsoft.com/en-us/learn/certifications/azure-fundamentals/