Course Description

Course Code	15B19CI891	Semester Even (specify Odd/Even)	Semester VIII Session 2023 -2024 Month from Janto May 2024
Course Name	**Major Project Part – 2 (CSE)**		
Credits	8	**Contact Hours**	…

Faculty (Names)	Coordinator(s)	Prashant Kaushik, Dr. Himani Bansal
	Teacher(s) (Alphabetically)	Entire Department

COURSE OUTCOMES		COGNITIVE LEVELS
C451.1	**Summarize** the contemporary literature&tools for hands-on in the respective project area	Understand Level (Level 2)
C451.2	**Develop** a working model for the identified problem	Apply Level (Level 3)
C451.3	**Analyze** the specific requirements to develop the workable solution for the **identified** computing problem	Analyze Level (Level 4)
C451.4	**Evaluate** the developed solution using test cases and performances	Evaluate Level (Level 5)
C451.5	**Create** and **report** the results of the project in writtenformats	Create Level (Level 6)

Module No.	Title of the Module	List of Experiments	CO
1.	…	…	…
2.	…	…	…
...	…	…	…
n.	…	…	…

Evaluation Criteria

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

Project based learning: Each student in a group of 2-3 will have to develop a Major Project based on different real-world problems using any open-source programming language. Students have to study the state-of-the-art methods before finalizing the objectives. Project development will enhance the knowledge and employability of the students in IT sector.

Syllabus

Course Code	15B1NHS832	Semester Even (specify Odd/Even)	Semester VIII Session 2023-24 Month from Jan - June
Course Name	International Studies		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Ila Joshi (62), Dr Gaurika Chugh (128)
	Teacher(s) (Alphabetically)	

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C402-8.1	Demonstrate an understanding of the basic concepts and theories in the area of international studies	Understanding (C2)
C402-8.2	Demonstrate an understanding of the contemporary world issues.	Understanding (C2)
C402-8.3	Compare the changes in India's foreign policy in the Cold War era and the post-Cold War era	Applying (C3)
C402-8.4	Analyze the major political developments and events since the 20th century	Analyzing (C4)
C402-8.5	Analyze the working of various international and regional organizations and their influence in international relations.	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Concepts	• Approaches to the Study of International Relations: Idealist, Realist, Neo-Realist Theory • Key Concepts in International Relations: 1) National interest and its instruments, 2) Power: Hard and Soft Power 3) Balance of power and Collective Security	8
2.	An Overview of Twentieth Century International Relations History	• World War I: Causes and Consequences • Fascist / Nazi Ideology • World War II: Causes and Consequences • Diplomacy after World Wars: Old and New	4
3	Cold War Politics	• Origin and Phases of the Cold War • Causes of the End of the Cold War • Non-Alignment Movement (NAM)	6
4	United Nations and World Politics	• League of Nations: Brief Introduction • United Nations and its Organs: Structure and Powers. • Chapter VI: United Nations and Peaceful Settlement of Disputes: Inquiry, Negotiation, Mediation, Conciliation and Arbitration • Chapter VII: United Nations and Collective Security Mechanism (Case study of Korean War).	8

		• United Nations and Reforms	
5.	India's Foreign Policy	• Basic Determinants (Historical, Geo-Political, Economic, Domestic and Strategic) • India - Look East Policy and Act East Policy • India - SAARC, ASEAN • India – QUAD, G20	8
6	Contemporary Global Concerns	• Human Rights • Role of Diaspora • Terrorism • Nuclear Proliferation	8

			Total number of Lectures	42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment/ Class Test/ Quiz)
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.	Appadorai, & Rajan, M. S. (eds.) (1985). *India's Foreign Policy and Relations*. New Delhi: South Asian Publishers.
2.	Baylis, J. & Smith, S. (eds.) (2011). *The Globalization of World Politics: An Introduction to International Relations*. Fifth Edition. Oxford: Oxford University Press,
3.	Calvocoressi, P. (2001). *World Politics: 1945—2000*. Essex: Pearson
4.	Carr, E.H. (2004). *International Relations between the Two World Wars: 1919-1939*. New York: Palgrave
5.	Chatterjee. A (2018). *International Relations Today*. Noida: Pearson
6.	Ganguly, S. (ed.) (2019). *India's Foreign Policy: Retrospect and Prospect*. New Delhi: Oxford University Press
7.	Goldstein, J. and Pevehouse, J.C. (2009). *International Relations*. New Delhi: Pearson
8.	Hobsbawm, E. (1995). *Age of Extreme: The Short Twentieth Century, 1914—1991*. London: Abacus
9.	Mewmillians, W.C. and Piotrowski, H. (2001). *The World Since 1945: A History of International Relations*. Fifth edition. London: Lynne Rienner Publishers.
10.	Pant, H.V. (2009). *India's Foreign Policy in the Unipolar World.* Delhi: Routledge

CO-PO-PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	BT PSO 1	BT PSO 2	BT PSO 3
C402-8.1						3			2			2			
C402-8.2						3			2			2			
C402-8.3						3			2			2			
C402-8.4						3			2			2			
C402-8.5						3			2			2			
Avg.						3			2			2			

Course Code	**16B1NHS831**	**Semester: EVEN** (specify Odd/Even)	**Semester: VIII Session** 2023 -2024 **Month: JAN 2024 –JUNE 2024**
Course Name	Gender Studies		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Prof Alka Sharma
	Teacher(s) (Alphabetically)	Prof Alka Sharma
		Shikha Kumari

COURSE OUTCOMES		COGNITIVE LEVELS
C401-19.1	Demonstrate knowledge of the construct of gender and the way itintersects with other social and cultural identities ofrace, class, ethnicity andsexuality	Understand(C2)
C401 - 19.2	Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity andmasculinity	Apply (C3)
C401- 19.3	Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women''s lives	Analyze (C4)
C401-19.4	Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporarysettings	Evaluate (C5)
C401- 19.5	Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	**Introducing Gender Issues**	• Sex andGender • Types ofGender • Gender Roles • Gender Division ofLabor • Gender Stereotyping and GenderDiscrimination	9
2.	**Gender Perspectives of Body & Language**	• Biological, Phenomenological and Socio-Cultural Perspectives ofbody • Body as a Site and Articulation of PowerRelations • Cultural Meaning of Female Body andWomen''s Lived Experiences • The Other andObjectification	6
3.	**Social Construction of Femininity &Feminism**	• Bio-Social Perspective ofGender • Gender as AttributionalFact • Feminine &Feminist • Major Theorists of Feminism Challenging Cultural Notions of Femininity • Feminism Today: Radical, Liberal, Socialist, Cultural, Eco feminism & Cyberfeminism • Images of Women in Sports, Arts, Entertainment, Media and Fashion Industry ;Cultural Feminism&	9

		Celebrating Womanhood • Analysis of role women have played acrosscultures	
4.	**Social Construction of Masculinity**	• Definition and Understanding ofMasculinities • Sociology of Masculinity& itsTypes • Social Organization of Masculinity and Privileged Position ofMasculinity • Politics of Masculinity andPower • Major Theorists ofMasculinity • Masculine Identities in Literature, Cinema & Media.	9
5.	**Gender Sensitization Empowerment &Gender Inclusivity**	• Women & Women Rights InIndia • From Women's Studies to Gender Studies:A ParadigmShift • Gender Sensitization & Gender Inclusivity • Gender Studies & Media: Creating NewParadigms in Gender &Culture	9
		Total number of Lectures	**42**

Evaluation Criteria

Components	MaximumMarks
T1	20
T2	20
EndSemesterExamination	35
TA	25 (Project/ Assignment)
Total	**100**

==Students will be given a project on the construction of gender and how does the major institution of the society have shaped their gender.==

	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 K., et al, "*Handbook of Gender and Women's Studies*. London: Sage. (2006)
2	Helgeson, Vicki S., "*The Psychology of Gender",* Pearson(2012)
3	Friedan B., "*The Feminine Mystique"*, Penguin. (1971/1992)
4	DebeauvoirS. , "*The Second Sex"*, Vintage (1953/1997)
5	Wharton Amy S., "*The Sociology of Gender: An Introduction to Theory & Research*", Wiley-Blackwell (2005)
6	Pachauri G.," *Gender, School & Society*", R.Lall Publishers(2013)
7	Connell R.W, "*Masculinities*", Cambridge: Polity. (1985)
8	MacInnes J., "The *End of Masculinity"*. Buckingham: Open University Press. (1998)
9	Kaul A.& Singh M., *"New Paradigms for Gender Inclusivity*", PHI Pvt Ltd (2012)

Optimization Techniques (16B1NMA831)

Simplex method and variants, game theory, queuing models, inventory models, network scheduling, CPM and PERT, sequencing problems, discrete and continuous dynamic programming, nonlinear programming problems-numerical methods.

Course Description

Course Code	16B1NMA831	Semester Even	Semester VIII Session 2023-2024
			Month from Jan 2024 to June 2024
Course Name	Optimization Techniques		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Ram Surat Chauhan	
	Teacher(s) (Alphabetically)	Dr. Ram Surat Chauhan	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C402-2.1	explain the basics of linear, dynamic and non-linear programming.	Understanding (C2)
C402-2.2	apply optimization techniques to solve problems related to linear programming, game theory, queuing and inventory models.	Applying (C3)
C402-2.3	analyze the problems related to dynamic programming, sensitivity analysis, sequencing and scheduling.	Analyzing (C4)
C402-2.4	determine numerical solutions of one dimensional and multidimensional nonlinear problems.	Evaluating (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 method, simplex method and its variants, revised simplex method, Duality theory, dual simplex method, sensitivity analysis.	08
2.	Game Theory	Rectangular Games, Minmax Theorem, Graphical Solution of 2×n, 3×n, m×2, m×3 and m×n Games, Solution of games using LPP technique.	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 waiting space. Inventory Models: Deterministic and Probabilistic models.	08
4.	Sequencing & Scheduling	Processing of Jobs through Machines: Processing of n jobs through two machines, two jobs through m machines and n jobs through m machines. Project Scheduling: Network diagram, Critical Path Method (CPM), Project Evaluation and Review Technique (PERT).	07

5.	Dynamic Programming	Discrete and Continuous Dynamic Programming: Bellman's principle of optimality, linear and nonlinear dynamic programming problems, Simple Illustrations.	06
6.	Nonlinear Programming	Unimodal function, One Dimensional minimization problem: Newton's method, Golden section method, Fibonacci search method, Bisection method. Multidimensional minimization problem: Steepest descent method, Multidimensional Newton's method.	07
		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 collect literature on dynamic programming to solve some practical problems. To make the subject application based, the students analyze the optimized way to deal with aforementioned topic.

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.

CO-PO-PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C402-2.1	2	2	2	1								2		
C402-2.2	3	3	2	1								2		
C402-2.3	3	3	3	2					1			2		
C402-6.4	**3**	**3**	**3**	**2**								**2**		
Avg.	**2.75**	**2.75**	**2.50**	**1.5**					**1.00**			**2.00**		

Detailed Syllabus

Course Code	16B1NPH634	Semester: Even	Semester: VI Session: 2023-24
			From: January 2024 to June 2024

Course Name	Applied Statistical Mechanics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Indrani Chakraborty
	Teacher(s) (Alphabetically)	Dr. Indrani Chakraborty

COURSE OUTCOMES After completion of the course, students will be able to:		COGNITIVE LEVELS
C302-9.1	Define the fundamental parameters of Thermodynamics and Statistical Mechanics.	Remember Level (Level 1)
C302-9.2	Explain the Thermodynamic potentials, Maxwell's equations and Heat equations.	Understand Level (Level 2)
C302-9.3	Apply the concepts of thermodynamics and statistical ensembles to understand the phase space and distribution functions.	Apply Level (Level 3)
C302-9.4	Determine the distribution functions in case of various types of physical and chemical ensembles.	Analyze Level (Level 4)
C302-9.5	Evaluate the ideas of Entropy with respect to Probability and Information Theory; and conclude Liouville's equation.	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Thermodynamics	Overview of basic laws of Thermodynamics; Microscopic and macroscopic parameters, Thermodynamic potentials; Introduction to equilibrium and non-equilibrium systems and related problems; Entropy and probability;	3
2.	Statistical Ensembles	Concept of Statistical ensembles, Density of States; Micro canonical, Canonical, Grand-canonical ensembles	5
3.	Distribution functions	Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac and their applications	6
4.	Non-equilibrium systems	Liouville's equation, von Neumann equation; Random walk, Stochastic methods;	6
5	Modeling and Simulations	Ising model and its applications, Molecular dynamics, Monte-Carlo simulations and Multi-scale modeling for materials properties and engineering applications.	15
6	Applications	Applications of ensemble formalism in dynamics of neural networks, ensemble forecasting of weather, propagation of uncertainty over time, regression analysis of gravitational orbits etc.,	5
		Total number of Lectures	40

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [Quiz (06), PBL (10), Attendance (05), Teacher's assessment (04)]
Total	**100**

Program Outcomes/ Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C302-9.1	3	3										1		
C302-9.2	3	3										1		
C302-9.3	3	3										1		
C302-9.4	3	3										1		
C302-9.5	3	3										1		
C302-9	3.00	3.00										1.00		

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.	Frederick Reif , *Fundamentals of Statistical and Thermal Physics*, Waveland Pr Inc, 2008.
2.	Kerson Huang , *Statistical Mechanics*, Wiley, 2nd Ed., 1987.
3.	R K Pathria, Paul D. Beale, *Statistical Mechanics*, Academic Press, 3rd Ed., 2011.
4.	Daniel V. Schroeder, *An Introduction to Thermal Physics*, Addison-Wesley, 1st Ed., 1999
5.	L D Landau, *Statistical Physics, Part 1: Volume 5 (Course of Theoretical Physics)*, Butterworth-Heinemann, 3rd Ed., 1980

Project Based earning:	Students will be suggested to choose their PBL topics from the structured syllabus, so that they can have basic knowledge of the subject and they can be familiar with the applications of the subject. Freedom will be given to the students for choosing the PBL topics, which will be approved by the instructor finally.

CO-PO MAPPING:

3: Strongly Related   2: Moderately Related   1: Weakly related   Left Blank: Not related

Employability: The course mainly focuses on the basic learning and applications of statistical mechanics in different spheres of Physics as well as beyond the scope of Physics.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17M11CS122	Semester: Even (specify Odd/Even)	Semester II Session 2023-2024 Month from Jan'24 to June'24
Subject Name	Performance Evaluation of Computing Systems		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Kavita Pandey
	Teacher(s) (Alphabetically)	Dr. Kavita Pandey

COURSE OUTCOMES		COGNITIVE LEVELS
C114.1	Outline the correct tools and techniques for computer system performance evaluation.	Understand (level 2)
C114.2	Identify the probability distribution in data reflecting system randomness.	Apply (level 3)
C114.3	Apply stochastic processes in various real-world problems.	Apply (level 3)
C114.4	Inspect the mathematical modeling techniques for analyzing any given system.	Analyze (level 4)
C114.5	Select the appropriate experiments and perform a simulation study of the given system.	Evaluate (level 5)

Module No.	Title of the Module	Topics in the module	No. of Lectures for the module
1.	Overview of Performance Evaluation	Need for Performance Evaluation, Systematic approach to Performance Evaluation, Selection of evaluation techniques and performance metrics	5
2.	Random Variables and Probability distributions	Discrete and continuous random variable, Expectation and variance, Bernoulli random variable, Binomial distribution, Poisson distribution, Geometric distribution, Normal and Exponential distribution, Normal approximation and Poisson approximation to binomial distribution, hazard rate function, , Comparing systems using sample data, Confidence interval	10
3.	Markov Process	Introduction and classification of stochastic processes, Discrete time and Continuous time markov chains, Birth and death processes , Transition probabilities, Steady state solution, Performance measure in terms of time spent and expected reward	6
4.	Queuing models	Basics of Queuing theory, Kendall notation, Little's Law, Analysis of a single queue with one server and multiple servers, Analysis of finite buffers queuing systems	8

5.	Simulation modeling	Introduction to simulation, Types of simulation, Random number generation, a survey of random number generators, seed selection, testing random number generators, random variate generation	6
6.	Measurement techniques and tools	The art of data presentation, Ratio Games	2
7.	Experimental design and analysis	Types of Experimental designs, 2^2 factorial designs, General 2^K factorial designs, 2^{K-p} fractional factorial designs	5
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Attendance (10 Marks), Assignments / Quiz / Mini project (15 Marks)	
Total	**100**	

Project based Learning: Each student in a group of 2-3, study the research papers related to experimental designs and present their summary in the form of report. To make it application based, students select the recent articles which is applied on various contemporary domains. Understanding the research papers gives them the knowledge about applicability of experimental designs in identifying the important factors, their variations, etc.

Recommended Text books:

1.	Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley, Reprint Edition, © 2014.
2.	K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd Edition, Reprint Edition, © 2018.

Recommended Reference books:

1.	Ross, Sheldon M. "A First Course in Probability". Upper Saddle River, N.J.: Pearson Prentice Hall, 10th Edition, ©2019
2.	Obaidat, Boudriga, "*Fundamentals of Performance Evaluation of Computer and Telecommunication Systems* ", 2010, Wiley, ISBN 978-0-471-26983
3.	Ross, Sheldon M. "Introduction to Probability Models". Amsterdam: Academic Press, 12th Edition, ©2019
4.	Fortier, Michel, "Computer Systems Performance Evaluation and Prediction", 2003, Elsevier, ISBN 1-55558-260-5

Detailed Syllabus
Lab-wise Breakup

Course Code	17M15CS121	Semester Even 2024	Semester M.Tech CSE(2nd)
			Session 2023-24
			Month from Jan to June, 2024

Course Name	Cloud and Web Services Software Engineering

Credits	3-0-0	Contact Hours	3 Hours

Faculty (Names)	Coordinator(s)	Dr Sulabh Tyagi
	Teacher(s) (Alphabetically)	Dr. Sulabh Tyagi

COURSE OUTCOMES		COGNITIVE LEVELS
C113.1	Demonstrate role of Software engineering in combining cloud and web services computing paradigms for service development	Understand (level 2)
C113.2	Categorize various cloud services into compute, storage, database, application, analytics, network, and deployment.	Understand (level 2)
C113.3	Analyze the requirements for developing and migrating applications to Web and Cloud Services	Analyze (level 4)
C113.4	Evaluate different design patterns, reference architectures performance metrics, testing for Cloud and Web Services	Evaluate (level 5)
C113.5	Make use of web & cloud services and service engineering process to design, implement, and test, deploy and execute services.	Create Level (level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Distributed Software Engineering	Software Engineering Meets Services and Cloud Computing, Distributed Systems, Models of Interaction, Client and Server Computing, Architectural Patterns for distributed systems, Software as Service.	3
2.	Service-oriented software engineering	Service-Oriented Computing, Service-Oriented Architecture (SOA), Service Engineering and Service Composition	4
3.	Modelling Service Composition	Business Process Modeling Notation (BPMN), block-structured process execution languages, including BPML and BPEL, Modelling tools like Bizagi,BPMN.io etc	5
4.	Introduction Web to Services	Brief of Web Services, Service Oriented Architectures, Core Functionality- SOAP, WSDL,UDDI, Microservices Architecture	4
5.	Designing and Implementing Services	Web Service Development Life Cycle, SOAP, Restful Services, Microservices – Domian Driven Design, Implementation, Deployment and Testing of Services	4

6.	Address SE in Web services	Web Services Design Pattern, Metrics to Measure Web Service Performance.	3
7.	Introduction to Cloud Services	Cloud Services, Cloud Deployment Models, Cloud Technologies and Open Source Software, Challenges - Scaling Computation, Scaling Storage, Multi-Tenancy, Availability, Limitations and Challenges in Cloud-Based Applications Development	3
8.	Cloud Services from Amazon	IAM services-users, groups, policy and roles, Elastic Compute Cloud, Databases on Amazon, Storage on Amazon services,	6
9.	Migrate, Secure and Consume Services	Migration of Application to Web or Cloud Service, Enabling SSL authentication and authorization, consuming services using another service or application.	4
10.	Address SE in Cloud services	Cloud Services Design Pattern, Metrics to Measure Cloud Service Availability, elasticity, Scalability, Load balancing, Auto scaling. Performance, Cloud Service Automation	6
		Total number of Lectures	**42**

Evaluation Criteria

Components Maximum Marks
T1 20
T2 20
End Semester Examination 35
TA 25
Attendance = 05
Internal assessment & Assignments in PBL mode = 20
(A Macro Assignment is given which will make the student conversant in design, creation and implementation of an application using Web Services and Cloud Services. This will make them industry ready in applying web and cloud services)

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.	Mahmood Z, Saeed S (eds) (2013) Software Engineering Frameworks for the Cloud Computing Paradigm. Springer-Verlag, London
2.	Cloud Computing: A Hands-On Approach Book by Arshdeep Bahga and Vijay K. Madisetti, December 2013 CreateSpace Independent Publishing Platform7290 Investment Drive # B North Charleston SC United States
3.	Cloud Computing Design Patterns Book by Amin Naserpour, Robert Cope, and Thomas Erl, June 2015, Prentice Hall Press One Lake Street Upper Saddle River, NJ United States
4.	Software Engineering Book by Ian Sommerville Apil 2015, Pearson
5.	Amazon Web Services for Mobile Developers: Building Apps with AWS October 2017, Abhishek Mishra, SYBEX Inc. 2021 Challenger Drive Alameda, CA United States
6.	Web Services, Service-Oriented Architectures, and Cloud Computing, Second Edition: The Savvy Manager's GuideJanuary 2013, Douglas K. Barry, Morgan Kaufmann Publishers Inc. 340 Pine Street, Sixth Floor San Francisco CA United States
Reference Books	
7.	XML, Web Services, and the Data Revolution Book by Frank P. Coyle , March 2002, Addison-WesleyLongman Publishing Co., Inc.75 Arlington Street, Suite 300 Boston, MA,United State
8.	Design Patterns: Elements of Reusable Object-Oriented Software with Applying UML and Patterns: AnIntroduction to Object-Oriented Analysis and Design and the Unified Process by Erich Gamma, RichardHelm, Ralph Johnson, and John Vlissides, 2003
9.	Cloud Computing and Software Services Theory and Techniques Syed A hson and Dr. Mohammad Ilyas July 2010, CRC Press, Inc. Subs. of Times Mirror 2000 Corporate Blvd. NW Boca Raton, FL, United State

Programme Outcomes: M.Tech (CSE)

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

Programme Specific Outcomes: M.Tech (CSE)

PSO 1: Students should be able to develop and implement the solution of real life computing problems using contemporary technologies.

PSO 2: Students should be able to apply ethical principles and commit to professional and social responsibilities.

COs	PO 1	PO 2	PO 3	PSO1	PSO2
C113.1			2	3	1
C113.2	2	3	3	3	1
C113.3			2	2	
C113.4	3	3	3	3	1
C113.5	3	3	3	3	1
AVG.	2.7	3	2.6	2.8	1

1. CO-PO and CO-PSO Mapping (M. Tech- CSE) II sem:

COs	PO 1	PO 2	PO 3	PSO1	PSO2
C113.1			2 Analysis of Cloud Architecture and its association with service computing	3 Understanding of Virtualization Technology	1 API creation and its fair and ethical usage is demonstrated
C113.2	2 Basic principles and architectures of Service computing is demonstrated	3 Various Cloud Service types and deployment models are demonstrated	3 Various Virtualization techniques in Cloud Model are demonstrated	3 Designing and implementing various cloud solutions	1 Analysis of ethical policies related to privacy and fair usage of cloud
C113.3			2 Analysis of instances on AWS, Elastic Compute Cloud (EC2) etc.	2 Analysis of Simple Storage Service (S3)	
C113.4	3 Role of micro services in cloud computing	3 Evaluation of Services oriented architectures viz. SOSP, WSDL, UDDI	3 .Performance evaluation of microservices architecture	3 Performance Evaluation of services design patterns.	1 Analysis of different web services metrics.
C113.5	3 Creation of AWS,Elastic Compute Cloud (EC2) features	3 Creation of AWS storages and their features, namely, Simple Storage Service (S3),	3 Development of instances on AWS, EC2, storage and other services	3 Creation of micro services and its deployment over containers	1 Analysis of Docker architecture, and its secure deployment.
AVG.	2.7	3	2.6	2.8	1

Module Coordinator: Course Coordinator: Dr. Sulabh Tyagi

Course Code	18B12PH812	Semester: Even	Semester: 8, Session : 2023 -2024 Month from: January to June
Course Name	Astrophysics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Prof. Anirban Pathak
	Teacher(s) (Alphabetically)	Anirban Pathak

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units	Remembering (C1)
CO2	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)
CO3	Apply mathematical principles and laws of physics to solve problems related to astrophysical systems	Applying (C3)
CO4	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	6

		related to big bang, cosmological constants, dark matter and dark energy.	
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

        (a) Quizes /class tests (06 M),
        (b) Attendance (05 M)
        (c) Internal Assessment (04)
        (d) Assignments in PBL mode (10 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.	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, Baidyanath Basu, 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.

Project based learning: 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.**

Subject Code	19M13HS111	Semester: Even	Semester: M.Tech II & Dual degree VIIISession 2023-24 Month from January to May 2024
Subject Name	**English Language Skills for Research Paper Writing**		
Credits	2	Contact Hours	2-0-0
Faculty (Names)	Coordinator(s)	Dr. Ekta Singh	
	Teacher(s) (Alphabetically)	Dr. Ekta Singh	

Course Outcomes:

At the completion of the course, students will be able to,

COURSE OUTCOMES		COGNITIVE LEVELS
C204.1	Demonstrate an understanding of all the aspects of grammar and language needed to write a paper.	Understand Level (C2)
C204.2	Apply grammatical knowledge & concepts in writing and presentation.	Apply level (C3)
C204.3	Examine each section of a paper after careful analysis of Literature Review.	Analyze Level (C4)
C204.4	Determine the skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion.	Evaluate Level (C5)
C204.5	Compile all the information into a refined research paper after editing and proofreading	Create Level (C6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures and Tutorials for the module
1.	Grammar & Usage	Structure of English Language Voice, Aspect & Tense SVOCA Sense & Sense Relations in English Enhancing Vocabulary Connotation, Denotation & Collocation	6
2.	Elements of Paper Writing	Planning & Preparation Word Order Breaking Long Sentences Structuring Paragraphs Being Concise and Removing Redundancy Avoiding Ambiguity and Vagueness	4
3.	Paraphrasing & Writing	Highlighting Your Findings Hedging and Criticising Paraphrasing and Plagiarism Sections of a Paper Abstracts; Introduction	6
4.	Process of Writing	Review of Literature Methods Results Discussion	4

		Conclusion The Final Check	
5.	Key Skills Needed	Key skills needed when writing a Title Key skills needed whenWriting an Abstract Key skills needed when writing an Introduction Key skills needed when writing a Review of the Literature Key skills needed when writing Methods & Results Key skills needed when writing Discussion & Conclusion	**4**
6.	Refining the Paper	Incorporating useful phrases Editing Proofreading References Annexures Ensuring good quality in submission	**4**
		Total number of Lectures and Tutorials	**28**

Evaluation Criteria

Components	MaximumMarks
Mid Term	30
End Semester Examination	40
TA	30 (Project, Assignment/ Class Test/ Quiz, Class Participation)
Total	**100**

PBL: The students in groups of 6-7 will identify a topic of their choice and write a self-edited research paper with all the essential components such as title, abstract and introduction, methods, discussion, results and conclusion in it.

Recommended Reading material:	
1.	Goldbort R. 'Writing for Science', Yale University Press (available on Google Books), 2006
2.	Day R. 'How to Write and Publish a Scientific Paper', Cambridge University Press, 2006
3.	Adrian Wallwork. 'English for Writing Research Papers', Springer, New York, Dordrecht Heidelberg, London, 2011
4.	Yadugari M.A. ' Making Sense of English: A Textbook of Sounds, Words & Grammar' Viva Books Private Limited, New Delhi, 2013, Revised Edition
5.	Strauss Jane. 'The Blue Book of Grammar and Punctuation, Josseybass, Wiley, San Francisco, 1999.
6.	Rizvi, A. R. 'Effective Technical Communication' 2nd edition, McGraw Hill Education Private Limited, Chennai, 2018
7.	Eckert, K. 'Writing Academic Paper in English:Graduate and Postgraduate Level', Moldy Rutabaga Books, 2017

8	Barros, L.O, 'The Only Academic Phrasebook You'll Ever Need: 600 Examples of Academic Language' Create Space Independent Publishing Platform; 1st edition,2016
9	Wallwork, A. 'English for Writing Research Papers (English for Academic Research)'.Springer; 2nd ed. 2016 edition.
10	Wallace,M&Wray,A. 'Critical Reading and Writing for Postgraduates (Student Success) SAGE Publications Ltd; Third edition, 2016
11	Butler, L. 'Longman Academic Writing Series 1: Sentences to Paragraphs, with Essential Online Resources', Pearson Education ESL; 2nd edition,2016
12	Saramäki, J. 'How to Write a Scientific Paper: An Academic Self-Help Guide for PhD StudentsIndependently published, 2018

Course Code	19M12CS112	Semester EVEN	Session 2023 -2024
		(specify Odd/Even)	Month from Jan to June

Course Name	Meta-Heuristics Modelling and Optimization		

Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Ankita Verma
	Teacher(s) (Alphabetically)	Dr. Ankita Verma

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C131.1	Understand the concepts of Meta-heuristics based optimization and it's utility in a diverse range of applications.	Understand Level (L2)
C131.2	Apply a single solution and population based Meta-heuristic algorithms to solve a given optimization problem.	Apply Level (L3)
C131.3	Apply Meta-heuristic algorithms to solve Multi-objective optimization problems.	Apply Level (L3)
C131.4	Apply hybrid and quantum based Meta-heuristic algorithms to solve a given optimization problem.	Apply Level (L3)
C131.5	Analyze the performance of any Meta-heuristic algorithm for a real world problem.	Analyze Level (L4)

Module No.	Title of the Module	Topics in the Module	CO Mapping	No. of Lectures for the module
1.	Introduction	Optimization Models, Approximate Algorithms, When to use Meta-heuristics?, Methods and Application	CO1	3
2.	Fundamentals of Meta-heuristics	Representation, Objective Functions; Constraint Handling; Parameter Tuning; Performance Analysis.	CO1	3
3.	Single-Solution Based Meta-heuristics	Basic Concepts, Fitness Landscape Analysis; Local Search; Tabu Search; Iterated and Guided Local search;	CO2	6
4.	Population-Based Meta-heuristics Methods	Basic Concepts; Evolutionary Algorithms (Genetic Algorithm, Differential Evolution), Swarm Intelligence: Stochastic diffusion search (Ant Colony Optimization), Social cognitive optimization (Particle Swarm Optimization, GWO)	CO2	8
5.	Meta-heuristics for Multi-objective Optimization	Basic concepts; Multi-objective Continuous and Combinatorial Problems, Multi-criteria Decision Making; Many objectives and large scale optimization, Design Issues.	CO3	5
6.	Fitness Assignment Strategies and	Scalar approach, Criterion-Based Methods; Dominance-Based Approaches; Indicator based Approaches; Diversity Preservation; Performance Evaluation MOPSO, NSGA-2,	CO3, CO5	8

7.	Evaluation of Multi-objective Optimization	NSGA-3, SPEA, SPEA-2		
7.	Hybrid Meta-heuristics	Design and Implementation Issues; Mathematical Programming Approaches; Classical Hybrid Approaches; Hybrid Meta-heuristics with Machine Learning and Data Mining; Hybrid Meta-heuristics for Multi-objective Optimization. Understanding Quantum based multi-objective optimization and its applications.	CO4, CO5	9
		Total number of Lectures		**42**

	Evaluation Criteria	
	Components	**Maximum Marks**
	T1	20
	T2	20
	End Semester Examination	35
	TA	25 (Attendance(10), Assignments/Project (15)
	Total	**100**

Project based learning: Each group of 3-4 students will be assigned an optimization problem at the beginning. They are required to apply the meta-heuristic methods they study on the given problem.

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]	E.-G. Talbi, Meta-heuristics: From design to implementation. Hoboken, New Jersey, USA: John Wiley & Sons, 2009.
[2]	G. Z¨apfel, R. Braune, and M. B¨ogl, Meta-heuristic search concepts: A tutorial with applications to production and logistics. Heidelberg: Springer Science & Business Media, 2010.
[3]	M. Gendreau and J.-Y. Potvin, Handbook of meta-heuristics. New York, USA: Springer, 2010.
[4]	S. Luke, Essentials of Metaheuristics. Lulu, 2013. Available for free at http://cs.gmu.edu/~sean/book/meta-heuristics/.
[5]	C. C. Ribeiro and P. Hansen, Essays and surveys in metaheuristics. New York, USA: Springer Science & Business Media, 2012.
[6]	F. Glover and G. A. Kochenberger, Handbook of metaheuristics. Dordrecht: Kluwer Academic Publishers, 2003.
[7]	I. H. Osman and J. P. Kelly, Meta-heuristics: Theory and applications. Norwell, Massachusetts, USA: Kluwer Academic Publishers, 2012. 41
[8]	S. Voß, S. Martello, I. H. Osman, and C. Roucairol, Meta-heuristics: Advances and trends in local search paradigms for optimization. New York, USA: Springer Science & Business Media, 2012.
[9]	T. F. Gonzalez, Handbook of approximation algorithms and metaheuristics. Boca Raton, FL, USA: CRC Press, 2007.
[10]	J. Dr´eo, A. Petrowski, P. Siarry, and E. Taillard, Metaheuristics for hard optimization: Methods and case studies. Berlin Heidelberg: Springer Science & Business Media, 2006
[11]	P. Siarry and Z. Michalewicz, Advances in metaheuristics for hard optimization. Berlin Heidelberg: Springer Science & Business Media, 2007.
[12]	K. F. Doerner, M. Gendreau, P. Greistorfer, W. Gutjahr, R. F. Hartl, and M. Reimann, Metaheuristics: Progress in complex systems optimization. New York, USA: Springer Science & Business Media, 2007.
[13]	X.-S. Yang, Nature-inspired optimization algorithms. London, UK: Elsevier, 2014.

1. **CO-PO and CO-PSO Mapping:**

COs	PO1	PO2	PO3	PSO 1	PSO2
C131.1	**1** Basic concepts of meta-heurstics are introduced	**1** Explanation of terminologies used in algorithms	**1** Understanding utility of meta-heurtistic algorithms	**1** For applying meta-heuristic, basic terms are explained	
C131.2	**3** Apply algorithms to solve practical problems independently	**2** Understanding algorithm application to write a technical document	**2** Mastery over application of single and population based algorithms	**3** Apply algorithms to real life computing problems independently	**1** Follow the rules of comparing the algorithm's performance
C131.3	**3** Apply algorithms to solve practical problems independently	**2** Understanding algorithm application to write a technical document	**2** Mastery over application of multi-objective algorithms	**3** Apply algorithms to real life computing problems independently	**1** Follow the rules of comparing the algorithm's performance
C131.4	**3** Apply algorithms to solve practical problems independently	**2** Understanding algorithm application to write a technical document	**2** Mastery over application of hybrid and quantum based algorithms	**3** Apply algorithms to real life computing problems independently	**1** Follow the rules of comparing the algorithm's performance
C131.5	**3** Anlayze practical problems and apply suitable algorithms	**2** Analyze algorithm performance write a technical document	**3** Mastery over application of meta-heuristic algorithms by analyzing its performance	**3** Analyze algorithms on real life computing problems	
Avg.					

Programme Outcomes:

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.
PO2: An ability to write and present a substantial technical report/document.
PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

Programme Specific Outcomes: M.Tech (CSE)

PSO 1: Students should be able to develop and implement the solution of real life computing problems using contemporary technologies.
PSO 2: Students should be able to apply ethical principles and commit to professional and social responsibilities.

Multi Attribute Decision Making (20B12MA411)

Basic Steps in Decision Analysis, Decision-Making Environments, Decision Making Under Uncertainty, Decision Making Under Risk, Utility Theory, Decision Tree. GDM Methods, Content-Oriented Methods, and Disadvantages of Non ranked Voting, Preferential Voting System, and Social Choice Functions. Multiattribute Decision Making, Multi Objective Decision Making, Decision Making Process, Structuring Process, Decision Matrix, Attributes, Normalization, Attribute Weight Assignment Methods. Dominance Relation method, Even-Swap method, Lexicographic method Maximax method, Maximin method, Conjunctive method, Disjunctive method, Median Ranking, Analytic Hierarchy Process, Analytic Network Process. Multi Attribute Value Theory, Simple Additive Weighting, Weighted Product, TOPSIS Outranking Methods.

Course Description

Course Code	20B12MA411	Semester- Even	Semester VIII Session 2023 -2024 Month from Jan 2024 to June 2024	
Course Name	Multi Attribute Decision Making			
Credits	3		Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Pankaj Kumar Srivastava and Dr. Dinesh C. S. Bisht		
	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:		
C402-6.1	explain the concepts of decision analysis and decision-making.	Understanding (C2)
C402-6.2	develop the concept of group and multi criteria in decision making problems.	Applying (C3)
C402-6.3	categorize decision making approaches to handle multi attribute problems.	Analyzing (C4)
C402-6.4	estimate value and outranking based methods in decision making problems.	Evaluating (C5)

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	Multiattribute 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 will be divided in a group of 4-5 to collect literature and submit a report on estimation of value and outranking based methods in decision making 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.	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.

CO-PO-PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C402-6.1	2	2	2	1								2		
C402-6.2	3	3	2	1								2		
C402-6.3	3	3	3	3								2		
C402-6.4	**3**	**3**	**3**	**3**					1			**2**		
Avg.	**2.75**	**2.75**	**2.50**	**2.00**					**1.00**			**2.00**		

Course Code	21B12EC413	Semester Even (specify Odd/Even)	Semester 8th Session 2023-24 Month from January-May
Course Name	Solar Engineering		
Credits	3	**Contact Hours**	3L

Faculty (Names)	Coordinator(s)	Nisha

COURSE OUTCOMES		COGNITIVE LEVELS
C402-37.1	Recall the basic concepts of Solar Energy and Global Energy Needs for Solar Engineering	Remembering Level (C1)
C402-37.2	Interpret the Physics of the Sun and Its Energy Transport.	Understanding Level (C2)
C402-37.3	Implement solar thermal and electrical system for performance estimation	Applying Level(C3)
C402-37.4	Differentiate Solar Water-Heating Systems for Commercial/Industrial Applications	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Solar Energy Conversion	Introduction , Environmental Characteristics, Heat transfer concept, Heat Transfer coefficient, Optimization of Heat Losses, Thermal analysis and effect of environment with economic analysis	5
2	Fundamentals of Solar Radiation	The Physics of the Sun and Its Energy Transport, Thermal Radiation Fundamentals, Sun–Earth Geometric Relationship, Extraterrestrial Solar Radiation, Estimation of Terrestrial Solar Radiation, Models Based on Long-Term Measured Horizontal Solar Radiation and Measurement of Solar Radiation	8
3.	Solar Engineering-I: Electrical Aspect	Solar Cell materials, Single crystal solar cell or solar grade, Types of Solar Energy Collectors, Performance of Solar Collectors, Photovoltaic Systems, Design and Modeling of Solar Systems, Solar Energy Analysis	10
4.	Solar Engineering-II: Thermal Aspect	Solar Thermal Power Systems, PVT air/water collectors performance, design and modeling, Thermodynamic Power Cycles, Design of Parabolic Trough–Based Power Plants, Parabolic Dish Systems, Central Receiver Tower Systems	10
5.	Solar Heating Systems and other applications	Solar Water-Heating Systems, Solar Space Heating and Cooling, Industrial Process Heat, Solar Dryers, Solar Desalination Systems, Solar Cooling and Dehumidification and applications of Solar Energy in Electronics and communication engineering Commercial/Industrial Applications	10
		Total number of Lectures	43

Evaluation Criteria

Components   **Maximum Marks**

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Attendance & Quiz)
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.	G.N. Tiwari, Solar Energy : fundamentals, Design, Modelling and applications. Narosa Publishing House, 2016.
2.	Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and applications. Prentice Hall of India, 2015
3.	James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley-IEEE Press, 2012.
4	Juan Bisquert, The Physics of Solar Cell, CRC Press, Taylor & Francis group, 2018

Subject Code	21B12HS411	Semester: EVEN	Semester 2nd Session 2023-24 Month from Jan to June	
Subject Name	**URBAN SOCIOLOGY**			
Credits	3	**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**	Dr Yogita Naruka		
	Teacher(s) (Alphabetically)	Dr Yogita Naruka		

COURSE OUTCOMES		COGNITIVE LEVELS
C401 - 25.1	Understand the concepts and theories of urban sociology	Understanding Level (C2)
C401 – 25.2	Apply and analytical framework to understand the structural characteristics of cities students are residing in	Applying Level (C3)
C401 – 25.3	Analyze the role of agencies and actors in shaping the process of urbanization	Analyse Level (C4)
C401 – 25.4	Evaluate importance of good governance and urban planning	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Urban Sociology	Basic Concepts and terminologies of the urban sociology, Origin of urban societies, Rural-Urban Continuum	2
2.	Theories of Urban Sociology	The classical theories – Simmel, Weber, Tonnies, Louis Wirth, Durkheim & Engels; Ecological Theories – Chicago School, Concentric Zone theory, Sector theory, Multiple Nuclei theory	5
3.	Contemporary Urban Processes	Industrialisation, Colonialism, Class-Conflict theories (Marxism), Neo-liberalism	5
4.	Urbanisation in India	Development of urban sociology in India, Evolution of urban structures, Spatial Structures and Classification of cities	4
5.	Urban Planning	Concept of urban planning – History, need and relevance, Principles of Urban planning, Urban	7

		planning in India – Agencies and Stakeholders, Strategies and techniques of urban planning – Social area analysis, mapping and zoning, role of cooperatives	
6.	Urban Governance	Urban governance – Concept and need, Urban Governance in India, Urban decentralization – agencies and role of local bodies	**4**
7.	Urban Issues in India	Urban Poverty, Informality & Exclusion, Urban Environment Lessons from Pandemic	**4**
8.	Technology and urbanisation	Smart cities, Case studies of smart cities and use of digital technologies in urban	**5**
9.	Sustainable urban Development	Sustainable urban development – concept, need, tenets and strategies Sustainable development goals (SDGs) in relation to urban	**4**
10.	Global perspectives on urban	Neo-liberalism and urban, Globalization and urban, Emergence of megacities	**5**
Total number of Hours			**45**

Evaluation Criteria

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

Project Based Learning: The students would be divided into a group of 4-5. They would be asked to map and discuss the different parts of their cities. The lectures and readings on the process of urbanization and models of urbanization will form the basis for this exercise. Students would be required to critically analyse the urban spaces using sociological perspectives and theories. The students would be needed to make a presentation and also submit a report.

Recommended Reading material:	
1.	Gottdiener, M., Budd, L., &Lehtovuori, P. *Key concepts in urban studies*. Sage. (2015)
2.	Lin Jan and Mele Christopher, ed. *The Urban Sociology Reader*. London: Routledge. (2005)
3.	Rao, M. S. A., ed. *Urban Sociology in India: Reader and Source Book*. New Delhi: Orient Longman. (1974)
4.	Savage, M., and Warde, A. *Urban sociology, capitalism and modernity*. Macmillan International Higher Education. (1993)
5.	Sivaramakrishnan, K.C., Kundu, Amitabh & Singh, B.N. *Handbook of Urbanization in India*. Oxford University Press (2007)

6.	Wirth, Louis. *Urbanism as a Way of Life*. American Journal of Sociology. (1938)
7.	Sharma, A.K. and Misra, B.D. *Urbanization in India: Issues &Challenges.*New Delhi: Ane Books Pvt. Ltd.(2018)

Subject Code	24M12CS128	Semester: EVEN	Semester: 2nd Session: 2023 -2024
			Month from: Jan to June 2024
Subject Name	Digital Forensics		
Credits	3-0-0	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. P. Raghu Vamsi
	Teacher(s) (Alphabetically)	Dr. P. Raghu Vamsi

COURSE OUTCOMES		COGNITIVE LEVELS
C163.1	Explain the concept of Cyber crimes and summarize the legal frameworks of different types of Cyber crimes.	Understand (Level - 2)
C163.2	Demonstrate the different forms of digital forensic investigation and its life cycle.	Understand (Level - 2)
C163.3	Make use of various digital forensic tools in real-time scenarios for investigation procedures.	Apply (Level - 3)
C163.4	Examine network logs, cache, cookie, history recorded in web browsers, file systems of Windows, Linux, and Mac operating systems.	Analyze (Level - 4)
C163.5	Analyze email crime, dark web, and static and malware code.	Analyze (Level - 4)

Module No.	Subtitle of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Digital Forensics	Fundamentals of Digital Forensics,Digital Evidence, Forensic Readiness, Roles and Responsibilities of a Forensic Investigator, Legal Compliance in Computer Forensics, Commercial and open source tools for digital forensics, Setting up Kali Linux for digital forensics process, Anti-forensic tools.	05
2.	Computer Forensic Investigation Process	Forensic Investigation Process and its Importance, Pre-investigation, Investigation Phase, Post-investigation Phase, Indian IT Act 2000, IT Amendment Act 2008 and Indian Evidence Act.	05
3	Understanding File systems and Storage media	Understanding Hard Disks and File Systems, Different Types of Disk Drives and their Characteristics, Logical Structure of a Disk, Booting Process of Windows, Linux, and Mac Operating Systems, File Systems of Windows, Linux, and Mac Operating Systems, File System Examination	04
4	Incident Response and Data Acquisition	Data Acquisition and Duplication, Data Acquisition Fundamentals, Types of Data Acquisition, Data Acquisition Format, Data Acquisition Methodology, Data imaging and hashing, Evidence Acquisition and Preservation with DC3DDand Guymager, File Recovery and Data Carving with Foremost, Scalpel, and Bulk Extractor	04
5	Operating System Forensics	Windows Forensics, Volatile and Non-Volatile Information, Windows Memory and Registry Analysis, Cache, Cookie, and History Recorded in Web Browsers, Windows Files and Metadata, Linux and Mac Forensics, Volatile and Non-Volatile Data in Linux, Analyze File system Images Using The Sleuth Kit, Memory Forensics, Mac Forensics.	05
6	Network Forensics	Network Forensics Fundamentals, Event Correlation Concepts and Types, Identify Indicators of Compromise (IoCs) from Network Logs, Investigate Network Traffic, Network and Internet Capture Analysis with Xplico	05

7	**Investigating Web Attacks**	Web Application Forensics, IIS and Apache Web Server Logs, Investigating Web Attacks on Windows-based Servers, Detect and Investigate Attacks on Web Applications, Dark web forensics - Tor browser forensics	05
8	**Malware Forensics**	Malware, its Components and Distribution Methods, Malware Forensics Fundamentals and Recognize Types of Malware, Analysis, Static Malware Analysis, Analyze Suspicious Word Documents, Dynamic Malware Analysis.	05
9	**Investigating Email Crimes**	Email Basics, Email Crime Investigation, steps and tools.	02
10	**Defeating Anti-forensics Techniques**	Anti-forensics and its Techniques, Anti-forensics Countermeasures	02
		Total Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance-10, Class Test/ Quiz/Assignment-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 digital forensics tools. The student will analyze the requirements and select the required applications. This will help in the employ-ability of students in the Cyber security and forensics based industry and public sectors.

	Text Books:
1.	Digital Forensics Essentials, EC-Council Official Curricula, https://codered.eccouncil.org/course/digital-forensics-essentials (Register to download the study material)
2.	Shiva V.N. Parasaram, "Digital Forensics With Kali Linux", Packet publishing, 2017.
3.	Cyber Forensics by Murugan, S, Oxford University Press.
4.	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.
	Reference Books:
5.	Cybercrime and Digital Forensics: An Introduction by Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar, Routledge; 2nd edition, 2017
6.	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
7.	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Syngress; 2nd edition, 2014
8.	Brian Carrier, " File System Forensic Analysis", Person Education, 2005.

CO-PO-PSO Mapping

CO	PO1	PO2	PO3	PSO1	PSO2
C163.1	2	2	2		2
C163.2	2	2	2		2
C163.3	2	2	2	2	
C163.4	2	2	2	2	
C163.5	2	2	2	2	
C163	2	2	2	2	2

Course Code	24M12CS121	Semester: Even	Semester II Session 2023-2024
NBA Code	C145	(Specify Odd/Even)	Month: Jan 2024
Course Name	Security of e-Systems and Networks		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Amanpreet Kaur
	Teacher(s) (Alphabetically)	Dr. Amanpreet Kaur

COURSE OUTCOMES		COGNITIVE LEVELS
C145.1	Explain the fundamental concepts of e security, principles theories of cryptography and networks protocols	Understand Level (C2)
C145.2	Apply Cryptographic techniques on real world problems	Apply (C3)
C145.3	Apply proactive solutions to security like IDS and secure network protocols	Apply (C3)
C145.4	Analyze and assess the stability of existing secure applications	Analyze Level(C4)
C145.5	Evaluate Authentication and Digital signature schemes	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to contemporary e-Systems. Threats and Vulnerabilities, Common Attacks and Prevention, Security Principles and Policies, Protection of users and networks, Security Planning.	6
2.	Cryptography for E-Systems	Secret vs Public key cryptography, Public Key Cryptosystems (PKC) – RSA and Elliptic Curve cryptography, Public Key Cryptography Standard(PKCS), Cryptographic Hash and Applications	6
3.	Authentication and digital signatures for E-Systems	Types of Authentication Services, Modes of Digital Signatures, Authentication Protocols, Digital Signature Schemes, One Way, Mutual and Centralized Authentication Schemes, X.509 Digital Certificates, Public Key Infrastructure (PKI), Password Management	9
4.	Case Study of Secure Esystems	One case study, for example – Electronic Payment Systems – Cardholder present e transactions, payment over the Internet, Electronic cash	2

5.	Networking Primer	Local Area Network Protocols, Network Layer Protocols, Transport Layer and Application Layer Protocols	3
6.	Network Protocol Vulnerabilities	Denial of Service (DoS), Distributed DoS, Session Hijacking and Spoofing, Pharming, Frame Spoofing, DNSSEC	4
7.	Network Intrusion Detection and Prevention	Prevention vs Detection of Intrusions, Types of Intrusion Detection Systems, DDoS Attack Prevention, Detection and IP Traceback Methods	6
8.	Secure Network Protocols	OSI Security Architecture X.800, IPSec and Its Services & Policies, Secure Socket Layer/Transport Layer Security (SSL/TLS), Secure Shell (SSH)	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance (10), Assignment/Quiz (5), PBL (10))
Total	**100**

Project based learning:

Students form group of size 2-3 members. Each group will identify several security issues in e systems and networks. Once problem has been identified, the group will analyze the problem and synthesize system-based solutions to the identified problem. Each group will apply differentsecurity tools. Students will gain required knowledge to secure the e-systems of a real organization/company. After this course, the students will able to undertake any work in this area in the industry or research.

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.	SeifedineKadry and Abdelkhalak El Hami. "E-Systems for the 21st Century-Concept, Developments, and Applications", ISBN: 9781774635254, Published March 31, 2021 by Apple Academic Press,
2.	Bongsik Shin, "A Practical Introduction to Enterprise Network and Security Management", Published on21 July 2021 by CRC Press, ISBN:9781000418163
3.	William Stallings, "Cryptography and Network Security: Principles and Practice", 8th Edition, Published by Pearson Press May 2022
4.	Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 2015, Mc Graw Hill Education(India) Private Limited, ISBN:9789339220945, 9339220943.

References:

1	Obaidat, Mohammad &Boudriga, N,"Security of e-Systems and Computer Networks", 2007. 10.1017/CBO9780511536700.
2.	Richard Bejtlich, "The Practice of Network Security Monitoring", July 2013, No Starch Press, ISBN: 9781593275099
3.	Chris Sanders, Jason Smith, Applied Network Security Monitoring, November 2013, Syngress, ISBN: 9780124172166

4.	Journal of Information Security and Applications, Elsevier	
5.	ACM Transactions on Information and system security	
6.	IEEE Press Computer Security and Privacy	
7.	Computers & Security, Elsevier	

	PO1	PO2	PO3	PSO1	PSO2
CO1	2	2	1	1	3
CO2	2	2	2	2	2
CO3	2	2	2	2	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2
CO	2.40	2.40	2.20	2.20	2.25