TERI SAS (Deemed to be University)





10, INSTITUTIONAL AREA, VASANT KUNJ, NEW DELHI

MINUTES

58TH MEETING OF ACADEMIC COUNCIL

Meeting No. : 58th (Fifty Eight)

Date: 08 January 2024 (Monday)Venue: Conference Room, TERI School of Advanced StudiesTime: 10.30 AM

TERI SAS (Deemed to be University) MINUTES FOR THE 58th MEETING OF THE ACADEMIC COUNCIL 08 January 2024 (10.30 AM ONWARDS)

ITEMS AT A GLANCE

Item No.	Particulars
Item No.58.1:	Welcome and opening remarks by the Vice Chancellor
Confirmation of Mi	nutes
Item No. 58.2:	To confirm the minutes of the Fifty Seventh (57 th) Meeting of the Academic Council held on 25 October 2023.
Action Taken Repo	rt
Item No. 58.3:	Action Taken Report on the 57 th Academic Council Meeting.
Agenda items for In	formation
Agenda items for C	onsideration
Item No. 58.4.	Agenda Items
58.4.1 Integr 58.4.2 admis 58.4.3 Maste 58.4.4 acade	 To consider and approve Course outlines of second semester for UG and ated programmes. 58.4.1.1 Seeking approval for 2 Course outlines for FYUP Economics from the Department of Policy and Management Studies 58.4.1.2 Seeking approval for 3 course outlines for PG programme of Sustainability Management from the Dept of Policy and Management Studies 58.4.1.3 Seeking approval for 1 course outline for BBA from the Department of Policy and Management Studies 58.4.1.4 Approval of course structures under second semester at undergraduate level from current academic year from the Department of Natural and Applied Sciences 58.4.1.5 Approval for addition of the following course structure under first semester at postgraduate level from subsequent academic year from the Department of Natural and Applied Sciences 58.4.1.6 Approval for the shifting of two courses from 3rd semester to 2nd semester under MSc. Climate Science and Policy (CSP) program from current academic year from the Dept. of Natural and Applied Sciences. 2 Seeking approval for changing the minimum eligibility criteria for sions in the BSc Economics programme. 3 To consider and approve the framework and programme structure of r's programme M.Sc (Energy Studies and Management) 4 To consider the proposal of online programme of PPSD from the next mic year.

58.4.5 To consider the intake / increase in MBA (SM) programme from 60 to 90 (AICTE approval).

58.4.6 To consider and approve adoption of University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022.

58.4.7 To consider and approve award of Degrees and other academic titles in the 16th Convocation ceremony scheduled for the 08 Feb 2024.

Item No. 58.5: Any other item with the permission of the Chair

58.5.1 Proposal for in-principle approval for restructuring M Tech Urban Development Management (UDM) Programme as an MBA UDM Programme.

TERI SAS (Deemed to be University) MINUTES FOR THE 58th MEETING OF THE ACADEMIC COUNCIL 08 January 2024 (10.30 AM ONWARDS)

DETAILED AGENDA ITEMS

The Fifty Eighth meeting of the Academic Council was held on 08 January 2024 at 1030 hours. The following were present:-

Members

Prof. Arun Kansal, VC, Chairperson **Prof Sagnik Dev** Prof Shreekant Gupta Prof P.S.N. Rao Dr Sabhyata Bhatia Mr Sudhir Vadehra **Prof Shaleen Singhal** Dr Suneel Pandey Prof Anandita Singh Prof Naqui Anwer Prof Chander Kumar Singh Dr Chaithanya Madhurantakam Prof Sukanya Das Dr Ranjana Ray Chaudhuri Dr Shruti Sharma Rana Dr Gopal Sarangi Dr Priyanka Arora Dr Amit Singh Dr Ramkishore Singh Prof Shashi Bhushan Tripathi Col B Venkat, Registrar

Item No 58.1: Welcome and opening remarks by the Vice Chancellor

Confirmation of Minutes

Item No. 58.2: To confirm the minutes of the Fifty Seventh (57th) Meeting of the Academic Council held on 25 October 2023.

The minutes of the Fifty Seventh Meeting of the Academic Council, held on 25 October 2023, were circulated to the members and there were no comments from other members except Prof. Anandita Singh and Prof. Ramakrishnan Sitaraman on the agenda for proposed commencement of new programs from the academic year 24 - 25.

The Academic Council may, therefore, consider confirming the minutes, as circulated.

Academic Council confirmed the minutes.

Item No. 58.3: <u>Action Taken Report on the 57th Academic Council Meeting</u>

Sr.No.	Agenda	Action taken
Item	57.5.1 To approve award of PG Diploma as	The same has since
No.1	an exit option (after 1 st year) for PG students.	been implemented.
	NEP 2020, provides for Multiple entry and exit options to the students specifically to ensure their employability at every level of exit. Further, reference is drawn to NHEQF, Para 4.2 (Table 1: Types of qualifications and qualification title/nomenclature). Types and title/nomenclature of qualifications Programme duration pertaining to Post-Graduate Diploma in (Field of study/discipline) reproduced below:- "One year (two semesters) in the case of those who exit after successful completion of the first year (two semesters) of the 2-year master's degree programme."	
	This has been further equated to be at Level 6 as per NHEQF. For consideration of the Academic Council	
Item	Resolution: Academic Council approved the same keeping into consideration the defining norms as per NEP 2020 and NHEQF. 57.5.2 To consider and approve CGPA/SGPA	The same has since
110.2	M.Sc/M.Tech/M.A/MBA /LLM Programs.	been implementeu.
	Item No. TS/AC/42.6.1 of the 42 nd AC meeting	
	Item No. TS/AC/42.6.1 of the 42 nd AC meeting (reproduced below).	
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ItemProposition with reconsider and approve a scholarship of 50% of the tuition fee amount for the employees, their spouse and children of TERI and TERI SAS.The same has since been implemented.As a means of promoting higher education and providing opportunities to the employees, their spouse and children of TERI and TERI SAS.Heir spouse and children of 50%As a means of promoting higher education and providing opportunities to the employees, their spouse and children of TERI and TERI SAS, it is proposed to institute a scholarship of 50% and 75% respectively of the tuition fee amount. For consideration of the Academic Council please.Resolution: Academic Council approved the agenda.The same has since been implemented.	Item No.3	 Programme, the student shall take additional courses /undertake an additional project, until the CGPA requirement is met. (e) These regulations shall be effective from Academic Year 2018-19. It is proposed that the SGPA 4 be the qualifying criteria for progressing to next semester, and a CGPA of 4 for the purposes of award of PG Diploma/degree. Further a CGPA of 4 be the qualifying criteria for award of certificate/diploma/degree/degree with Hons or Hons with research and MSc for UG/Integrated programs. For consideration of the Academic Council please. Resolution: Academic Council deliberated in length on the merits of the proposal and keeping into consideration the general practice followed across the country, approved the same. 57.5.3 To consider and approve commencement of additional programs in the UG/Integrated/PG for the Academic year 2024-25. It is proposed to commence following program in the UG/Integrated/PG from the academic year 2024-25:- (a) Five-year Integrated Post graduate program in Statistics. (b) M.Sc. in Energy Studies & Management. For consideration of the Academic Council please. 	 (a) Five-year Integrated Post graduate program in Statistics is held in abeyance as the program structure has not been prepared. (b) M.Sc. in Energy Studies & Management has since been offered from the academic year 2024 – 25.
ItemNo.57.5.4 To consider and approve a scholarship of 50% of the tuition fee amount for the employees, their spouse and children of TERI and TERI SAS.The same has since 		proposal with recommendation to have the nomenclature of Five-year Integrated Post graduate program in Statistics revisited to include sustainability aspect	
As a means of promoting higher education and providing opportunities to the employees, their spouse and children of TERI and TERI SAS, it is proposed to institute a scholarship of 50% and 75% respectively of the tuition fee amount. For consideration of the Academic Council please. Resolution: Academic Council approved the agenda. Item No 57 5 5 To consider and approve B Arch The same has since	Item No.4	No.57.5.4 To consider and approve a scholarship of 50% of the tuition fee amount for the employees, their spouse and children of TERI and TERI SAS.	The same has since been implemented.
Resolution: Academic Council approved the agenda.		As a means of promoting higher education and providing opportunities to the employees , their spouse and children of TERI and TERI SAS, it is proposed to institute a scholarship of 50% and 75% respectively of the tuition fee amount. For consideration of the Academic Council please.	
	Itom	Resolution: Academic Council approved the agenda.	The same has since

No 5	as an aligibility anitaria in addition to the	heen implemented
IN0.5	as an eligibility criteria in addition to the	been implemented.
	M Tash (DEEM)	
	Present eligibility criteria for admission to	
	M. Tech (REEM) is Graduate or equivalent	
	from any branch of Engineering or	
	Postgraduate or equivalent in Environmental	
	Science, Physics, Mathematics, Statistics,	
	Chemistry, Geology, Atmospheric Science,	
	Economics, Geography, Agricultural Science	
	with mathematics at $10+2$ level.	
	It is proposed that B.Arch be also considered as	
	an eligibility criteria in addition to the existing	
	for the purposes of admission for M Tech	
	(RFFM)	
	For consideration of the Academic Council	
	Por consideration of the Academic Council	
	picase.	
	Desolution: Academic Coursell (1	
	kesolution: Academic Council approved the	
	agenda.	
Item	57.6.1 To consider and approve Master of	Detailed
No.6	Science (M.S) Research at TERI SAS.	structured
	Dean Academic proposed commencement of	proposal with a
	M.S Research at TERI SAS of 2 years	concept note is
	(maximum duration to complete shall be 3	under preparation.
	years) with eligibility criteria as BE/B Tech or	
	Masters degree in appropriate Sciences with a	
	suitable score in GATE/NET or equivalent	
	national level examination to get admission into	
	MS Research (with specialisation in select	
	disciplines) from the Academic year 2024	
	The Admission Process shall include GATE	
	CSIR-NET or LIGC-NET score: and personal	
	interview. The delivery of the program shall	
	have 200 gradits through taught courses	
	have 50% creatis through taught courses	
	focusing on research methods, tools, principles	
	for research and sustainability and the balance	
	70% credits through - research proposal	
	development and defence; conducting the	
	research including empirical work and analysis;	
	writing a thesis; defending the thesis orally.	
	The proposal has the following potential	
	benefits:-	
	(a) Focused on research.	
	(b) Acquiring critical-thinking skills required	
	to address real life s sustainability challenges.	
	(c) Potential to propel the career prospects in	
	overarching and specific sustainability	
	domains.	
	(d) Potential to prepare the profile for career	
	prospects into advance research and/or	
	academics	
	(e) Elevible duration	
	For consideration of the Acadamic Council	
	nlosso	
1	picase.	

Resolution: Academic Council while appreciating the merit of the agenda, recommended presentation of a detailed structured proposal with a concept note for the same. Subsequently, the proposal needs to be forwarded to the AICTE for their approval.	
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Resolution: The action taken report was noted.

Agenda Items for Consideration

Item No. 58.4 Agenda items

58.4.1 The following courses have been approved at the level of BoS, wherein detailed presentation followed by analysis and vetting by external experts was carried out. Academic Council is requested to consider and approve Course outlines of second semester for UG / Integrated and PG programmes.

- **58.4.1.1** Seeking approval for 2 Course outlines for FYUP Economics from the Department of Policy and Management Studies as placed in **Enclosure 1.**
 - a. Basic Mathematics for Economics
 - b. Introductory Statistical methods
- **58.4.1.2** Seeking approval for 3 course outlines for PG programme of MBA (Sustainability Management) from the Department of Policy and Management Studies as placed in **Enclosure 2.**
 - a. Introduction to Negotiation skills,
 - b. Organisational Change Management
 - c. Climate ,Energy and Carbon Markets
- **58.4.1.3** Seeking approval for 1 course outline for BBA from the Department of Policy and Management Studies as placed in **Enclosure 3.**
 - a. Organisational Behaviour
- **58.4.1.4** Approval of following course structures under second semester at undergraduate level from current academic year from the Department of Natural and Applied Sciences as placed in **Enclosure 4.**
 - a. Problem-Solving and Python Programming
 - b. Fundamentals of Information Technology
 - c. Database Management System
 - d. Sustainability Communication
 - e. Environmental Physics
 - f. Environmental Biology
 - g. Environmental Chemistry
 - h. Introduction to Remote Sensing
 - i. Modern Indian Language 1
 - j. Ancient Indian Sustainable Practices
 - k. Personality Development for Success
 - 1. Constitutional Values and Fundamental Duties

The Academic Council discussed, gave inputs and approved the agenda after assurance by respective coordinators to incorporate the suggestions of AC and revise the course contents. Further, for Modern Indian Language - 1 it was proposed that the students be given option to pursue their preferred courses through online mode (Swayam / NPTEL was referred as options).

- **58.4.1.5** Approval for addition of the following course structure under first semester at postgraduate level from subsequent academic year from the Department of Natural and Applied Sciences as placed in **Enclosure 5.**
 - a. Holistic Personality Development Course
- **58.4.1.6** Approval for the shifting of following two courses from 3rd semester to 2nd semester under MSc. Climate Science and Policy (CSP) program from current academic year from the Department of Natural and Applied Sciences.
 - a. Aerosol Science
 - b. Economics of Climate Change

The Academic Council discussed, gave inputs and approved the agenda after assurance by respective coordinators to incorporate the suggestions of AC and revise the course contents.

58.4.2 Seeking approval for changing the minimum eligibility criteria for admissions in the BSc Economics programme.

For students taking Economics as minor, 1st Semester math course 'Introductory Mathematical Methods for Economics' may be made mandatory/ a pre-requisite or equivalent courses in 'National Institute of Open Schooling (NIOS)' may be considered as mandatory.

The Academic Council noted and approved the agenda.

58.4.3 To consider and approve the framework and programme structure of Master's programme M.Sc (Energy Studies and Management)

Academic Council is requested to consider and approve the framework and programme structure of Master's programme M.Sc (Energy Studies and Management) from the Department of Sustainable Engineering as placed in **Enclosure 6**.

The Academic Council discussed, gave inputs and approved the agenda after assurance by the coordinator to further refine the program structure by incorporating suggestions from organisations / agencies / industries working in the field of Energy management.

58.4.4 To consider and approve proposal of online programme of M.A. (Public Policy and Sustainable Development (PPSD)).

The MA (Public Policy & Sustainable Development) offered by the TERI SAS is a two years Masters Programme that is founded on a consolidated and well organised curriculum focusing on multiple angles of public policy making. It revolves around the concepts of formulation, analysis, evaluation and practical implications while incorporating them into the developmental needs of the society. The program has a direct bearing on the policy decisions by government officials at all levels and private not-for-profit and for-profit business entities.

It is proposed to offer the program in online mode. Necessary approval shall be sought from UGC for the same to commence from the academic year 24 - 25.

The Academic Council noted and approved the agenda.

58.4.5 To consider and approve intake / increase in MBA (SM) programme from 60 to 90 (AICTE approval).

The M.B.A. (Sustainability Management) at the TERI SAS equips students with acumen to lead in a resource-sensitive world amid increasing competition and concern for sustainable development. Different courses such as Principles and Concepts of Sustainability, Climate Change and Development, Sustainability Reporting, Corporate Social Responsibility, Strategies for sustainable business, Business, Natural Ecosystems and Community, Accounting and Finance for Sustainability taught in the programme help the students recognize the need, challenges and ways to approach long-term viability of businesses through management and optimization of resources without compromising on profitability and competitiveness.

It is proposed to increase the number of seats from the existing 60 to 90. Necessary approval shall be sought from AICTE for the same to be effective from the academic year 24 - 25.

The Academic Council noted and approved the agenda.

58.4.6 To consider and approve adoption of University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022.

The minimum standards and procedure for the award of, Ph.D have been revised according to the recommendations of National Education Policy 2020 and the UGC has notified the new UGC (Minimum Standards and Procedure for award of Ph.D.) Regulations, 2022 in the official Gazette on 7th November 2022. These new regulations are framed to encourage research scholars to become well trained researchers and inquisitive explorers.

It is proposed to adopt UGC (Minimum Standards and Procedure for award of Ph.D.) Regulations, 2022 at TERI SAS.

Detailed discussion on the agenda post presentation by Dr Gopal Sarangi on the differences between the TERI SAS rules and University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022 took place.

The Academic Council noted and approved the adoption of amendments in existing TERI SAS Ph.D rules for those clauses that breaches the 'minimum standards' of UGC (Minimum Standards and Procedure for award of Ph.D.) Regulations, 2022. For other provisions in TERI SAS PhD rules that are higher/more stringent than the stated UGC regulations of 2022, the Academic Council suggested an internal committee to assess and present the proposal in the next AC comprehensively.

58.4.7 To consider and approve award of Degrees and other academic titles in the 16th Convocation ceremony scheduled for the 08 Feb 2024.

16th Convocation ceremony of TERI SAS has been scheduled for the 08 Feb 2024. Prof. Ajay Kumar Sood, PSA Govt of India has kindly consented to be the Chief Guest.

A total of 249 students across various disciplines and the programs are eligible for the grant of degrees/titles. The list of students declared qualified vide the processes laid down by Academic Council are as per following details. (Enclosure 7).

(i) Doctoral - 13(ii) Masters - 230

(iii) P.G.Diploma (PPSD) - 06

The Academic Council noted and approved the agenda.

Item No.58.5 Any other item with the permission of the Chair.

58.5.3 Proposal for in-principle approval for restructuring M Tech Urban Development Management (UDM) Programme as an MBA UDM Programme.

M Tech Urban Development Management (UDM) Programme in its present state requires restructuring to be relevant. Over the last few years, M Tech programs in general have not been able to be as relevant as earlier. The changes to M Tech programs in terms of course restructuring, curriculum revision, alignment to international and industrial norms have occurred across the country. On similar lines, it is proposed to restructure the existing M Tech UDM and launch it as an MBA UDM Programme from the Academic year 24 - 25.

Prof. Shaleen Singhal presented the agenda. Post deliberate and detailed discussion, the option to launch M.Tech UDM as an MBA program was not recommended, and the Academic Council proposed to explore all other available options to rejuvenate M.Tech UDM program, including starting with certificate courses.

Enclosure 1

Cours	e title: Basic Mathematics for Ecor	nomics							
Cours	se code: TBD	No. of cred	lits: 4	L-T-P: 45-15-0	Learn	ing h	ours	: 60	
Pre-re UEO 1	Pre-requisite course code and title:								
Scienc	e	10 101 LC							
Depa	rtment: Department of Policy and I	Managemen	t Studies	3					
Cours	e coordinator: Dr. Sanyyam Khur	ana	Course	e instructor:					
Conta	ct details: sanyyam.khurana@teris	sas.ac.in							
Cours	se type: Core		Course	e offered in:					
Cours This c functi constr	e description: course is a second course on ma ons of more than one variable, vec cained optimization with equality o	athematical ctor spaces, c constraints.	method convex a	s for economics. T nalysis, unconstrai	The cou ned opt	rse w imiza	vill c ition,	over , and	
Coun 1 2 3	 rse objective: To familiarize the students wit used in economics. To apply these techniques in economical and technical and techn	th the core c onomic appl al skills and	concepts lications develop	and techniques of mathematical sopt	mather	matics	s tha	t are	
Cours	e contents					Ŧ	F	D	
5.N.	1 opics					L	I.	ľ	
1	Introduction to functions of more range, graph and level curves, co derivatives and their properties, Hessian matrix, Young's theorem homothetic functions, Euler's the implicit function theorem Economic applications including analysis, and elasticity of substitu	e than one va ontinuity, dif higher-orde n, homogene corem, linear gutility analy ution.	ariable, o ferentia r partial cous func approx ysis, pro	domain and bility, partial derivatives, ctions, imations, duction		9	3		
2	Introduction to vector spaces, line products, norms, metric, eigen val Introduction to quadratic forms, s	ear independ lues. emi-definite	ence and	d dependence, inne 1 definiteness.	r	9	3		
	Convex analysis.								
3	Convex sets, hyperplanes, cones, o properties.	concave and	convex	functions, and thei	r	7	3		
	Unconstrained optimization with	n multiple v	ariables	•					
4	Introduction to unconstrained opt global optima, saddle points, seco Economic applications including j and monopolist problem.	timization, fi nd-order con profit maxim	irst-ordendition. nization	er conditions, local o under perfect comj	optima, petition	10	3		
	Constrained optimization with e	quality cons	straints.						
5	Introduction to constrained optim	uzation with	equality	y constraints, theor	em of	10	3		

Lagrange, first- and second-order conditions, method of Lagrange, Weierstrass theorem, comparative statics, Envelope theorem.			
Economic applications including utility maximization, cost minimization, cake- cutting problem, and exchange economy problem.			
Total	45	15	
Pedagogical approach: Classroom teaching and problem-solving sessions.			
Evaluation criteria: Minor 1: Written Examination - 30% [Syllabus: 1-2, Learning outcomes: 1-4] Minor 2: Homework - 30% Major: Written Examination - 40% [Syllabus: Complete course, Learning outcomes: 1-	-5]		
Learning outcomes:			
 At the end of the course, the students will be able to: 1. Understand the ideas of core mathematical concepts. [Modules 1-5] 2. Apply the techniques learned during the course in economic problems. [Modu 3. Provide economic interpretations of some of the key concepts and results. [Modules 4. Graphically analyze economic and mathematical problems, wherever possible 5. Optimize functions of multiple variables. [Modules 4-5] 	ıles 4- odules 2. [Mo	5] ; 4-5] dules	s 1,3]
 K. Sydsaeter and P. Hammond. "Mathematics for Economic Analysis" (2016) (S Additional readings: A. Chiang. "Fundamental Methods of Mathematical Economics" (2017) M. Hoy, J. Livernois, C. McKenna, R. Rees, T. Stengos. "Mathematics for Econo (HLKRS) 	бН) mics″	(201	6)
Module-wise chapters: 1. Module 1: SH: Chapter 15, Sections 15.1-15.7; Chapter 16 2. Module 2: SH; Chapter 14, Sections 14.1-14.5, Chapter 15, Section 15.8, HLKRS: 3. Module 3: SH: Chapter 17, Sections 17.5-17.8, 17.10 4. Module 4: SH: Chapter 17, Sections 17.1-17.4, 17.8, HLKRS: Chapter 12 5. Module 5: SH: Chapter 18, Sections 18.1-18.2, 18.4-18.7, HLKRS: Chapter 13	Chap	ter 1	0
Course prepared by: Dr. Sanyyam Khurana			
Student responsibilities: Attendance, feedback, discipline: as per university rules.			
 Course reviewers: Naveen Joseph Thomas. Associate Professor, Jindal School of Government Public Policy, O.P. Jindal Global University. Niti Khandelwal Garg. Associate Professor, Kirori Mal College, University of I 	and Delhi.		

Cours	e title: Introductory Statistical Methods	S					
Course code: TBDNo. of credits: 4L-T-P: 44-12-8Learning hours: 60						s: 60	
Pre-re	equisite course code and title: N/A						
Depa	rtment: Department of Policy and Mana	gement Studies					
Cours	e coordinator: Dr.Subhasree Sarkar	Course i	nstructor:				
Conta	ct details: subhasree.sarkar@terisas.ac.	in					
Cours	se type: Core	Course o	offered in : 2nd Sen	nester			
Cours	se description:						
This o	course is an introduction to the statis	stical tools that	are widely used	in var	ious	area	as of
econo variał	mics. The course will cover elementar ples, joint probability distribution and d	y probability the escriptive statisti	cory, discrete and cs.	contin	uous	ran	dom
Cours 1. T e 2. T 3. T	Se objective: To familiarize the students with the co conomics. To introduce the key concepts of probab To help students apply these techniques	re concepts and ility theory. in economic app	techniques of sta lications.	tistics 1	that a	are ı	ised in
Cours	e contents						
S.N.	Topics				L	Т	Р
	Introduction and Overview						
	Application of statistics in Eco	nomics					
1	Data- elements, variables and	observations			6	0	0
1	Scales of measurement of data				6	0	0
	• Types of data- categorical, qua	intitative, cross-se	ectional and time	series			
	Distinction between populatio	n and sample					
	Flamontary Probability Theory						
	 Sample spaces and events (cor 	cents and definit	tions using set the	orv)			
2	 Conditional probability 	cepts and definit	lions using set the	Oly)	14	4	0
_	 Bayes' theorem and its applica 	tions			**	-	C
	buyes theorem and its upplied						
	Probability Distributions						
	Random variables (discrete an	d continuous)					
	 Probability distributions (pmf, 	, pdf. Distribution	n functions)				
	• Expected values of random v	variables (mean,	variance, raw m	oment,	,		
	central moment, moment gene	erating functions)					
	 Properties of commonly used 	d discrete and c	ontinuous distrib	utions:			
3	Uniform, Binomial, Poisson, N	Iormal			12	6	0
	 Joint distribution functions 	of random w	variables (discret	e and			
	continuous) - joint pdf (pmf)						
	 Expected values of jointly dist. 	ributed random v	variables				
	Conditional distributions and	expectations					
	Association between two varia	ables: covariance,	correlation coeffi	cient			
	Management of combined tory down on					_	
	Measures of central tendency	tria maan harma	niamoon				
4	Iviean, weighted mean, geometric mean, narmonic mean				4	2	0
4	 Medial, mode Quartilas Decilas and Percent 	:100			4	2	0
	• Quarmes, Declies and Percent	nes					
	Descriptive Statistics						
	Representation of data- graph	ical (dot plot. lin	e diagram. bar di	agram			
	scatter diagram and trendli	ne, histogram.	pie chart) and	tabular			
5	method	, 0-,	· , · · ·		8	0	8
ſ	Frequency Distribution				ľ	Ĵ	Ĩ
	Relative frequency and percent	t frequency distr	ibutions				
	Cumulative distribution	1	-				

	• Distribution shape, z-Scores , Chebyshev's Theorem, detecting outliers						
	• Dispersion (range, inter-quartile range, variance, standard deviation,						
	coefficient of variation)						
	 Moments, Skewness and Kurtosis (definition, computation) 						
	 To introduce students to analysing data using R/Stata 						
	Total	44	12	8			
Pedag Classr	ogical approach: room teaching and problem-solving sessions.						
Evalu Minor Minor Assign Major	ation criteria: : 1: Written Examination - 20% [Syllabus: Module 1] : 2: Written Examination - 20% [Syllabus: Module 2-3] nment: Homework (software based)- 20% [Syllabus: Module 5] : Written Examination - 40% [Entire Syllabus]						
Learn	ing outcomes:						
At the	e end of the course, the students will be able to:	1					
1. 2	Understand the low concepts of probability theory [Minor 2, Assignment, Major]						
2. 3	Apply the techniques learned during the course in economic problems. [Mi	nor 1	Мі	oor 2			
5.	Assignment Major		, 10111	.101 2,			
4.	Provide economic interpretations of the statistical results. [Minor 1, Minor	2. As	sign	ment.			
	Major]	_, 110					
_							
Core 1	reading:	10	.1	1			
1.	Anderson, D. R, Sweeny, D. J, et.al (2019), Statistics for Business and Economi Cengage Learning (AS)	.cs, 13	th ec	lition,			
2.	Additional readings:	(57.1	$\overline{7}0$	NT			
3.	Nitteinammer, K. C. (1996). Mathematical statistics for economics and busines	s (voi	. 78)	new			
4	Iork. Springer. James McClave P. George Benson, Terry Sincich (2017) Statistics for Business	and F	con	mics			
1.	Pearson Publication.		COIR	Jinco,			
Modu	ale-wise chapters from the core readings:						
 Module 1: AS, Chapter 1, Sections 1.1-1.5. Module 2: AS, Chapter 4, Sections 4.1-4.5 Module 3: AS, Chapter 5, Sections 5.1-5.7, 6.1-6.2 Module 4: AS, Chapter 2, Sections 2.1-2.4, AS, Chapter 3, Sections 3.1-3.3, 3.5 							
Addit	ional information:						
Cours	e prepared by: Dr. Subhasree Sarkar						
Stude Attend	nt responsibilities: dance, feedback, discipline: as per university rules.						
Cours	e reviewers.						
(1	1) Sourabh B Paul (Associate Professor IIT Dolbi)						
	2) Gaurav Arora (Associate Professor IIIT Delhi)						
(2	3) IV Meenakshi (Professor, IIIT Delhi)						
(-							

Course Title: In	Course Title: Introduction to Negotiation skills					
Course code:	No. of credits: 1	L-T-P: 12-03-00	Learning ho	ours: 15	5	
Pre-requisite c	ourse code and title (if any): N	.A.				
Department: I	Department of Policy and Manag	gement Studies				
Course coordin	nator: Dr Shruti Sharma Rana	Course instructor: Dr M	Moumita Acl	haryya		
Contact details	: shruti.rana@terisas.ac.in					
Course type: C	ore	Course offered in: Sem	ester II			
Course type: Core Course offered in: Semester II Course description: Contemporary times are of great strife and conflict, with major pulls and pushes that are shattering already fragile fabric of the society we live in, and the bonds that connect us. These times require professionals who can bring about peace and harmony all around, between cultures, countries, communities, classes and businesses. To make this happen, one of the most critical communication skills that an executive is expected to acquire and display is the "art and the science of negotiation." As the students prepare to step into the corporate world, they will face multiple situations where negotiations will be critical to a successful business outcome, from pricing to business contracts to mergers & acquisitions, a well-orchestrated negotiation process can make or break the deal and relationship. Course objectives : 1. To familiarize the students with the structure and dynamics of negotiation, preparing them for leadership positions. 2. To help students develop their skills in effective use of different forms of influence and persuasion strategies in the decision-making process. 3. To facilitate students in rethinking of negotiation as a problem-solving tool and improving their negotiating skills and confidence when engaging in important real-world negotiations at work and other settings						
Course Conten	t					
Module	Торіс			L	Т	Р
1	 Course overview, methode Negotiation context: when informal & explicit/forma Interface Map: Negotiation Volume 	blogy, expectations etc., do we negotiate impli l, experience sharing, n Definitions, Importance	cit/ and	3		0
2	 Negotiation: A voluntary pr appetite/skill/confidence), Negotiation dimensions: Pe Conflict & negotiation: Peop around them: 	rocess (emotion/motivatio ople, Problem, Process, le, Problem, Process &	n/risk dilemmas	2		0
3 Negotiation stages: 3 1 0 • Stage 1: Pre-Negotiation: Preparation, Checklist, Activity, Mindset, Stage 2: Negotiation: Business Situations, application of Skills, Stage 3: Post Negotiation: Impact Analysis, Summary & Closure 3 1 0						
4	Negotiation strategies and tact	ics		2		0
6	Cross cultural negotiations			2	2	0
		Total		12	03	0
Evaluation crit	eria:					

Minor Test 1: **20%** (at the end of teaching of module 2) Structure: The students will be quizzed from the first four modules of the course. Minor Test 2: Case Analysis/ Assignment/ Presentation -20% (at the end of teaching of module 6) Structure: Students in groups will be assigned role plays/case study assignments. Major Test: **40%** (at the end of teaching of all modules) Structure: This will be an exam based on all the modules covered in the class. **20%** marks will be given on class participation: basis case study discussions, role plays etc.

Learning outcomes:

By the end of the course, the students should be able to:

- Illustrate the concept of negotiation, its types, process & practice;
- Demonstrate the ability to consider factors pan organization while negotiating;
- Apply learning across disciplines to lead an organization in building productive relationship;
- Use overt & subliminal communication techniques in an ethical manner to build relationships;

Pedagogical approach: Case study, role-plays, focussed group discussions.

Materials:

Reference Books:

- Negotiation: Lewicky, Barry and Saunders: Tata McGraw Hill, 8th edition
- Effective Negotiation: from Research to Results by Ray Fells: Cambridge University Press, 2010
- How to Negotiate Effectively by David Oliver, Kogan Page, 2007

Additional information (if any):

Student responsibilities:

Attendance, Participation in the class exercises and case discussions, to read relevant student material before attending the class.

Prepared by: Dr Moumita Acharyya

Course reviewer(s):

- Dr. Damini Saini, Assistant Professor, IIM Raipur
- Dr. Pratima Daipuria, Professor & Dean, JIMS Rohini

Course Title: Organizational Change Management								
Course code: PPM180No. of credits: 3L-T-P: 36-08-0	Learning hours: 45							
Pre-requisite course code and title (if any): N.A.								
Department: Department of Policy and Management Studies								
Course coordinator: Dr Shruti Sharma Rana Course instru	ctor: Dr Moumita Acharyya							
Contact details: shruti.rana@terisas.ac.in								
Course type: Core Course offered	d in: Semester II							
Course description: Organizational change management strategies are vital for success and great performance in today's dynamic environment. As organizations are constantly dealing with changing social, political, cultural, global as well as economic environments, having a clear understanding of the factors that drive effectiveness will enable future managers and leaders to develop strategies that will drive performance in line with the vision of their organization and its people. The purpose of the course is to provide future managers and leaders with state of art knowledge for achieving and enhancing organizational effectiveness in context of current realities.								
 The objectives are: To understand the forces for change and planned change. To describe ways to overcome resistance to change. To prepare students with managerial and leadership challeng change. 	ges while dealing with organisational							
Course Content								
Module Topic	L T P							
 Organizations context: internal & external env Organization change: People process (OD) & structure process. 	vironment, 4 0							
 2 Purpose & types of organization change? Purpose of change, Types of change Restructuring (Redesigning, Downsizi) 	ing), M&A							
 Internal & external factors forcing cha Diagnosis for change: WHAT to change Organization Models: How organization 	ange 4 0 ge? on works?							
 4 Change process & models: HOW to change Building & Energizing need for chang Change Models: General process, Lew Bullock & Batten model, Kotter's model 	ge vin's model, del of change.							
5 Resistance to change • Emotional • Rational/logical	4 0							
 6 Overcoming resistance & change Institutionali Ability & willingness Communication to Coercion strategy 	ization: 4 2 0							
7 Issues and complexities in managing organizat Strategic role and impact of change on organiz performance, Ethical issues related to change.	Issues and complexities in managing organizational change. 4 0 Strategic role and impact of change on organizational performance, Ethical issues related to change. 4 0							
8 Role of vision in organizational change; Overview of Change 4 2 0 activities: Motivating change, managing the transition, Role of change agent, Role of leadership in steering change.								
9. Semester Project presentations								
Total	36 09 0							
Evaluation criteria:								

Minor Test 1: 20% (at the end of teaching of module 4)

Structure: The students will be quizzed from the first four modules of the course.

Minor Test 2: Case Analysis/ Assignment/ Presentation -20% (at the end of teaching of module 7)

Structure: Students in groups will be assigned role plays/case study assignments.

Major Test: 40% (at the end of teaching of all modules)

Structure: This will be an exam based on all the modules covered in the class.

20% marks will be given on class participation: basis case study discussions, role plays etc.

Learning outcomes:

By the end of the course, the students should be able to:

- Identify the individual, team, organization & environment dynamics in the context of change
- Assimilate, and apply knowledge of basic theories and concepts to solve problems and build strategies for organisational change.
- Explain how organization can change business process to deal with business challenges.

Pedagogical approach: Case study, role-plays, focussed group discussions.

Materials:

Reference Books:

- Organizational Development & Change by Cummings, Thomas G. & Worley, Christopher G. CENGAGE Learning (10th Edition), 2016 (C&W)
- Managing Change: a human resource strategy approach by Thornhill, Lewis, Millmore & Saunders. Pearson (2006).
- Organizational Development & Transformation: Managing Effective Change by French, Bell & Zawacki. Tata Mc Graw-Hill, 6th Edition (2011).

Suggested Readings:

- Campaigning for Change Harvard Business Review
- Change for change's sake Harvard Business Review
- The Pandemic changed us now the companies need to change too McKinsey

Additional information (if any):

Student responsibilities:

Attendance, Participation in the class exercises and case discussions, to read relevant student material before attending the class.

Prepared by: Dr Moumita Acharyya

Course reviewer(s):

- Dr. Damini Saini, Assistant Professor, IIM Raipur
- Dr. Pratima Daipuria, Professor & Dean, JIMS Rohini

Course title: Climate, Energy & Carbon Markets							
Course code: XXX	No. of credits: 2	L-T-P : 26-04-00	Learning hours: 30				
Pre-requisite course code	Pre-requisite course code and title (if any): N.A.						
Department: Department	of Policy and Manage	ment Studies					
Course coordinator: Dr Gopal Sarangi Course instructor(s): Dr Gopal Sarangi							
Contact details: gopal.sarangi@terisas.ac.in							
Course type: CoreCourse offered in: Semester 2							

Course description

The energy sector is associated with significant contributions to a country's carbon emissions and there exist a strong nexus between energy and climate change. Several countries have ratified the Kyoto Protocol and are party to Paris Agreement (PA) and are supposed to report their emissions to UNFCCC. In this course, the students shall be provided with an overview on global climate agreements, energy specific emissions, and tools and methodologies for accounting and reporting the emissions. They shall be apprised on the Indian GHG inventory and the initiatives to reduce the same. Importantly, students will be appraised on the emerging Indian carbon market and India's experience in CDM and VCM markets. Carbon trading has been identified as a tool to reduce emissions. In this context, the students shall be taught about the various trading mechanisms operational worldwide along with their pricing structures.

Course objectives

Course content

- Understand and appraise the importance of market-based instruments for environment and climate change.
- Get an overview on global climate goals, strategies and international agreements and Indian climate policy, regulation, and emerging carbon market architecture.
- Understand and apply the energy related GHG emissions and carbon emissions and their estimation procedures.
- Understand and apply the methods and tools of carbon footprint assessment for key sectors

Module	Topic	L	T	Р			
1	Introduction to Market Failure and MBIs	4	0	0			
	Market failure: public bads and externalities, Basic regulatory						
	instruments, Command and Control (CAC) versus, Market Based						
	Instruments (MBIs), Different forms and typologies of MBIs,						
	Understanding and estimation of Marginal Abatement Cost (MAC)						
	and their importance in the context of carbon market						
	Global climate change regimes and carbon market						
2	Climate and energy nexus	6	0	0			
	Climate change and greenhouse gas (GHG) emissions						
	Market mechanisms under Kyoto such as CDM, JI and IETs						
	and Paris Agreements under Art. 6						
	Global carbon budget distribution, and budget allocation issues						
	Indian policies and regulations around energy and carbon market						
3	Existing market-based mechanisms for energy and climate change	6	0	0			
	(e.g. PAT, REC) and non-market instruments (e.g. building codes,						
	appliance standards)						
	Commitments under UNFCCC and Paris Agreement						
	NDC goals for mitigation, Accounting and Reporting						
	Net-zero goal and pathways and market mechanisms.						
	Low carbon growth strategy of the country						
	Carbon Market in India- emerging context and future market design						
	and market architecture						
4	Different forms of pricing carbon (e.g. cap and trade, carbon tay	_	2	0			
4	etc.)	5	2	0			
	Carbon markets prevalent across globe						
	Voluntary and compliance carbon markets						
	Introduction to Internal Carbon Pricing (ICP) & Carbon labeling						

	-			
	Carbon assessment techniques and methods			
	Gases, Sectors, and methodologies			
5	Estimation of carbon footprint and its assessments	5	2	0
	IPCC guidelines for National GHG inventories			
	Case Studies from key sectors			
		26	4	0
Evaluation	criteria			
Minor Test	1 20%			
Classroom	exercises 20%			
Group Ass	ig./Presentations 20%			
Major Exa	n 40%			
Learning o	utcomes			
After comp	pleting this course, students would be able to:			
 Unders 	tand the various global climate regimes and MBIs as evolved and imple	men	ted i	n the
climate	change context.			
 Unders mochai 	itand and appraise the theoretical and practical basis of carbon market a	s a m	narke	et
Develo	n the ability to interpret estimate and analyze the carbon footprint asse	ssme	nts a	nd
carbon	pricing mechanisms.	5511C	1113 u	na
 Apprai 	se, understand, and apply the tools and techniques through the demons	stratio	on of	case
studies	on carbon market in key sectors.			
Padagogia	alapproach			
The course	will be delivered through classroom lectures assignments classroom (ovorc	icoc 1	with
relevant ca	so etudios		1303	v ItII
Material	Se studies.			
1114001141				
Textbook				
 Kols UNI Gup Dell S, <u>Be</u> Mac 	tad C.D. (2002) <i>Environmental Economics</i> , Oxford University Press. DP (2014) <i>Carbon Handbook</i> , United Nations Development Programme (2 ta M. (2006) <i>Restricting Greenhouse Gas Emissions: Economic Implications fo</i> i. <u>enjamin Stephan</u> and R. <u>Lane</u> (2015) <i>The Politics of Carbon Markets</i> , Routh inante, J. D. (2020) <i>Effective Global Carbon Markets</i> , <u>Elgar Studies in Clima</u>	014) 17 Ind ledge <u>ite La</u>	ia, N	ew
Suggested	readings/ Websites			
• BEI	E (India) - National Carbon Markets Scheme			
• Mo	EFCC (Índia) GHG Inventory			
NA INA	PCC, India ECCC National Inventory Submissions			
htti	ps://cdm.unfccc.int/about/index.html			
• Wo	rld Bank - State and Trends of Carbon Pricing (Annual Reports)			
• Sele	ected online readings on Carbon Pricing:			
http	os://eplibrary.libguides.com/CART/SR/carbon_pricing/e-books			
Iournals				
• Ene	rgy Policy			
• Ene	ergy Economics			
• Ap	plied Energy			
Clin	nate Change Economics			
• Chi	nate Policy			
• Glo	bal Environmental Change			
• Rer	newable Energy			
• Rev	view of environmental economics and policy			
• Sus	tainable and Kenewable Energy reviews			
Additiona	l information (if any)			
Student re	sponsibilities			
1	L			

Course Prepared by: Dr Gopal Sarangi

Course reviewers

- Mr. RR Rashmi, IAS (Retd.), Distinguished Fellow and Director, Earth Science and Climate Change, TERI
- Prof. Sacchidananda Mukherjee, Professor, National Institute of Public Finance and Policy
- Mr. Jatin Kapoor, Head Climate Transactions, Emergent Ventures India
- Dr Vaibhav Chaturvedi, Senior Fellow, Councial on Energy, Environment and Water (CEEW)
- Dr Aman Srivastava, Fellow, Climate Policy, Sustainable Futures Collaboratives (SFC) and Visiting Faculty, Kautilya School of Public Policy, Hyderabad

Enclosure 3

Course Title: Organizational Behaviour						
Course code: BPB104	No. of credits: 4	L-T-P: 50-10-00	Learning	g hours	: 60	
Pre-requisite co	ourse code and title (if any):					
Department: [Department of Policy and Managen	nent Studies				
Course coordin	ator: Dr Moumita Acharyya	Course instructor: Dr	Moumita A	Acharyy	a	
Contact details	: moumita.acharyya@terisas.ac.in					
Course type: Co	ore	Course offered in: Sem	nester II			
Course descrip Human behavio at work is a re Understanding effectiveness bu cognizant of the well as long terr Course objectiv 1. To understa sustain high 2. To attain an "real life" pr 3. To understa business eff 4. To achieve of	tion: ur in the organizational and work esult of interaction between varie how individuals and groups bel t also nurture the quality of work le ese workplace dynamics so that the <u>n career</u> . wes: nd the conceptual framework and performance and effectiveness. d improve the ability and skills to roblems and situations concerning nd and identify the behavioural sl ectiveness and apply them in organ overall development to become eff	context is a complex pho ous individual, group an have at workplace will ife of the individuals. Thi ey make conscious decis fundamentals of Organiz analyse and apply critica human behaviour. kills that improve individuit izational work.	enomenon. nd organiz not only is course w ions in the ational Be al thinking dual and g	Individ zational help vill help eir futur haviour and lea	dual beh level f improve student re work to enab urning sl erformar	aviour factors. e their s to be life as ole and kills to nce for
4. 10 acmeve (cenve readers & manager				
Course Conten	t					
Module	Торіс			L	Т	Р
	Individual Dy	namics (Module 1-7)				
1	Organizational Behaviour: Fou Why study of Organizational Beh Evolution of the field of Organiza Spectrum of Individual behaviour Organizational behaviour trends - Contemporary challenges for org	aviour is important. ational Behaviour rs in organizations. – impacting economies. anizations vis a vis OB		4	0	0
2	Personality Definition and concept of person Personality Frame works – Big F Determinants, traits & major p Personality and Situation	nality ive ersonality attributes infl	uencing	4	0	0
3	Perception Definition, Factors influencing perception. Complete process of perception Perceptual bias and errors Rectifying perceptual errors Attribution theory Specific Applications in organiza	tions		4	2	0

4	Attitude, Values and Belief	4	0	0
	Concept and components of attitudes			
	Types of attitudes in the workplace			
	Organizational commitment and Job satisfaction			
	Organizational commitment			
	Employee engagement			
	Importance and organization of values, Cultural values.			
5	Motivation	4	2	0
	Defining Motivation			
	Theories of motivation (Content theory and Process theory)			
	Motivation: From Concepts to Applications			
6	Emotional intelligence and Stress management	6	0	0
	Emotions, feelings and moods			
	Workplace and emotions			
	Emotional intelligence			
	Stress management: Work stress, coping strategies and			
	management and employee wellbeing			
7	Interpersonal relationship: Interpersonal skills, Importance of	2	2	0
	empathy, emotional intelligence, listening, teamwork,			
	collaboration			
	Group Dynamics (Module 8-10)			
8	Toom Processes	1	0	0
0	Groups and Teams	-	0	0
	Concept nature and importance of teams			
	Types of teams			
	Team Building processes			
	Team Roles			
	Creating effective and winning teams			
9	Power, Politics and Conflict	4	0	0
-	Power and politics		Ŭ	Ũ
	Conflict management			
	Organization change and negotiation skills			
10	Leadership and followership: Introduction, Trait, Behavioural	4	2	0
10	and Contingency Approaches to leadership. Transactional and		-	Ŭ
	Transformational leadership.			
	Organization Dynamics (Module 11-12)			
11	Foundations of Organization structure and Organization	6	0	0
	culture		_	-
	What is organization structure, common organizational design			
	and employee behaviour?			
	Organization culture			
	Elements of culture			
	Types of Culture			
	Organization culture and Ethics			
	Cultural mind set and embracing diversity			
12	Responsibility of organization towards sustainability issues	4	2	0
	Genesis of ESG, Role of organizations towards various			
	environmental problems such as air quality, water quality, land			
	quality.			
	Various sustainability interventions taken by organizations			
	Total	50	10	0
Evaluation cri	teria:	-	-	·
Minor Test 1: 3	0% (at the end of teaching of module 4)			
Structure: The	students will be quizzed from the first four modules of the course.			
Minor Test 2: C	Case Analysis/ Assignment/ Presentation -30% (at the end of teaching	ng of mo	dule 7)	
Structure: Stude	ents in groups will be assigned role plays/case study assignments.			
Major Test 3: 4	40% (at the end of teaching of all modules)			
This will be an	exam based on all the modules covered in the class.			

Learning outcomes:

By the end of the course, the students should be able to:

- **LO1:** Understand the broader perspectives and importance of interpersonal dynamics and organizational behaviour at the workplace.
- LO2: Strengthening the foundations of individual behaviour with an understanding of human personality, perception, attitude and emotions
- LO3: Develop an understanding of teams and groups in organizations and the process of leadership.
- LO4: Identify the various organization structures and their usefulness and learn to sustain an organization's culture.

Pedagogical approach: Case study, In-class discussions, Role play, Debate

Materials:

Reference books

- Organizational Behaviour: Stephen R.Robbins /Tomothy A. Judge Neharika (2019)18th edition, Pearson Publisher
- Organizational Behaviour Fred Luthans, McGraw Hill International Edition (FL)
- Organizational Behaviour- Mirza S Saiyadain, Tata McGraw Hill, (MSS)

Additional information (if any):

Student responsibilities:

Attendance, Participation in the class exercises and case discussions, to read relevant student material before attending the class.

Prepared by: Dr Moumita Acharyya

Course reviewer(s):

Dr. Nidhi Mathur, Associate Professor, IMT Ghaziabad (CoDL)

Dr. Archana Poonia, Associate Professor, O.P. Jindal University

Enclosure 4

Course Co	ode: No. of credits: 3 L-T-P: 20-10-30 Learning hou	rs: 4	5	
	L: Lectures: T: Tutorials	; P: F	Practi	cals
Pre-requis	site Course Code and Title (if any): None	,		
 Departme	nt: Natural and Applied Sciences			
Course Co	oordinator: Course Instructor:			
Contact D	etails:			
Course Ty	pe: Course Offered in: Semester-2			
Course D	escription			
The cours problem-s code, flow strategies phase, Py approache functions, storytellin of Python Course OI • To • To • To • To • To • To	e begins with exploring diverse ways of computational approaches and applolving. The fundamentals include building blocks of algorithmic problem so v charts, program flow diagrams, and infographics. The students will get for designing algorithms using iteration, recursion, function, and file handlin thon constructs would be introduced as a programming tool to develop pr s. This will involve the basics of Python, control statements, data struct modules, and packages. The course will also include visualizations, data struct modules, and packages. The course will also include visualizations, data struct modules and packages on problem solving approaches to real-world Djectives understand the fundamentals of algorithmic approaches to problem solving learn Python programming essentials using conditionals, iterations, recursions use functions and file handling in Python for data representation and manipulation perform data visualization, file handling and interactive computing in Python	ying olving acqua g. In oblen tures, ata, a under cases	them , pse aintec the l n-solv lam	for udo l of ater ving bda code ding
	perform data visualization, the nanoming and incruence computing in Fymon			
Course Co Module	Topic	T.	Т	Р
1	Computational Problem Solving		-	-
	The objective of this module is to develop methodical approach to defining, framing, examining, and resolving problems through computational and algorithmic methods. This enables the decomposition of complex problems into sub-problems and providing rational solutions using computational thinking. The module will include the following topics:			
	Computing fundamentals for problem solving, Identification of computational problems, Pseudo codes and algorithms, building blocks of a program (control statements, iteration, functions, recursion), designing flow chart, program flow diagrams, infographics with Canva, visual paradigms, Visme, etc.; instances of algorithmic problem solving; application to geoinformatics in data acquisition, spatial data science, and remote sensing tasks.	5	2	4
2	Fundamentals of Python Programming	<u> </u>	1	
	This module provides insights on the fundamentals of Python programming and encompasses the essential principles and foundational concepts that serve as the building blocks for writing code in the Python programming language. After completing this module, the students will be able to perform effective programming in Python. Following will be covered in this context:	5	4	8

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Python basics, interpreter, code debuggin Boolean, string; variables, expressions, input, and output statements, chain conditional statements, operators, pr constructs, while, for, break, continue, p comments	ng, data types-integer, floating point, simple and conditional statements, ed conditional statements, nested recedence of operators, iterative eass; use of single-line and multi-line			
3 Data Structures & Functional Program	ming in Python			
The purpose of this module is to combin programming in Python to develop a p solving complex problems. This will ass of computational problems with clarity, code. The topics to be covered in this mod	the the data structures with functional owerful and expressive approach to ist the learners to address wide range modularity, and scalability in Python odule include:			
Defining functions, actual and formal ar global scope of variables; List: list oper tuple assignment, tuple as return value; I sets, advanced list processing- list compressions, lambda functions, regular e handling (read, open, close), context ma (text, csv, json, etc.), file opening modes Pandas, scientific computing using SciPy	rguments, return statement, local and rations, slicing, list methods, Tuples: Dictionaries: operations and methods; rehension, sorting, searching, lambda xpressions, arrays using Numpy, file anagers, handling different file types s, file operations, managing files with	5	2	6
4 Data Visualization & Interactive Pytho	n			
This module will connect the pro- fundamentals with interactive and impace It will allow the students to present and representations. The knowledge of dyna presentability of complex information in for advanced topics and real-world app following contents: Significance of data visualization, I Matplotlib for Line, scatter, bar plots; correlation plots, interactive visualization correlation plots, interactive visualization extraction of geospatial information using etc., geospatial data visualization with study in geoinformatics using PySAL interactive dashboards using Dash, data/contents	rogramming and problem-solving tful data visualizations using Python. meaningful insights using graphical amic visualizations will enhance the a comprehensible manner, especially oplications. This module will cover Python libraries for visualization, sustomizing plots, multiple plots and sualization using Seaborn, heatmaps, ions using Plotly, Pandas plotting, ng Selenium, Scrapy, BeautifulSoup, GeoPandas, Folium, Basemap; case and Rasterio, 3-dimensional plots, code storytelling, iPython	5	2	12
Total		20	10	30
Practical Flow diagram tools like draw.io, Visio, Paradigm, Visme, etc.	etc., infographics with Canva, Visual			4
Python Programming, basic I/O construction, recursion	ts, simple and conditional statements,			8
File handling, list, tuple, set, dictionary, Pandas, SciPy, etc.	Practical with libraries, like Numpy,			6
Hands-on with data visualizations representations, Practical with librarie BeautifulSoup, GeoPandas, Folium, H iPython; Minor project and case studies.	, higher dimensional graphical es, like Plotly, Selenium, Scrapy, Basemap, PySAL, Rasterio, Dash,			12
Total				30

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Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Minor Test 2: Written test [at the end of teaching of module 3] -- 20%
- Practical: Practical test [including modules 1, 2, and 3] -- 20%
- Minor Project: Project-based learning [at the end of teaching of module 4] -- 10%
- Major Test: Written test [at the end of the semester, full syllabus] -- 30%

Learning outcomes

By the end of the course, students will:

- Acquire a critical understanding of problem-solving techniques [module 1 and 2; minor test 1]
- Develop knowledge of building algorithms and programming with python [module 2 and 3; minor test 2; practical]
- Perform file handling, functional programming, data analysis [module 3 and 4; practical; major test]
- Perform data processing, programming, visualization, interactive computing [Module 1, 2, 3, and 4; Minor Project; Major Test]

Pedagogical approach

- The course critically evaluates the concepts of programming with Python through classroom discussions, lectures, tutorials, and project-based learning with real-world case studies.
- The course will allow learners to engage with enough hands-on sessions that will help in bridging the gap between theoretical understanding and real-world problem solving.
- The course will offer opportunities to explore how computational concepts and problem-solving techniques can address challenges in industry-relevant scenarios.

Reading Resources (* = compulsory readings)

- * Dromey, R.J. (2008). *How to Solve it by Computer*. University of Wollongong, Pearson Education, ISBN: 9788131705629, 442 pages.
- * Brown, M.C. (2001). *Python: The Complete Reference*. Osborne/McGraw-Hill, ISBN: 9780072127188, 691 pages.
- * Chen, D.Y. (2017). *Pandas for Everyone: Python Data Analysis*. Pearson Education, ISBN: 9780134547053, 416 pages.
- Lubanovic, B. (2014). Introducing Python Modern Computing in Simple Packages, First Edition. O'Reilly Media, ISBN: 9781449359362, 454 pages
- Chun, W.J. (2006). *Core Python Programming, Second Edition*. Pearson Education, ISBN: 9788131711880, 1137 pages
- Downey, A.B. (2015). *Think Python: How to Think like a Computer Scientist, Second Edition.* O'Reilly Publishers, ISBN: 9781491939413, 292 pages
- Kanetkar, Y., Kanetkar, A. (2020). Let Us Python, Second Edition. BPB Publications, ISBN: 9789389845037, 359 pages

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the class discussions.

Course Designed by:

• Dr. Adwitiya Sinha, Associate Professor, Department of Computer Science & Engineering and Information Technology, Jaypee Institute of Information Technology, Noida-62, Uttar Pradesh – 201309

Course Reviewers:

- Dr Satish Chand, Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University, New Delhi.
- Dr Bijendra Kumar, Professor & Head (CSE), Department of Computer Science & Engineering, Netaji Subhas University of Technology, New Delhi

		nology	
Course Code:	No. of credits: 3	L-T-P: 18-16-22	Learning hours: 45
		L: Lect	ures; T: Tutorials; P: Practicals
Pre-requisite Course C	ode and Title (if any): No	one	
Department: Natural ar	d Applied Sciences		
Course Coordinator:	Co	ourse Instructor:	
Contact Details:	·		
Course Type:	Co	ourse Offered in: Sem	nester 2
Course Description			
communication with an retrieval, and exchange, digital applications, red course aims to demons The students will gain quantifying performan	The learners will explore cognizing their pivotal rol trate the structure and fun insights on the critical	the significance of con e in shaping modern ction of computer org role of operating sy	mputing technologies in diverse technological landscapes. The ganization and storage systems.
contemporary challeng modern age of digitizati	es by identifying and exa on.	mining various secur	Also, the course will address fity concerns prevailing in the

• To identify different issues of information security in modern digital age

Course C	Course Content						
Module	Торіс	L	Т	Р			
1	Computing Technologies & Applications	-					
	This module highlights the significance of general-purpose computing technologies and their multifunctional aspects to perform variety of computational tasks. The students will learn about the digital computers, and their types based on size and purpose, including mainframes, minicomputers, microcomputers, and supercomputers. This will be followed by insights on computer arithmetic, and several types of software that can cater to specific user needs, thereby highlighting the diverse capabilities and constraints of modern computing systems. The following topics related to information technology (IT) will be addressed in this module:						
	Basics of general-purpose computers, types, characteristics stages of evolution of computing technologies, applications, categorization of digital computers anatomy of a digital computing device, capabilities and constraints, computer arithmetic, positional (decimal, octal, binary, etc.) & non-positional (excess-3, cyclic, gray, etc.) number system, number base conversions, system software, application software (word processor, spread- sheets, data marts, graphics, presentations using Prezi, Google slides, etc.), advanced IT tools for data processing, data visualization, collaborative coding, data repositories, etc. (Weka, Orange, Gephi, Google Colab, GitHub, Kaggle, etc.)	5	4	10			
2	Basics of Computer Organization & Storage						
	The focus of this module lays on computer peripherals and storage devices that act as an interface between end-users and computers. It will cover data storage and retrieval methods for efficient access of information. The learners	4	4				

will be able to acknowledge the eminence of primary storage for quick data access, and auxiliary storage for long-term data retention. It will also cover essentials of file management, thus highlighting the complexity and diversity of storage systems. Following topics will be covered in this context:			
Input and output devices, I/O terminals and its types, voice recognition systems, vision input system, screen types and technologies, impact, and non- impact printers sound cards, etc., storage fundamentals, primary and secondary storage system, data retrieval methods, types of storage: primary and auxiliary, file types, file organization.			
3 Operating System Fundamentals	r	T	,
The purpose of this module is to illustrate the importance of operating system for facilitating user interaction. The learners will understand the need for programming languages, ranging from machine-level to high-level languages; thus, enabling communication between humans and computers. This module will help in understanding several ways of measuring and evaluating system performance. The topics to be covered in this module include:	4	4	6
Basics of operating system, programming languages, types (machine, assembly, high level), assembler, loader, linker, language translators (compiler, interpreter), functions of operating system, system performance metrices, batch processing, multiprogramming, multiprocessing, multi-tasking, time sharing, instances (DOS, Windows, Unix/Linux).			
4 Data Communication, Internet & Security		1	1
This module combines the effectiveness of data communication and internet technologies required for performing information exchange over networked devices. The students will perceive knowledge on analog and digital data transmission, across wired and wireless communication medium. It will also cover different network topologies and protocols to accommodate diverse communication needs. The learners will acquire awareness on computer and internet-related crimes, along with the need for security mechanism in the modern digital age. This module will include the following contents:	5	4	6
Overview of data communication, data transmission types of communication, medium of transmission, modem, communication network, network characteristics, network types, network LAN topologies, protocols for digital communication, basics of world wide web, web designing with html, web technologies, network data analysis using Wireshark, internet addressing, e- mail basics, computer crimes, computer security techniques, computer viruses, spam, malwares, identity theft.			
Total	18	16	22
Practical Application software and tools for word processing, data storage, graphics,			2
Advanced IT tools like Weka, Orange, Gephi, Google Colab, GitHub, Kaggle,			8
etc. Unix programming shell scripting. Unix commands & filters, profiling			6
Analysing network data with Wireshark, profiling network traffic, web			
designing, Minor Project			6
Total			22
 Evaluation Criteria Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 20% Minor Test 2: Written test [at the end of teaching of module 3] 20% 			

- Practical: Practical test [including modules 1 and 3] -- 20%
- Minor Project: Project-based learning [at the end of teaching of module 4] -- 10%

• Major Test: Written test [at the end of the semester, full syllabus] -- 30%

Learning Outcomes

By the end of the course, students will:

- Develop critical understanding of computer technology, applications, and software fundamentals [module 1 and 2; minor test 1]
- Acquire knowledge of characteristics, components, and software architectures associated with information processing [module 2 and 3; minor test 2; practical test]
- Gain insights of functionalities of information systems for securing and managing digital data [module 1, 2, 3, and 4; minor project; major test]

Pedagogical Approach

- The course will provide knowledge and awareness on concepts of information technology through classroom discussions, lectures, tutorials, assessments, practical, project-based learning
- The course will allow learners to develop an understanding of computing technologies and their wide variety of usage in digital communication, processing, and storage.
- The course will enable students to explore different issues in context of information security.

Reading Resources (* = compulsory readings)

- * Leon, A., Leon, M. (2009). *Fundamentals of Information Technology, Second Edition*. Vikas Publishing House, ISBN: 9788182092457, 602 pages
- * Thareja, R. (2019). *Fundamentals of Computers*. Oxford University Press, ISBN: 9780199499274, 296 pages
- Anoop, M., Murugeshan S.K. (2013). *Fundamentals of Information Technology*. Narosa Publishing, ISBN: 9788184872439, 236 pages
- Radhakrishnan, N., Ramya, D.S.A. (2023). *Fundamentals of Information Technology*. MJP Publisher, ISBN: 9789355282545, 236 pages
- Doja, M.N. (2005). *Fundamentals of Computers and Information Technology*. Deep & Deep Publications, ISBN: 9788176296755, 428 pages
- Sinha, P.K., Sinha, P. (2004). *Computer Fundamentals. Sixth Edition*. BPB publications, ISBN: 9788176567527, 536 pages
- Gioia, R. (2022). Fundamentals of Information Technology, 3.5 hours on-demand video *lectures*. Available at: udemy.com/course/fundamentals-of-information-technology
- IBM Skills Network Team. (2023). *Information Technology (IT) Fundamentals for Everyone*. 18 hours on-demand video lectures, available at: coursera.org/learn/information-technology-it-fundamentals-for-everyone

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the class discussions.

Course Designed by:

 Dr. Adwitiya Sinha, Associate Professor, Department of Computer Science & Engineering and Information Technology, Jaypee Institute of Information Technology, Noida-62, Uttar Pradesh – 201309

Course Reviewers:

- Dr Nanhay Singh, Professor, Department of Computer Science & Engineering, Netaji Subhas University of Technology, East Campus, New Delhi
- Dr. Vir Bahadur Singh, Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University, New Delhi

Course Title: Database	e Management System		
Course Code:	No. of credits: 3	L-T-P: 20-16-18	Learning hours: 45
		L: Lectu	res; T: Tutorials; P: Practicals
Pre-requisite Course C	ode and Title (if any): No	one	
Department: Natural an	d Applied Sciences		
Course Coordinator:	Co	ourse Instructor:	
Contact Details:			
Course Type:	Co	ourse Offered in: Sem	ester 2

Course Description

This course explores the foundational concepts of database system and its components. This includes modelling of real-world systems using Entity Relationship Diagrams (ERDs). Subsequently, the students will learn to transform these ER models into relational logical schemas, by employing diverse mapping algorithms. The practical knowledge of Structured Query Language (SQL) commands and relational algebraic expressions will be emphasized for efficient query processing. Additionally, the curriculum covers the simplification of databases through the normalization process, with keys and functional dependencies. A crucial aspect of the course involves addressing issues related to atomicity, consistency, isolation, durability, transactions, and concurrency within databases. Overall, the course will help the students to acquire the skills for navigating the intricacies of designing databases, implementing, and managing robust systems.

Course Objectives

- To understand the basic concepts of database systems and components
- To learn usage of entity relationship diagrams using various mapping algorithms
- To apply SQL commands and relational algebraic expressions for query processing
- To manage databases using normalization process using functional dependencies
- To address security issues in databases to safeguard against unauthorized access

Course (Course Content							
Module	Торіс	L	Т	Р				
1	Introduction to Database Design							
	The objective of this module is to foster the understanding of database concepts for designing, implementing, and managing relational data effectively. This will help to ensure optimal storage and retrieval, with a structured approach to data organization. The students will learn about features including generalization and specialization for modelling inheritance and aggregation. This will further assist in representing relationships involving part-whole structures, and other advanced concepts for more complex data modelling scenarios. The module will include the following topics: Introduction to databases, physical level of data storage, structure of relational databases, entity type, attributes, relation types, notations, constraints, Entity Relationship Diagrams (ERD), extended ER features	5	4					
2	Relational Model and Structured Query Language							
	This module illustrates on the facilitation of creation, management, and querying of relational databases. The relational model establishes relationships between tables using keys, enabling the representation of complex relationships in a structured manner. The learns will acquire knowledge on SQL for performing various operations on a database, including data retrieval, insertion, updating, and deletion. The combined proficiency on relational model and SQL will empower students to efficiently design, build queries, and managing relational databases. Following are the topics to be covered in this module:	5	4	8				

	Structured Query Language, relational algebra, data definition, data manipulation, data control			
3	Database Normalisation			L
	This module will enable the students to learn organizing databases efficiently by eliminating redundancy, while preserving data integrity. The knowledge of normalization will help to reduce data anomalies and improve the overall database structure. The process involves breaking down large tables into smaller, well-organized tables, thereby reducing data duplication, and ensuring that relationships between tables are well-defined. The topics to be covered in this module include:	5	4	4
	Data Dependencies, 1NF, partial dependencies, 2NF, transitive dependencies, 3NF, BCNF, multi-valued dependencies, 4NF, 5NF, building normalised databases			
4	Database Applications & Transaction Management			
	This module will highlight the applications of SQL to enhance database capabilities for procedural programming, facilitating complex logic and practical implementation. The learners will acquire the concept of concurrency control manages that are required for database integrity. The module will provide insights on recovery mechanisms to restore database consistency after failures, thereby enhancing robustness. It will also include security measures, encompassing authentication and authorization, thus ensuring data confidentiality and integrity. This module will cover following topics: SQL, introduction to web enabled and multimedia databases, database connectivity, transactions, concurrency, recovery, security	5	4	6
	Total	20	16	18
Practica	1 Data definition languages, basic SQL commands to create, alter, drop, rename, truncate; data types			4
	Basic data manipulation languages for querying & viewing data, like select, insert, update, delete			4
	Data control languages, join, subqueries, commit, rollback, etc., normalization			4
	Database tools, like MySQL, PostgreSQL, SQLite, etc., Minor Project			6
	Total			18
Evaluat	Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 20% Minor Test 2: Written test [at the end of teaching of module 3] 20% Practical: Practical test [including modules 2 and 3] 20% Minor Project: Project-based learning [at the end of teaching of module 4] 10% Major Test: Written test [at the end of the semester, full syllabus] 30% mg outcomes			
By the	end of the course, students will:			
•	Develop an in-depth knowledge of the relational model and database design [moduminor test 1]	ule 1 a	and 2	;
•	Learn the usage of structured query language and database normalisation [module test 2; practical test]	2 and	3; m	inor
•	Attain practical knowhow of managing and manipulating relational databases [mod and 4; minor project; major test]	dule 1	, 2, 3	;,

Pedagogical approach

- The course critically evaluates the concepts of database management system and its components through classroom discussions, lectures, tutorials, project-based learning, and case studies.
- The course will allow learners to engage with enough hands-on sessions that will help in bridging the gap between theoretical concepts of database and practical implementation.
- The course will offer in-depth knowhow of SQL programming and diverse database application.

Reading Resources (* = compulsory readings)

- * Date, C.J., Kanman, A., Swamynathan, S. (2000). *An Introduction to Database Systems* Pearson Education, ISBN: 9780201684193, 938 pages
- * Panneerselvam, R. (2018). *Database Management Systems*. PHI Learning Private Limited, ISBN: 9789387472105, 476 pages
- Bush, J. (2020). *Learn SQL Database Programming*. Packt Publishing, ISBN: 9781838981709, 564 pages
- Nield, T. (2016). *Getting Started with SQL*. O'Reilly Media Publishing, ISBN: 9781491938560, 134 pages
- Ramakrishnan, R., Gehrke, J. (2000). *Database Management Systems*. Tata McGraw Hill Education, ISBN: 9780072465358, 906 pages
- Date, C.J. (2012). *SQL and Relational Theory: How to Write Accurate SQL Code*. O'Reilly Media Publishing, ISBN: 9781449316402, 428 pages
- Chopra, R. (2016). *Database Management System: A Practical Approach*. Fifth Edition. S. Chand Publishing, ISBN: 9789385676345, 669 pages

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the class discussions.

Course Designed by:

• Dr. Adwitiya Sinha, Associate Professor, Department of Computer Science & Engineering and Information Technology, Jaypee Institute of Information Technology, Noida-62, Uttar Pradesh – 201309

Course Reviewers:

- Dr. D. K. Lobiyal, Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Ela Kumar, Professor, Department of Computer Science and Engineering, Indira Gandhi Delhi Technical University for Women, New Delhi
- Dr. Kapil Sharma, Professor, Department of Information Technology, Delhi Technological University, Shahbad Daulatpur, Main Bawana Road, Delhi

Course Title: Sustainability Co	ommunication					
Course code:	No. of credits: 3	L-T-P: 25-20-0	Learning ho	urs: 45	5	
		L: Lectur	res; T: Tutorial	s; P: F	ractic	al
Pre-requisite course code and	title (if anv): None					
Department: Natural and Appli	ed Sciences					
Course coordinator:	Cour	sa instructor				
Contact details:	Cour	se instructor:				
Contact uctans.	Cour	sa offered in: Seme	stor ?			
Course type.	Cour	se onereu m. seme	Ster 2			
Course description	hadia undenstandina	of anotoinability of		This		
familiarize students with how s	basic understanding	of sustainability co	be affectively	This	course	e will ted to
policymakers opinion leaders si	trategic groups and t	the public. The cou	rse will help s	tudents	s deve	elon a
basic understanding of the com	nunication tools and s	strategies used to in	fluence differe	nt stak	ehold	ers in
attaining sustainability. The case	studies and success s	tories of effective s	ustainability co	ommun	icatio	n will
equip them with soft skills require	ed to become profession	onals in sustainable o	levelopment.			
Correct all in stimus						
Course objectives		otiona an un danstan di				ation
• To build an inter and tra	ns-disciplinary perspe	ctive on understandi	ng sustainabilit	y com	munic	ation.
• To empower students to	o critically analyze di	illerent approaches t	ised for strateg	ic con	imuni	cation
To provide students with	nem.	n to the application of	of custoinability	, comn	unice	tion
	r a general introductio	in to the application (of sustainability	comm	lume	uion.
Course content						
Module	Торіс			L	Т	P
1 Basics of Communica	ation					
This is an introducto	ory module for devel	loping a basic und	erstanding of			
communication, a	prerequisite to	understanding	sustainability			
communication. The k	ey concepts discussed	under this module i	nclude:			
1. Communicatio	on concepts, functions	, and principles				
11. Elements of a	toxt poise & offects	irce, message, chan	nei, receiver,			
iii Understanding	the Social Behavior	Change Communica	tion (SBCC)			
its characterist	tics and principles	Change Communica	uton (SDCC),	8	3	
iv SBCC theorie	es - Stages of change	theory theory of so	cial learning	0	5	
diffusion of	innovation media th	eories network th	eories social			
movement the	ories.	leones, network u	corres, social			
v. SBCC Models	s - Social ecological r	nodel, health belief	model, social			
learning, reaso	oned action.					
vi. Barriers to con	mmunication					
vii. New media: co	ommunication in the c	ligital age				
2 Need for communica	ting sustainability					
This module focused	on the need for comm	nunicating sustainab	ility from the			
microscopic to the p	planetary level, thus	making sustainabil	ity visible at			
diverse levels. It des	scribes the various s	strategies used for	sustainability			
communication. The s	pecific domains cover	ed under this modul	e are:			
i. Key stakehol	ders and their role i	in sustainability co	mmunication:			
government, n	nedia, business, thinkt	anks, public, youth		_	~	
ii. Advocacy for	policy change, system	nc change, mass mo	bilization	5	2	
111. Behavior chan	ige communication for	r individual actions				
iv. Training and c	capacity building for k	ey stakeholders				
v. Public particip	Communication	a decision-making	and business			
vi. Environment	Comparate Sector	corporate firms a	and Dusiness			
organizations	- Corporate Sustaina	onity keporting, E	so reporting,			
green advertis	illy Ials for sustainability	communication				

Afte com for o cove i. ii. iii. iii. iv. v. v. vi. vii. vi	r gaining familiarity with the basic concepts and need for sustainability munication, this module discusses frameworks, perspectives, and steps designing strategic communication for sustainability. The focus areas red under this module are: Understanding strategic communication for sustainability - basic principles and its branches Steps in designing strategic communication for sustainability Sustainability communication - concept, communication about sustainability vs Communication of Sustainability (CoS), need, importance, functions, theoretical frameworks - strong sustainability, integrated approach models, Sociological, cultural & psychological perspectives of sustainability communication Systemic-constructivist perspective of sustainability communication Environment Communication - a key instrument of environment policy, Pro-environment behaviours - models, factors, and barriers Designing sustainability communication- includes focus on framing clear goals and objectives, choosing a primary audience, identifying the right tools and media of communication and monitoring, and evaluating communication strategies Steps in planning SBCC process	12	3	
4 App	lication of Sustainability Communication			
Tool i. ii. iii. iii. v. v. v.	 and the incorrection framework for sustainability munication, this module aims to build practical understanding among ents using the best practices and case studies. The specific domains red under this module are: as of sustainability communication and its application (case studies) Advocacy tools for policymakers Corporate Sustainability and ESG Reporting and communication for corporates, green advertising for brands Behavior change communication techniques for the general public Environmental journalism & Role of social media Risk communication for early warning systems Addressing challenges of misinformation 	10	2	
Tota	l	35	10	
Evaluation cr Assignm Minor 7 Minor 7 Major 7 Learning outc	iteria nents: 20% Fest 1: Written test [at the end of teaching of module 1] 15% Fest 2: Written test [at the end of teaching of module 2] 15% Fest: Written test [at the end of the semester, full syllabus] 50%			
Upon successf • Appreci Test 1 • Attain a [Modu • Develop	ul completion of the course, the students would be able to: iate the need for effective communication for attaining sustainability. [Mo] an understanding of the various frameworks and models for sustainabilit ile 3; Minor Test 2] p a practitioner's perspective toward sustainability communication. [Modu pproach	dule 1 ty con le 4; N	& 2; 1 nmunic Iajor T	Minor ation. [est]
 The confoundate efforts. The confoundate and to define the confoundate and the definition of the confoundate and the def	urse will be delivered through lectures and tutorials that focus on d ion of the core concepts of sustainable development and associated interna urse will also focus on classroom discussions and assignments to discuss of levelop student's perspective towards addressing the domain-specific challe	levelop tional current enges.	ping a and na t appro	clear ttional

Reading Resources:

- Barker, L. (1990). Communication, New Jersey: Prentice Hall, Inc; 171
- Brereton, P. (2022). Essential Concepts of Environmental Communication: An A-Z Guide. Routledge.
- Cox, R. (2013). Environmental communication and the public sphere. Sage.
- Devito, J. (2012). *Human Communication*. New York: Harper & Row.
- Godemann, J., & Michelsen, G. (2011). *Sustainability communication-an introduction*. Springer Netherlands.
- Oepen, M. (2006). Strategic Communication for Sustainable Development. GTZ Rioplus, Bonn.
- Robertson, M. (2018). Communicating sustainability. Routledge.
- Zeuschner Raymond F. (1997). Communicating Today. Allyn and Bacon Publisher.

Student Responsibilities

The students must prepare with readings suggested during the class and ensure timely assignment submission. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions.

Course Designed by:

• Dr. Swati Sharma (Kwatra), Independent Environmental Consultant.

Course Reviewers:

- Dr. Archna Kumar, Professor, Department of Development Communication and Extension, Lady Irwin College, University of Delhi, New Delhi
- Ms. Rishu Nigam, Freelancer, Communication Specialist, Ex-TERI

Course	Title: Introduction to Environmental Physics				
Course	e code: No. of credits: 3 L-T-P: 30-15-0 Lear	ning ho	urs: 4	5	
Pre-requisite course code and title (if any): None					
Depart	ment: Natural and Applied Sciences				
Course	coordinator: Course instructor:				
Contac	t details:				
Course	e type: Course offered in: Semester 2				
Course	Description	1 1		1 4	c
This con diverse	backgrounds. Environmental knowledge of environmental physics to un backgrounds. Environmental physics focuses on matter and energy of	dergrad	uate st	udents	from
compon	nents of the Earth and associated processes at various spatial scales. T	The cour	se wil	l enab	le the
students	s to develop a better understanding of the origin and propagation	of vario	ous en	vironn	nental
processe	es and phenomena, and the physical controls governing their behavior	. Upon		etion o	f this
course,	students will have acquired the necessary knowledge to analyze d in addressing real-world environmental challenges	the phy	sical 1	mechai	nısms
Course	e objectives				
The cou	urse aims to build the following basic understanding among students:				
•	Selected fundamental concepts and principles in physics.				
•	How environmental processes and interactions are driven and regulated	by thes	e princ	viples.	
•	How these concepts are used in practical environmental applications.				
Course C Module]	T.	т	р
1	Measurement of Physical Properties: Properties of Gases and Liqu	ids	L	L	-
	Being an introductory module in environmental physics, this module b	ouilds a			
	general foundation for understanding the following basic concepts reg	garding			
	the measurement of different physical variables, properties of gas	es and			
	inquids, and associated fluid dynamics:		4	2	
	Measurement: international system of units, length, time, and mass		•	-	
	Properties of gases and liquids: pressure, volume, temperature, c	lensity,			
	viscosity, heat and thermal conductivity, diffusion, vapor pressure introduction to fluid dynamics, turbulance; Tutorial disparsion of poll	, brief			
2	Motion	utants			
	This module focuses on developing fundamentals of the various pri	nciples			
	involved with entities in motion and the associated forces. These pri	nciples			
	are essential in understanding physical processes such as the movemen	t of air			
	masses, global almospheric circulation, landslides, etc. The contents module are as follows:	of this			
			4	2	
	Motion: motion along a straight line, displacement, velocity and	speed,			
	acceleration, momentum, circular motion, relative motion, friction;	an and			
	atmospheric circulation. Coriolis force				
3	Waves				
	This module introduces principles of wave physics to students and the	various			
	applications of these fundamentals to practical applications in environ	mental			
	investigations. The contents of this module are as follows:				
	Waves: oscillation and resonance, types of waves, amplitude, waveleng	gth and	4	2	
	frequency, wave velocity, propagation, and interference; Tutorials -	sound			
	waves (intensity and sound level), noise, Doppler effect, application $SONAR$ and $RADAR$	ons of			
4	Gravitation				
· · ·	This module introduces students to the fundamental laws and	various			
	phenomena associated with gravitational force. Its focus is prima	rily to			
	impart a basic understanding of how this force impacts earth proce	sses as	3	1	
	through artificial satellites in terrestrial orbits. The contents of this	nodule			
	are as follows:				

	Gravitation: Newton's law of gravitation, gravitational force, acceleration due			
	to gravity, tides, Kepler's laws of planetary motion; Tutorials - artificial satellites - types of Earth orbits and orbital velocity			
5	Thermodynamics			
	Transport of energy and matter as regulated by thermodynamics is the prime driver for many environmental processes and interactions, including the interactions between living organisms and their physical environment. These processes across environmental components are driven by the same transfers irrespective of their scale of operation. This module introduces various concepts and principles of heat transfer to students as covered under following topics:	4	2	
	Thermodynamics: temperature and heat, laws of thermodynamics, thermal expansion, heat transfer mechanisms, convection, conduction, insulation, radiation; Tutorials - specific heat, latent heat, lapse rate			
6	Energy and Radiation Environment			
	This module introduces various concepts related to energy and its sources as well as introduces students to properties of electromagnetic radiation and transport of radiant energy as covered under the following topics:			
	Energy: potential energy, kinetic energy, work and power, conservation of energy, energy sources Radiation environment: absorption and emission of radiation, Planck's law, radiance and irradiance, electromagnetic radiation - spectrum of solar radiation, atmospheric attenuation, terrestrial radiation; Tutorials - radiative properties of natural materials (water, soils, rocks, snow, vegetation), greenhouse effect	4	2	
7	Energy from the Nucleus			
	This module introduces students to the domain of radioactivity and concepts related to harnessing nuclear energy. It also enables them to understand the environmental and health hazards associated with exposure to such energy. The contents of this module are as follows:	3 2	2	
	half-life, nuclear fission, nuclear reactor, thermonuclear fusion; Tutorials - the relation between radiation and health (exposure), case studies (nuclear accidents)			
8	Optics			
	This module introduces principles associated with light and its interaction with different surfaces. It also focuses on practical applications of these principles in various environmental investigations as covered under the following topics:	4	2	
	Optics: reflection, refraction, interference, diffraction, polarization, total internal reflection, dispersion of light; Tutorials - applications of LASER in environmental science, optical instruments, and their applications			
	Total	30	15	
 Evaluation criteria Minor Test 1: Written test [at the end of teaching of modules 1, 2 and 3] 20% Minor Test 2: Written test [at the end of teaching of modules 4, 5 and 6] 20% Major Test: Written test [at the end of the semester, full syllabus] 40% Assignment: 20% 				
 Upon completion of the course, the students will be able to Understand the basic concepts and principles in different branches of physics like energy, thermodynamics, waves, and optics. [Test 1, Test 2, Tutorials/Assignments, Major Test] Realize the physics behind major environmental issues. [Tutorials/Assignments, Major Test] 				
Pedage	ogical approach			
•	• The course will be delivered through class lectures and tutorials.			

• Visual media and tools like Phyphox will be used to make the learning process interesting and interactive for students.

Reading resources

- C. Smith (2001). *Environmental Physics*. Routledge Introductions to Environment, Taylor and Francis.
- E. Boeker and R.V. Grondelle (2011). *Environmental Physics: Sustainable Energy and Climate Change*. Wiley, 3rd Ed.
- Giambattista (2010). Fundamentals of Physics. McGraw-Hill Education (India) Pvt Ltd.
- Giancol, D.C. (2002). Physics: Principles, with Applications. New Jersey: Prentice Hall.
- J. L. Monteith and M. H. Unsworth (2013). *Principles of Environmental Physics: Plants, Animals, and the Atmosphere*. Academic Press, Elsevier, 4th Ed.
- P. Hughes and N.J. Mason (2014). *Introduction to Environmental Physics: Planet Earth, Life and Climate*. Taylor and Francis.

Student Responsibilities

The students must come prepared with readings suggested during the class and ensure timely assignment submission. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions.

Course Designed by:

- Dr. Prateek Sharma, Professor & Vice-Chancellor, Delhi Technological University, Shahbad Daulatpur, Main Bawana Road, Delhi
- Dr. Amit Singh, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

- Dr. Krishan Kumar, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Anshumali, Professor, Indian Institute of Technology (ISM) Dhanbad

Course	Title: Introduction to Environmental Biole	ogy				
Course	code: No. of credits: 3	L-T-P: 37-8-0	Learning h	ours	: 45	
		L: Lectures;	T: Tutorial	s; P :	Pract	icals
Pre-rea	uisite course code and title (if any): None	2		-		
Depart	nent: Natural and Applied Sciences	~				
Course	acondinatori	Course instructory				
Course		Course Instructor:				
Course	type [.]	Course offered in: Semest	ter 2			
Course	Description	course onered in. Semest				
This co	Description	c and advanced concents c	of biology i	n the	conte	ext of
environ	nental sciences. It includes an overview of	biological classifications a	and delves in	nto th	e stru	cture
and fun	ction of plants and the various physiologi	ical processes in plants. Th	ne course a	lso ez	kplore	s the
emergin	g field of environmental genomics and its	applications in biodiversit	y conservat	ion a	nd cli	mate
change	nitigation.					
Course	objectives	f the biological classificat	tions of liv	vina	organ	isms
• 1 ii	actuding recent advancements and debates	i ule biological classifica		mg	organ	151115,
• T	o explore the structure, functions, and	d adaptations of plants	and anima	ls in	n diff	erent
e	nvironmental contexts.					
• 1	o introduce students to environmental	genomics, including its	role in ad	dressi	ing g	lobal
e	nvironmental challenges					
Course c	ontent					
Module		Topic		L	Т	Р
1	Taxonomy and Biological Classifications	S S S		-	-	_
-	This module introduces to the classific	ation of biological system	n and the			
	scientific nomenclature.			4		
	Taxonomic classification and nomencla	ture; biological classifica	tion: five	4		
	kingdoms (emphasis on plant and animal k	tingdom).				
2	Plant Physiology		.1 .			
	This module delivers in detail the physiol	logy of plants that includes	the water			
	discussed under this module include:	Johishi processes. The conc	epis to be			
	Plant-Water relations: mechanism of stor	matal movement; water an	d nutrient	2	2	
	uptake; transpiration.	,		3	2	
	Photosynthesis: mechanisms and enviro	onmental influences; resp	iration in			
	plants; nitrogen metabolism; biologi	ical nitrogen fixation,	ammonia	4		
	assimilation.	role in plant growth and a	Instations			
	plant responses to environmental stresses	physiology of flowering	iapianons,	4		
3	Animal Physiology	<u>1 ja 8ja 18 8</u>				
	Concepts of enzymes, membranes, transpo	ort; metabolism and thermor	regulation;	4		
	animal response to environmental changes	•		4		
4	Environmental Biotechnology					
	This module focuses on introducing the	students to basics of biote	echnology,			
	along with delivering in-depth knowledge	e of biotechnological appli	ications to			
	Introduction to environmental biotechno	blogy: concepts of biotec	hnological			
	processes.		morogical	3		
	Bioreactors: types and designing.			3	2	
	Application of biotechnology in agriculture	e and environmental remedi	iation.	4	2	
5	Basics of Environmental Genomics					
	The module will be introducing the studen	ts to genetics and genomics	s. Through			
	this module, the students will learn about	t the functioning and comp	position of			
	the single gene as well as all genes and influencing the growth and development	their inter-relationships, co	ombinedly			
	module are as follows:	or organisms. The coller				

Concepts of genetics; population genetics and species interactions; gene expression.	4		
Introduction to genomics and environmental DNA; application of			
environmental genomics in conservation biology, climate change studies,	4	2	
remediation studies; case studies.			
Total	37	8	
Evaluation criteria			
• Minor Test 1: Written test [at the end of teaching of module 2] - 20%			
• Minor Test 2: Written test [at the end of teaching of module 3] - 20%			
• Major Test: Written test [at the end of the semester, full syllabus] - 40%			
• Assignments: 20%			
Learning outcomes			
Upon completion of the course, the students will be able to:			
• Understand the basic concepts and principles in different branches of biology like	taxon	omy, j	plant
physiology, animal physiology, biotechnology, and genomics. [Test 1, Test 2,			
Tutorials/Assignments, Major Test]			
• Realize the application of principles of biology in solving major environmental iss	ues. ['	Test 2	,
Tutorials/Assignments, Major Test]			
Pedagogical approach			
The course will be delivered through lectures and tutorials that focus on developin	g a cle	ear	
foundation of the core concepts of environmental biology and genomics.			
The course will also focus on classroom discussions, practical and assignments air	ned at	,	
understanding the living organisms and life processes.			
Reading resources			
• Cutter, E. G. (1969). Plant Anatomy; Experiment and Interpretation: Cells and	l tissi	ies. U	nited
Kingdom: Edward Arnold.			
• Vashishta, P.C. (1997). <i>Plant Anatomy</i> . Pradeep Publications.			
• Verma, S.K and Verma, M (2008). A Textbook of Plant Physiology, Bi	ochen	nistry	and
Biotechnology. S. Chand Publishing.			
• Verma, V. (2007). <i>Textbook Of Plant Physiology</i> . India: Ane Books India.			
Snustad, D. P., & Simmons, M. J. (2015). <i>Principles of genetics</i> . John Wiley & So	ns.		
Student Responsibilities			
The students are required to come prepared with readings that are suggested during the	class	and e	nsure
timely submission of assignments. They are also expected to participate and further	streng	gthen	their

Course Designed by:

• Dr. Sayantee Roy, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by the following reviewers:

- Dr. Indu Shekhar Thakur, (Retd. Professor & Former Dean), School of Environmental Sciences, Jawaharlal Nehru University, New Delhi.
- Dr. Vandana Mishra, Professor, Department of Environmental Studies, University of Delhi.

understanding of concepts through practical sessions and classroom discussions.

Course 7	Title: Introduction to Environmental Chemistry			
Course c	ode: No. of credits: 3 L-T-P: 39-06-0 Learning hour	rs: 45		
	L: Lectures; T: Tuto	rials; l	P: Prac	ticals
Pre-requ	isite course code and title (if any): None			
Departm	ent: Natural and Applied Sciences			
Course c	oordinator: Course instructor:			
Contact	details:			
Course t	ype: Course offered in: Semester 2			
Course I	Description			
The cour	se is about understanding the basic concepts of chemistry. The students would	learn 1	the bas	ics of
physical,	inorganic, and organic chemistry and would accordingly develop the unde	rstandi	ng of	these
concepts	in relation to environment. The reactions, processes that govern the chemi	ical na	ature c	of our
environm	ent and the anthropogenic contaminants that lead to environmental disasters the	e effec	ts, reac	ctions,
and origi	ns of chemicals in the air, water, earth and living environments. It gives a bri	ef bac	kgroun	d and
overview	of chemistry in the environment and then covers a more detailed and in-depth	topics	withir	1 each
compone	nt of the environment. The course describes the chemistry of the atmosphere	, hydr	ospher	e and
fatos of	re and related environmental issues. Specifically, we will examine the sources, real species found in air water and sail followed by gotting insights of m	ictions	, enect	s, and
disasters	around the world	ajor ei	IVITOIII	nentai
uisasters				
Course o	bjectives			
• 0	Dutline the basic concepts of inorganic, organic and physical chemistry in relation	to envi	ronme	nt
• t	Inderstanding the chemical basis behind the range of environmental processes in a	ir, wat	er, and	soil.
• (Gain understanding of major environmental disasters around the world			
Course c	ontent	-	m	D
	Topic	L	Т	P
1	Inorganic Chemistry and Environment	1		
	I his module covers the aspects of basic chemistry and discusses law of			
	conservation of mass, law of definite proportions, law of multiple			
	overview of periodic table. The student would understand what ions molecules			
	and diverse types of chemical bonds are along with molecular and ionic			
	compounds Understand metal non-metals and metalloids. The topics that			
	would be covered in this module will be			
	1. Atomic theory and atomic structure of matter, orbitals, and electronic	12	3	
	ii Deriodic table and periodic properties of elements; ionization energy			
	electron affinity			
	iii. Basic concepts of chemical bonding; ionic, covalent and coordination			
	compound, free radicals, ions			
	iv. Reactions in the atmosphere, water, and soil: chemistry of troposphere,			
	photochemical smog, ozone chemistry, GHGs, CFC's, acid rain,			
	v. Chemical analysis in the field, simple colorimetric tests and			
2	Sensors, chemical analysis in the laboratory using utrimetric methods			
	The module covers the important tonics of physical chemistry and tries to			
	explain the concepts of rates of chemical reactions half-life period order of			
	reactions. The module will cover the concept of solubility, normality, molarity.			
	catalysis, chemical equilibria, stoichiometry, buffer solutions and			
	electrochemistry			
	i. Chemical kinetics, chemical equilibria, differential and integrated	14		
	rate laws. Properties of solutions; solution process, solubility,			
	concentration, mole concept			
	n. Reactions in aqueous solution; actu dase reactions, actu dase equilibria oxidation reduction			
	iii Thermo- and nuclear chemistry enthalpy entropy laws of			

 thermodynamics, radioactivity, half-life, nuclear processes, food and fuels iv. Electrochemistry, voltaic cells, Gibb's energy, corrosion electrolysis, batteries, and fuels v. Weathering; physical and chemical, heavy metals, toxicity and bioaccumulation, Environmental impact of Hg, F, Pb, Cd, As, U, Second State and the state of the food of the state of the food of the state of	, , 1				
acid-base chemistry of natural waters due to the CO ₂ /carbonate system and chemical equilibrium equations. Acid mine drainage (us appropriate chemical equations) and its impact on natural waters, majo source(s) of the drinking water contaminants.	1 2 r				
3 Organic Chemistry and Environment					
The module covers the introduction to organic chemistry including the concept on hydrocarbons, alkanes, functional groups, chirality in organic chemistry. Th students would also be exposed to the biomolecules and would learn basic aspects of biochemistry.	3 9 8				
 i. General characteristics of organic molecules. ii. Hydrocarbons, unsaturated hydrocarbons, functional groups. iii. Chirality in organic chemistry iv. Introduction to biochemistry, proteins, carbohydrates, nucleic acids v. Soil chemical properties, and dominant reactions mechanisms, the us and impacts of fertilizers, insecticides, herbicides, and wood preservatives. The nature of soil, soil properties, important soil chemical reactions, COD, BOD 	8 1 1	3			
4 Case Studies of Environmental Disasters					
Japan's four big pollution disease, Bhopal gas tragedy, Chernobyl disaster Arsenic poisoning, Fluorosis, Fukushima nuclear accident, London smog Ecuador's Amazon degradation, Italy's Seveso dioxin cloud, France's Amoc Cadiz tanker spill, Romania's cyanide spill, Ivory Coast's toxic waste dumping Deep water horizon oil spill	, , , , , , ,				
Total	39	6	0		
 Evaluation criteria Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 25% Minor Test 2: Written test [at the end of teaching of module 3] 25% Major Test: Written test [at the end of the semester, full syllabus] 50% 					
 By the end of the course, students will be able to: Describe the generic details of inorganic chemistry, understand the internal structukinds of chemical bonding, generations of ions, free radicals. Once they gain these processes they will learn about ozone depletion, environmental effects tropospheric chemistry with photochemical smog, and how this leads to the " 	re of at he unde of acic natural'	coms, d erstand l depo ' greer	liverse ing of sition, house		
 effect., evidence of global warming. [Module 1; Minor Test 1] Learn about physical chemistry concepts on kinetics, solutions, electro and nuclear chemistry, buffer solutions, concepts of acid-base. The students would be able to understand the concept of normality, molarity, mole concept etc. [Module 2; Minor Test 2] The chemistry of hydrocarbon, biomolecules/macromolecules thus will help them to understand the 					
concepts of organics in soils. Aerobic decomposition of organic matter in natura measurement of BOD, COD and qualitatively describe how these measurements a and 4; Major Test]	l waters are mad	s, theor e. [Mo	ry and odule 3		

Pedagogical approach

- The course critically evaluates the concepts of chemistry and apply it in environmental processes understanding thus develops discussion in classroom through lectures, case studies and tutorials.
- The course will use several case studies for environmental pollution. The journal publications will be given to develop robust understanding of severe environmental problems

Reading Resources (* = compulsory readings)

- *Ibanez, J.G. Esparza, M.H., Serrano, C.D., Infante, A.F. (2006). *Environmental Chemistry Fundamentals* Springer
- *Ball, D.W., Hill, J.W. and Scott, R.J. (2011). *The basics of general, organic, and biological chemistry*. Open Textbook Library.
- *Corwin, C.H. (2011). Introductory chemistry: Concepts and critical thinking. Pearson Prentice Hall.
- Monks, P., Farmer, J. G., Graham, M. C., De Mora, S. J., Pulford, I., & Hulsall, C. (2007). *Principles of environmental chemistry*. Royal society of chemistry.
- Dara, S. S., & Mishra, D. D. (2006). *A textbook of environmental chemistry and pollution control*. S. Chand Publishing.
- Andrews, J. E., Brimblecombe, P., Jickells, T. D., Liss, P. S., & Reid, B. (2009). An introduction to environmental chemistry. John Wiley & Sons.
- De Anil, K. (2023). Environmental chemistry. New Age International Publishers.

Journals

Environmental Pollution, Elsevier

Bulletin of Environmental Contamination and Toxicology

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the discussion.

Course Designed by:

• Dr. Chander Kumar Singh, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

- Dr. Dhanesh Tiwari, Professor, Department of Chemistry, IIT-BHU
- Dr. Anshumali, Professor, Indian Institute of Technology (ISM) Dhanbad

Course T	itle: Introduction to Remote Sensing			
Course c	ode: No. of credits: 3 L-T-P: 35-05-10 Learning hour	s: 45		
	L: Lectures; T: Tuto	orials;	P: Pra	ctical
Pre-reau	isite course code and title (if any): None			
Departm	ent: Natural and Applied Sciences			
	aardinator:			
Contact of	lotaile.			
Course ty	vne: Course offered in: Semester 2			
Course D				
Remote s	ensing has transformed our understanding of the earth system science as an	integr	ated s	vstem
providing	us an essential source of environmental information to get in-depth understand	ding of	f trend	is and
strategize	management plans for a range of environmental applications. This course is	desig	gned f	or the
undergrad	luate students to appreciate the development of remote sensing discipline as a cur	tting-e	dge sc	ience.
With intro	oduction to its development the student would also dwell into understanding the	scienc	e and	art of
the remote	nsing discipline. This course will focus on the basic concepts of physics used in e sensing processes for application of satellite datasets in environmental studies ar	n unde d its n	rstand	ing of ment
With this	s necessary background, course participants will use remote sensing data	to und	lerstar	d the
informatio	on extraction about the features using elements of image interpretation. The cours	e will	also p	rovide
the insigh	ts in wider domain of monitoring and applications in different domains of environ	ment.		
Course o	bjectives			
• T	o develop broader understanding of fundamentals of remote sensing.			
• 1 • T	o understand remote sensing data applications in various domains of environment.			
Course c	ontent			
Module	Торіс	L	Т	Р
1	Remote Sensing of Environment			
	The objective of this module is to gain familiarity with the phrases, terms and			
	jargons used in remote sensing. The module introduces remote sensing			
	concepts, its development, application, and future scope. The module further			
	strengthens the broader understanding of different domains where remote			
	sensing can be applied for problem understanding and its solution. The thematic(s) in this module are:			
	i. What is remote sensing, how remote sensing helps in identifying the	6	2	2
	challenges of environment, advantages/disadvantages.			
	ii. Historical development of camera (sensor) and platform aided in			
	development of remote sensing, active and passive sensors.			
	iii. International and National Space Programs			
2	Physics of Remote Sensing, Platforms, Sensors			
	This module introduces the concepts of electromagnetic radiation its			
	interaction with atmospheric components. The physical laws associated with			
	matter and energy would be introduced. The students are made aware of how to			
	use electromagnetic radiation understanding to visualize satellite data and	0		
	features. This module addresses the concepts of:	8		3
	i. Laws of reflection and refraction			
	iii. Electromagnetic radiation-matter interaction			
	iv. Principles of transmission, absorption, reflection, and emission			
3	Data Models, Resolutions, Elements of Image Interpretation			
	This module discusses "raster and vector data models." The student is exposed			
	to what types of data exists in domain of geoinformatics and how this can be			
	used for depiction and visualization, and information. The module also describes different resolutions associate with satellite datasets. The following			
	topics are introduced in this module:	6		3
	i. Data models and sources	-		-
	ii. Spectral response patterns and spectral signature			
	iii. Elements of image interpretation			
1	iv. Resolutions: spatial, spectral, temporal, radiometric			

4	Remote Sensing Applications			
	Once the students are aware of the basic concepts of remote sensing, data types,			
	they would be made aware about the applications of satellite data in the domain			
	of forest/vegetation/urban landscape/atmosphere/earth surface. The module will			
	cover the following topics:	15	3	2
	i. Remote sensing of vegetation (forest and agriculture)	10	5	-
	ii. Remote sensing of water			
	111. Remote sensing of urban objects/landscape			
	IV. Remote sensing of atmosphere and clouds	25	~	10
Practics	110tai al Modules	35	5	10
Website	s for data sources (knowing about different sensors and their characteristics)			2
Interpre	t features of satellite dataset			3
Explore	ERDAS Imagine Interface/OGIS			3
Spectral	Signatura			2
Special Total	Signature			10
				10
Evaluat	ion criteria			
•	Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 20%			
•	Minor Test 2: Written test [at the end of teaching of module 3] 20%			
•	Program 20%			
Loorn	Fractical 20%			
By the	and of the course students will:			
Dy the	Command a broader understanding of how the current technology has evolved over	the ve	are an	d
	how development of different technologies contributed to development of this disci	nline	Under	stand
	the key concepts of remote sensing involving physical laws to understand the satell	ite dat	a [Mo	dule 1
	and 2: Minor Test 1]	ne aut	u. [1110	uule 1
•	Develop knowhow of types of data models used and its requirement. Understand	ing th	e foun	dation
	how to interpret satellite images/extract features from satellite dataset [Module3; M	inor T	'est 2]	
•	Develop understanding on the information content of remotely sensed data and h	now to	retrie	ve the
	information. To understand the conceptual, theoretical, basis for use of satellite d	lataset	s for v	arious
	applications by developing understanding based on module 1, 2 and 3. [Module 1,	2, 3, 4	4; Prac	cticals,
	Major Test]			
Pedago	gical approach			
•	The course critically evaluates the concepts of remote sensing and builds the discus	sion in	ı class	room
	through lectures, case studies, tutorials, practical.			
•	The course infuses the interest in remote sensing through hands-on on satellite data	as we	ll as th	rough
	the tutorials.			
Reading	g Resources (* = compulsory readings)		• · · ·	
•	Jensen, J. R. (2009). Remote sensing of the environment: An earth resource persp	ective	2/e. P	earson
	Education India.			
•	Campbell, J. B., & Wynne, R. H. (2011). Introduction to remote sensing. Guilford j	press.	, , .	T 1
•	Lillesand, T., Kiefer, R. W., & Chipman, J. (2015). <i>Remote sensing and image in</i> Wiley & Sons.	nterpre	etation	. John
•	Joseph, G. (2005). Fundamentals of remote sensing. Universities Press.			
Student	Responsibilities			
The stuc	lents are required to come prepared with readings that would be given in the class.	The stu	idents	are
required	to participate in the discussion.			

Course Designed by:

• Dr. Chander Kumar Singh, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by the following reviewers:

• Dr. Pawan Kumar Joshi, Professor School of Environmental Sciences, Jawaharlal Nehru University, New Delhi-67, India Dr. Ram Avtar, Associate Professor, Faculty of Environmental Earth Science, Hokkaido

University, Japan

Course Ti	le: Ancient Indian Sustainable Practices			
Course co	le: No. of credits: 2 L-T-P: 20-10-0 Learning hour	s: 30		
	L: Lectures; T: Tuto	rials;	P: Prac	ctical
Pre-requis	ite course code and title (if any): None			
Departme	nt: Natural and Applied Sciences			
Course co	ordinator: Course instructor:			
Contact d	etails:			
Course ty	Course offered in: Semester 2			
Course De This course of ecologic study tradi to peaceful is to apply Course ob 1. Analyse embed forest of 2. Evalua methoo 3. Exami enviro 4. Explor moder	scription offers a thorough examination of Ancient Indian Sustainable Practices, exploring al knowledge woven throughout the historical and cultural context of ancient Ir ional crafts, spiritual ecology, sustainable farming methods, and moral principles cohabitation with the natural world through an interdisciplinary approach. The important historical lessons to guide current sustainability initiatives jectives e Traditional Ecological Knowledge (TEK): examine the traditional ecolo- ded in ancient Indian practices, with a focus on sustainable agriculture, water conservation. te sustainable agricultural practices: critically assess organic farming techniques ls, and biodiversity conservation strategies employed in ancient Indian agriculture the spiritual ecology and environmental ethics: analyze the connection beto mental ethics, and the establishment of sacred landscapes in ancient India. e contemporary relevance: assess the adaptability and relevance of ancient practices. metantal	g the india. S s that i goal o ogical mana; , wate e. ween tices in	ntricate students led soc of the co know gement r harve spiritu n addre	e web s will ieties ourse ledge t, and esting nality, essing
Course Co	ntent Torria		T	D
	10ptc ntroduction to Ancient Indian Wisdom on Sustainability	L	1	ľ
	 i. Overview of ancient Indian civilization Indus valley civilization vedic period Maurya and Gupta empires ii. Philosophical foundations of sustainability based on ancient vedic scriptures - 4 vedas, upanishads, puranas etc - concepts of dharma and ahimsa harmony with nature in hinduism, buddhism, and jainism. The cyclical view of time in Indian philosophy. iii. Traditional Ecological Knowledge (TEK) in ancient India practices for sustainable agriculture water management techniques, forest conservation and sacred groves. 	6		
2	ustainable Agriculture in Ancient India			
	 i. Organic farming practices crop rotation and companion planting use of natural fertilizers (e.g., cow dung, compost) traditional pest control methods (stubble issue - pollution) ii. Water harvesting and management, stepwell systems, tank irrigation, aqueducts, and canals iii. Biodiversity conservation in agriculture, sacred groves, and their ecological significance, indigenous crop varieties, and seed saving 	4		
3	raditional Crafts and Sustainable Lifestyles		L I	
	 i. Handicrafts and cottage industries, handloom, weaving pottery, and terracotta, traditional carpentry ii. Barter system and local economies community-based economies, role of trade guilds 	4		

	 iii. Material recycling and upcycling in ancient India, reuse of materials in construction, upcycling of clothing and accessories iv. Sustainable health practice and lifestyle management - ayurveda and yoga, other alternate medicinal channels like naturopathy 					
4	Spiritual Ecology and Environmental Ethics					
	 i. Sacred landscapes and environmental sanctity, pilgrimage sites with ecological importance, environmental protection as a religious duty ii. Ethical guidelines for sustainable living, non-violence (ahimsa) and its application in daily life, responsible consumption, and minimalism iii. Case studies: eco-friendly monasteries and temples, architectural designs promoting natural ventilation and lighting, sustainable practices in religious institutions 	4				
5	Contemporary Relevance and Adaptation					
	 i. Learning from the past: modern applications incorporating ancient practices in contemporary agriculture, reviving traditional crafts for sustainable livelihoods ii. Challenges and opportunities in implementing ancient practices, balancing tradition with technological advancements, community engagement for sustainable development iii. Field visits and practical applications: visits to eco-friendly villages iv. Hands-on experience in traditional crafts and farming 	2	5			
6	Project Work		5			
	 i. Group projects on sustainable community development, developing sustainable models for a chosen community presentation and evaluation of project outcomes ii. Research paper on a specific ancient practice, in-depth study of a selected sustainable practice, analysis of its potential application in the modern context. 					
	Total	20	10			
Evaluatio	on criteria linor Test 1: Written test [at the end of teaching of modules 1 and 2] 25% linor Test 2: Written test [at the end of teaching of module 3] 25% lajor Test: Written test [at the end of the semester, full syllabus] 50%					
 Learning outcomes By the end of the course, students will: Demonstrate knowledge: exhibit a comprehensive understanding of the philosophical, ecological, and cultural foundations of ancient Indian sustainable practices. Evaluate sustainable agricultural techniques: critically evaluate and compare sustainable agricultural practices from ancient India and assess their contemporary applicability. Integrate spiritual ecology and ethics: integrate spiritual and ethical dimensions into discussions on environmental conservation and sustainable living. Contribute to sustainable development: propose and implement sustainable community development projects based on lessons learned from ancient Indian practices. Reflect on contemporary issues: reflect on contemporary sustainability issues considering historical practices, fostering a critical perspective on current environmental challenges Pedagogical approach The course critically evaluates the concepts of data sciences and develops discussion in classroom through lectures, case studies and tutorials. 						
• T pi	he course will have the filed visits like some villages, cow sheds etc to understand actices in the modern context	the su	staina	ble		

Reading Resources

Here are some key references that can serve as valuable sources for understanding sustainable practices in ancient India:

- Guha, R. (2000). *The unquiet woods: Ecological change and peasant resistance in the Himalaya*. University of California Press.
- Hodge, H. N. (2013). Ancient futures: learning from Ladakh. Random House.
- Patel, S. K., Sharma, A., & Singh, G. S. (2020). *Traditional agricultural practices in India: an approach for environmental sustainability and food security*. Energy, Ecology and Environment, 5, 253-271.

Research Papers and Journals: Explore academic journals like the

"Journal of Ethnobiology and Ethnomedicine" and "Environmental History" for specific research

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the discussion.

Course Designed by:

• Dr. Neeraj Sharma, Professor of Practice, Department of Policy and Management Studies, TERI School of Advanced Studies, New Delhi

Course Reviewers:

- 1. Dr. Sushil, Professor Emeritus, Department of Management Studies, Indian Institute of Technology, Delhi.
- 2. Dr. Sanjay Verma, Professor, Indian Institute of Management
- 3. Dr. Priyanka A Arora, Asst. Professor, Adhia College of Law, JVPD-Juhu, Mumbai

Course T	itle: Personality Development for Success			
Course co	ode: No. of credits: 2 L-T-P: 20-10-0 Learning hour	s: 30		
	L: Lectures; T: Tuto	orials;	P: Pra	ctical
Pre-requi	site course code and title (if any): None			
Departm	ent: Natural and Applied Sciences			
Course co	oordinator: Course instructor:			
Contact d	letails:			
Course ty	Course offered in: Semester 2			
Course d	escription			
In our dy: challenges undergrad inspiration challenges peace.	namic world, filled with constant changes and diverse lifestyles, students often s that impact their overall well-being and future achievements. This course is des uate students with valuable insights and practical tools for navigating life's com n from timeless wisdom, this course explores the intersection of ancient teach s, providing students with the skills to approach life with resilience, confidence	encour signed plexition hings a , and l	ter int to emp es. Dr and m asting	tricate power awing odern inner
• E • R • U • A	 xploring happiness perspectives: Delve into the multifaceted concept of happiness, considering both material dimensions. Analyse the factors shaping individual happiness in today's context. edefining success: Examine success beyond conventional measures, exploring diverse dimensio Integrate spiritual principles to redefine and pursue authentic success. nderstanding conditioning and unveiling the real self: Analyse societal and personal conditioning that shapes beliefs and behaviou Learn techniques to decondition the mind, fostering independent thinking. ttaining sustainable happiness and success: Integrate practices promoting long-term well-being and success. Develop resilience through spiritual insights when facing life's challenges. 	and sp ions.	piritua	1
Course C	ontent			
Module	Торіс	L	Т	Р
1	Discovering Your Authentic Self			
	 i. Embracing body changes Exploring the noticeable changes our bodies go through at different life stages. Introducing the idea of identity and how it differs from our everevolving physical form. ii. Building blocks of the body and the illusion of identity Taking a closer look at the various elements that make up our physical bodies. Unveiling the misconception of tying our identity to the constantly changing body. iii. Finding the "real you" within Delving into the philosophical concept of the "Self" or the authentic self. Understanding where the essence of who we are resides within our physical selves. iv. The inner exploration: connecting with your true self Guiding students through introspective activities to help them connect with their genuine selves. 	2	2	
2	Navigating the Landscape of Happiness			
	 i. Diving into happiness realms Introducing the diverse facets of happiness: physical, mental, 	4	2	

	 and intellectual dimensions. Exploring everyday sources of joy in our modern lives. ii. The Journey of happiness in adulthood Reflecting on the understanding that sources of happiness evolve over time. Exploring the concept of lasting joy during the mature stages of life. iii. Cultivating inner and lasting happiness Guiding towards the exploration and cultivation of enduring happiness. Emphasising the idea that true happiness exists independently of external circumstances. 			
3	Navigating Paths to Success	1		1
	 What success means Unpacking the meaning of success Exploring various definitions of success Understanding how society and personal beliefs shape our view of success Personalized success and the journey to lasting fulfilment Recognizing the significance of personalized paths to success Discovering individual routes to sustainable success Emphasising lasting fulfilment over temporary achievements 	4	2	
4	Understanding Human Responses			1
5	 i. Diverse responses to life's challenges Exploring reasons behind varied responses Discussing the impact of upbringing, family, society, and education on perspectives ii. Reading without filters Examining how conditioning shapes reading approaches Discussing the role of cultural and educational conditioning in text interpretation iii. Shaping our view of the world Investigating conditioning's role in perception Discussing individual and cultural conditioning's impact on event interpretation iv. How we listen, focus, and process Exploring conditioning's influence on listening, focus, and information processing Discussing cultural and societal influences on communication styles 	4	2	
5	Cultivating Positive Thinking: Lessons from Indian Scriptures			
	 i. Introduction to positive mindset Understanding the relevance of positive thinking in our daily lives, as highlighted in the Bhagavad Gita. Discussing fundamental concepts that encourage a positive mindset for personal growth. ii. Harnessing the power of positive affirmations Exploring the practical use of positive affirmations for personal development, drawing inspiration from the Bhagavad Gita. Discussing verses from the Bhagavad Gita that promote self-empowering affirmations. iii. Nurturing gratitude and positivity Emphasizing the importance of gratitude in fostering a positive mindset. Exploring verses from the Bhagavad Gita that underscore the value of gratitude in daily life. 	6	2	
	iv. Overcoming challenges through positive thinking			

	, · · ·				
• Discussing how positive thinking serves as a tool for					
overcoming life's challenges.					
• Exploring verses from the Bhagavad Gita that offer guidance					
during tough times.					
Total	20	10			
Evaluation criteria					
• Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 25%					
• Minor Test 2: Written test [at the end of teaching of module 3] 25%					
• Major Test: Written test [at the end of the semester, full syllabus] 50%					
Learning outcomes					
After completing this course, the students will be able to:					
• Explore and understand the real self:					
 Investigate the nature of the self through self-reflection and exploration. 					
 Develop a deeper understanding of one's authentic self beyond societal experience 	ectatio	ns.			
• Learn the art of positive thinking:					
 Understand the power of positive thinking in personal development. 					
 Incorporate positive affirmations and gratitude into daily life. 					
Effectively manage stress and time:					
 Recognize stressors and apply stress management techniques. 					
 Manage time effectively by integrating Bhagavad Gita's wisdom on time an 	d actic	ons.			
• Foster a holistic perspective on life:					
 Develop a comprehensive and holistic perspective on life. 					
 Embrace interconnectedness and balance in personal and professional sphere 	es.				
Pedagogical approach					
• The course critically evaluates the concepts of holistic living with the focus on ac	chievin	ig hap	piness		
and success, and develops discussion in classroom through lectures, case studies and	d tutor	ials.			
Reading resources:					
The following textbooks independently cover all the five modules:					
• Narayan Goswami B.V. (2015). Srīmad Bhagavad-gītā, 4th Edition. Gaudiya Vedar	nta Put	blicatio	ons.		
• Chopra, D. (2010). The Seven Spiritual Laws of Success-One Hour of Wisdom: A	Pocket	tbook	Guide		
to Fulfilling Your Dreams. Amber-Allen Publishing.	- D		4 1		
• Yogananda, P. (2005). Autobiography of a Yogi: The Original 1940 Eattion plu	s Boni	us ma	teriai.		
Civitia Clarity Fublishers.	or Dub	licatio	n 0		
• Singer, M. (2007). The unternetied sour. The journey beyond yoursely. New Harding	Covey		0118. orchin		
• Covey, S. K. (1991). The seven naous of memory effective people. Flovo, 01. Covey Leadership Center					
• Lama D (2009) The art of happiness: A handbook for living Penguin					
Student Responsibilities					
The students are required to come prepared with readings that would be given in the class	The	studer	nts are		
required to participate in the class discussions.					
A A Free Free Article					
Course Designed by:					

• Dr. Neeraj Sharma, Professor of Practice, Department of Policy and Management Studies, TERI School of Advanced Studies, New Delhi

Course Reviewers:

- Dr. Sushil, Professor Emeritus, Department of Management Studies, Indian Institute of Technology, Delhi,
- Dr. Sanjay Verma, Professor, Department of Information Science, Indian Institute of Management, Ahmedabad
- Dr. Priyanka A Arora: Asst. Professor, Adhia College of Law, JVPD-Juhu, Mumbai

Course	Title:	Constitutional Values and Fundamental Duties					
Course	code:	No. of credits: 2 L-T-P: 27-3-0 Learning ho	urs: 3	0			
Pre-requisite course code and title (if any): None							
Department: Natural and Applied Sciences							
Course coordinator: Course instructor:							
Contac	t details	Course offered in Semaster 2					
Course	type:	Course onered in: Semester 2					
This comprehensive course delves into the foundational principles that govern a nation's governance and social structure, with a primary focus on constitutional values and fundamental duties. The students will explore the relationship between these elements and their significant role in shaping a just and equitable society.							
Course The course • (s • t • t • (h	 Course objectives The course aims to inculcate the following basic understanding among students: Comprehend the exact practical meanings of the terms like sovereignty, democratic republic, and secularism. Understand and decipher the concepts of justice, liberty, equality, and fraternity Understand and inculcate citizen accountability and citizen obligations Comprehend the fundamental duties of preservation of unity and integrity of the nation, culture, harmony, and environment 						
Course Modulo	conten	t Topia	T		D		
1	Identif	ication of Constitutional Values under the Constitution of India: An	intro	duction	1 1		
	i.	Framing of the Constitution of India - salient features - establishment of Sovereign, Socialist, Secular, Democratic Republic.					
	ii.	Preamble of the Constitution of India.	9				
	iii.	Purpose and objectives enshrined in the Preamble.					
	iv.	Concept of Basic Structure.					
2	Basic ı	Inderstanding of Constitutional Values: Justice, Liberty, Equality, F	raterr	nity			
	i.	Justice - social, economic, political					
	ii.	Liberty - thought, expression, belief, faith, and worship					
	iii.	Equality - status and opportunity, equality before law and equal protection of law, natural justice, and due process of law.	7				
	iv.	Fraternity - dignity of the individual, unity, and integrity of the nation					
	v.	Meaning, basis, and power of judicial review.					
3	A Brie	f Introduction to Fundamental Rights	2				
	i.	Fundamental Rights - an introduction.					
	ii.	Fundamental Rights - striking a balance between individual liberty and public interest.					
4	Funda	mental Duties under the Constitution of India		L L			
	i.	Meaning and source of Fundamental Duties $\{42^{nd} Amendment, Part IV-A; Article 51-A\}$					
	ii.	Respect for institutions, National Flag, National Anthem, and Symbols; Protect Natural Environment; Development of Scientific Temper {Article 51-A(a), (g), (h) and DPSP - Article 48A)	6				
	iii.	Preservation of Unity and Integrity of the Nation, Composite Culture					

	and Harmony {Article 51 - A(c), (e), (f)} iv. Education and awareness of Fundamental Duties and Constitutional values - 51A (k) and Art.21A				
5	Fundamental Duties - Practical Application		I		
	i. Relationship between Fundamental Duties and Fundamental Rights				
	ii. Enforcement of Fundamental Duties.	2	2		
	iii. Citizen's obligations and participation	3	3		
	iv. Role of youth - Practical Application.				
	Total	27	3		
 Minor Test 1: Written test [at the end of teaching of modules 1 and 2] 20% Minor Test 2: Written test [at the end of teaching of module 3] 20% Major Test: Written test [at the end of the semester, full syllabus] 40% Assignment: 20% Learning outcomes Upon completion of the course, the students will be able to: Demonstrate a deep understanding of the historical development and evolution of constitutional values and fundamental duties within the context of India's governance structure. Apply critical thinking skills to analyze and interpret constitutional values such as justice, liberty, equality, and fraternity in legal and societal contexts. Assess the implications and responsibilities associated with fundamental duties within the framework of individual and collective civic engagement. Analyze scenarios where the alignment of values and duties contributes to the overall well-being of a democratic nation. 					
Pedage	societal issues. gical approach A combination of lecture based, and discussion-based learning would be used.				
 Reading resources Chemerinsky, E. (2019). Constitutional law: principles and policies. Aspen Publishing. Bakshi, M.P (2023). Constitution of India. LexisNexis, Vol 1, 19th edition. Basu, D. D. (2023). An Introduction to the Constitution of India. 26th edition, New Delhi, Prentice Hall. Pylee, M. V. (1998). An Introduction to the Constitution of India. New Delhi. Austin, G. (1966). The Indian Constitution: Cornerstone of a Nation. Oxford, Oxford University Press. Austin, G. (2000). Working a Democratic Constitution: The Indian Experience. Delhi, Oxford University Press. Khosla, M. (2012). The Indian Constitution. Oxford University Press. Fali S Nariman (2023). You Must Know your Constitution. Student Responsibilities The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions. 					

- Dr Moumita Mandal, Assistant Professor, Department of Policy and Management Studies, TERI School of Advanced Studies, New Delhi
- Mr. Sachin Sharma, Advocate and Founder Vaikuntha Law Advisory & Guest faculty at TERI School of Advanced Studies, New Delhi

Course Reviewers:

- Dr. T.V. Subba Rao, Professor-Emeritus and Chairperson, Vivekananda School of Law and Legal Studies (VSLLS) and Former professor at National Law School of India University, Banglore.
- Dr. Shiju M. V., Professor School of Law, Sai University

Enclosure 5

Course title: Holistic Personality Development							
Course co	de:	No. of credits: 2	L-T-P: 22-08-0	Learr	ning ho	ours: 30)
Pre-requis	ite course code and ti	tle (if any): No pre-re	equisite required				
Department: Natural and Applied Sciences							
Course co	ordinator(s):		Course instructor(s):				
Contact d	etails:						
Course ty	pe: Value Added Con	urse under Indian	Course offered in: Seme	ester 1			
Knowledge	System						
Course de	scription						
The world	with the new ways of I	living including devel	lopment of technology is	putting	g press	ure on j	people
in more that	an one way. While the	development leading	to advancement and the	change	es in ev	ery sph	ere of
life is visib	le, however its impact	to create a peaceful w	vorld and a happy individ	lual is a	a suspe	ct. The	issues
of sustaina	bility, environmental	changes, depleting en	nergy resources are add	ing to 1	the alro	eady ex	sisting
multiple u	resolved issues affecti	ing the overall happin	less and success of the ir	ndividua	als. We	must l	ook at
the vast lit	erature available at ou	r end in the form of a	ancient wisdom coming	through	h vario	us scrip	otures.
The course	e helps to even solve	these fundamentals	issues and helps create	a powe	erful p	ersonal	ity by
following t	he vast available know	ledge in Indian script	ures.				
Course ob	jectives						
The course	aims to achieve the fo	llowing objectives					
 Unders 	tanding real self						
 Unders 	tanding the contours o	f happiness					
 Deeply 	understand the levels	of real success	10				
Phenor	nenon of conditioning	and how to decondition	on oneself				
Course co	ntent				т	T	D
Module					L	I	P
1	Introduction						
	The courses begin	with the discussing	the need of looking a	at the			
	scriptures itself in th	scriptures itself in the first place. The course helps to understand the					
	limitations that the	s that the human beings have and therefore the theories					
	propounded from tin	ne to time become 1	tutile and does not lead	to a			
	definitive formula that	at can provide perma	nent happiness and succ	ess to			
	individuals. It also e	examines that what co	omes first "nappiness" (or the	2		
	of hoppings. The op	amines what the contract of th	ours of success and the	levels			
	the scriptures is also	discussed as the introd	ductory part of the course	n anu a Tha			
	concept of a human	body along with the	infinite power inside it t	nakes			
	the course holistic	body along with the	infinite power inside it i	nakes			
2	Understanding Real	Solf					
2	Every individual no	tices that the body	(physical appearance)	keens			
	changing from the	time we become c	onscious about it ie	from			
	childhood to school a	ige to college age to t	the working age to the ol	ld age			
	and finally the deat	th. However, our id	lentity does not change	e and	4	2	
	therefore helps us exa	amine that object which	ch does not change despi	te the	-	-	
	changing external ph	vsical shape. The stu	dents will learn that wh	at are			
	constituent elements	of the body and w	vithin this bodily frame	work,			
	where lies the 'self' of	or the 'real self'					
3	Understanding the p	ohenomenon of Happ	oiness				
	The course explores t	the levels of happines	s and how to reach the h	ighest			
	level of happiness. Th	he kinds of happiness	are described below:	c			
	i. Physical hap	piness (attained throu	igh physical means - hig	h and			
	comfortable l	iving - eating, lodging	g, travelling, gatherings)				
	ii. Mental happ	oiness - country with	nning matches, school	team	1	r	
	winning quiz	zes, compatriots gettin	ng international awards.		4	۷	
	iii. Intellectual h	nappiness - winning	a debate, authoring a	good			
	article, preser	nting a paper, creative	ely solving a complex pro	oblem			
	practically						
	iv. Permanent h	appiness - especiall	y at the mature stage	s, we			

	realize that the things which earlier used to give happiness does					
	not give the same level of happiness. This section explores how					
	we can reach the level where the happiness and not temporary					
	but permanent. At this level, the contours of happiness do not					
	depend on outside factors but are situated within.					
4	Understanding Contours of Success					
	The success is defined differently by different people or in other words it					
	is dependent on time, place and circumstances. This section helps the					
	students to identify the real definition of the success. This will help					
	students define the individualized definition of success.					
	i. Definition of success					
	ii. Contours of success	4	2			
	iii. Relative vs absolute success					
	iv. Individualized success					
	v. Route to success					
	vi. Route to permanent success					
5	Phenomenon of Human Conditioning and Process of Decondition					
	This part of the course explores that why different people react					
	differently to various situations. This is due to the different kind of					
	upbringing- kind of family, society, education system, country, continent,					
	and individuals thought process. Often this becomes the issue in					
	understanding the genuine issues of life/work. Unless we understand the					
	phenomenon of conditioning, we cannot reach the level of happiness or					
	the success.					
	i. Conditioning in reading	4				
	ii. Conditioning in perceiving					
	iii. Conditioning in processing of listening					
	iv. Conditioning of the focus					
	Once the person understands the phenomenon of conditioning, the					
	phenomenon of deconditioning starts too.					
6.	Case Study (Gitopnishad) to modify personality traits					
	1. Positive thinking - the scriptures very clinically diagnose the					
	reasons of negative and positive thinking and recommends the					
	way to permanent positive thinking					
	11. Public speaking - the hesitation to speak in public or have the	4	2			
	stage fear is nothing but our own thinking/mindset/conditioning					
	111. Life management - the session does not only cater to stress or					
	time management but goes beyond to file management					
	Total	22	08			
Evaluatio	on criteria					
• T	est 1: Written test [Module 1 & 2, after 5-6 weeks of teaching] 20%					
• T	est 2: Written test [Module 3 & 4, after 12-13 weeks of teaching] 20%					
• T	est 3: Written test [Module 1 to 6, end of semester] 40%					
• T	utorials: ten tutorial assignments spread over entire semester 20%					
Learning	outcomes					
After con	pleting this course, the students will be able to					
• D	Develop Awareness about powerful and holistic personality					
• Understand the concept of real self						
• plan for achieving higher success						
• Practice principles of happiness						
• Can take the leadership position to create a better society						
Reading	Reading resources:					
The following textbooks independently cover all the modules.						
• N	arayan Goswami B.V. (2015). Śrīmad Bhagavad-gītā, 4th Edition. Gaudiya V	Vedanta	ı			
Р	ublications.					
• 0	hopra, D. (2010). The Seven Spiritual Laws of Success-One Hour of Wisdom.	A Poc	ketbool	k		
6	uide to Fulfilling Your Dreams. Amber-Allen Publishing.					
• Y	ogananda, P. (2005). Autobiography of a Yogi: The Original 1946 Edition plu	ıs Bonı	ıs Mate	rial.		
C	rystal Clarity Publishers.					
• Singer, M. (2007). The untethered soul: The journey beyond yourself. New Harbinger						

Publications.

- Rinpoche, S. (2012). *The Tibetan book of living and dying: A spiritual classic from one of the foremost interpreters of Tibetan Buddhism to the West.* Random House.
- Vasudev, J., & Sadhguru. (2016). *Inner engineering: A yogi's guide to joy (p. 30)*. New York: Spiegel & Grau.
- Jeste, D. V., & Vahia, I. V. (2008). *Comparison of the conceptualization of wisdom in ancient Indian literature with modern views: Focus on the Bhagavad Gita*. Psychiatry: Interpersonal and Biological Processes, 71(3), 197-209.

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course Designed by:

• Dr. Neeraj Sharma, Professor of Practice, Department of Policy and Management Studies, TERI School of Advanced Studies, New Delhi

Course Reviewers:

- Dr. Sushil, Professor Emeritus, Department of Management Studies, Indian Institute of Technology, Delhi,
- Dr. Sanjay Verma, Professor, Department of Information Science, Indian Institute of Management, Ahmedabad
- Dr. Priyanka A Arora: Asst. Professor, Adhia College of Law, JVPD-Juhu, Mumbai

MSc (Energy Studies and Management)

Global Energy Workforce Dynamics

Energy sector currently employs over 65 million people globally, with the profiles being distributed across the business value chain - fuel supply (coal, oil, gas and bioenergy), power sector (generation, transmission and distribution) and end use (energy efficiency for buildings and industry). It is estimated that USD 2.8 trillion was invested in the energy sector in the year 2021, across various verticals - renewables, coal, oil, gas, nuclear, grids, storage, equipment manufacturing, efficiency improvements and electrification.

A massive transition is currently underway in the energy sector, with several countries as well as business corporations including fossil majors, working towards net zero emissions (NZE). As per some estimates, investment of \$12-15 trillion is required annually in the energy sector to meet the goals as enshrined under the Paris Climate Agreement. This may lead to a profound change in the global energy ecosystem, including in terms of the employment dynamics.

Overview of Indian Energy Workforce

India is the third largest country in terms of energy consumption (800 million tonnes of oil equivalent), with three quarters contributed by fossil based fuels. The energy sector in India currently employs over 8 million people directly, with four times this number employed (involved) indirectly. The profiles varies across a range of themes (technical, managerial, commercial, social, economic and environmental) and sectors (conventional fuels, renewables, EVs, grid management). The country is the third largest in terms of total installed power capacity and fourth-highest contributor to renewable energy, with ambitious targets to have over 40% share of clean energy in its grid by the year 2030, and achieve NZE by the year 2070. Recent initiatives also mandate steadily increasing targets for biofuels and sustainable aviation fuel. A number of private corporations and public utilities are working towards achieving net-zero, with major fossil industry players orienting their portfolio accordingly.

The energy demand of the country is expected to quadruple in the coming decades, powered by a high economic growth (rising income levels), amidst efforts to decarbonize the economy. A booming economy under an impending energy transition has the potential to create over 35 million jobs across the business value chain – conventional fuels (coal, oil and gas), as well as the upcoming clean energy themes (renewables, electric vehicles, storage, green hydrogen, green buildings). In addition, policy reforms such as the 'Production Linked Incentives' (PLI) schemes shall boost local manufacturing of green products, including electrolysers, solar cells and battery storage systems.

A growing (and transitioning) energy sector shall provide enormous opportunities to our youth, both in the domestic market as well as internationally. Niche educational programmes need to be initiated to train them on a variety of skillsets, enabling them work across the energy business value chain.

Need Assessment

Skillsets required in the fast evolving '*Energy*' sector are inter-disciplinary in nature, varying across a range of themes - technical, social, managerial, commercial, economic and environmental. The sector is being accorded high importance amidst climate challenges and NZE commitments. This presents tremendous professional opportunities for the students pursuing a range of UG programmes with an inter-disciplinary approach (which became more pronounced

after NEP). However, only a limited number of institutions offer MSc in Energy (and related subjects), with most offering M.Tech (Energy), or MBA (Power).

Within TERI School of Advanced Studies (TERI SAS), it has been observed students across various programmes have been opting for energy specific electives, besides undertaking research on related aspects. This is partly because of the reason that over the last few years, job profile of energy sector has changed, from being hired by pure energy companies to hiring by mainstream corporates towards managing their energy portfolio (especially after the advent of ESG and NZE). These organizations are coming at TERI SAS campus and absorbing students from the generic MSc programmes.

The proposed curriculum has been designed keeping into consideration the pre-existing knowledge levels of the UG students belonging to diverse backgrounds not limited to engineering graduates only and the business needs of the sector.

References:

- World Energy Investment, IEA (2023)
- Mapping Skills Landscape for Green Jobs, Skill Council India (2021)
- World Energy Employment, IEA (2021-22)
- India's Expanding Clean Energy Workforce, Skill Council India (2022)

Programme Overview

It is proposed to start MSc (Energy Studies and Management) at the TERI School of Advanced Studies. This shall be a two-year full time programme with an academic credit load of 80- credits and fits in at Level 6.5 as per National Higher Education Qualifications Framework (NHEQF).

The aim shall be to equip the participants/ students with suitable knowledge so as to contribute meaningfully on the various facets of the energy sector, besides strengthening the skill ecosystem of the country.

Program Objectives

- Empower students with niche knowledge and skillsets in the field of energy
- Enable students contribute meaningfully as energy sector professionals, ensuring sustainable development.

Programme Specific Outcomes

- Grasp fundamentals on energy resources, technologies, production and conservation aspects
- Understanding the business value chain and role of stakeholders
- Analyse the efficacy of energy policies cum programmes
- Comprehend the concept of energy transition and sustainable development
- Acquaintance with upcoming technologies, business models and market platforms
- Demonstrate knowledge and understanding of scientific and management principles towards project design and development
- Utilization of computing technologies and tools for techno-commercial assessment
- Contribute towards research and development on all aspects of energy

Eligibility Conditions

A Bachelor's degree in Science/ Engineering/ Economics/ Mathematics/ Statistics/ Geology/ Geography/ Commerce/Management/Computer with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate. 80 credits

MSc (Energy Studies and Management)

<u>Programme Outline</u>

Courses	Credits	Broad Themes
S	EMESTER-	1
Introduction to Energy Resources, Systems and Technologies	3	Types, Resources, Technologies, Statistics
Energy System Infrastructure & Operations	3	Understanding the value chain of energy/ power system
Climate Change and Energy Transition	3	UNFCCC-CoP, Net-Zero, Mitigation & Adaptation Strategies, Just Transition
Energy Conservation, Audit and Management	3	Policy & Regulations, EEC Opportunities, Energy Audit, Business Models
Energy Science Lab	3	Basic Electrical & Thermal Experiments
Basic Computer Programming	0	Basic computer programming and structured
	(Audit)	program logic environment
Introduction to Sustainable Development	1	Understanding SDGs
Communication Skills & Technical Writing	2	Skill development
Total semester credits	18	
S	EMESTER-	2
Firm and Dispatchable Energy – Resources, Technologies, Applications	3	Coal, Gas, Hydro, Nuclear, Biomass and Biofuels
Variable Energy and Decentralized Systems-	3	Solar, Wind & Hybrid Power, Distributed and
Resources, Technologies, Applications		Decentralized Generation
Building Energy Management and Green Building	3	Building Physics, Active & Passive, Rating Systems
Energy Project Management	3	Project Lifecycle, Stakeholders, Business Models, Entrepreneurship
Energy Markets and Trading	3	Short & Long-Term Markets, Open Access, Oil & Gas Trading, Carbon Markets
Energy Systems Lab	3	Experiments on Solar, Wind & Biomass Technologies
Total semester credits	18	
S	EMESTER-	3
Minor Internship (Summer)	6	Research on Industry Problems
Energy Policy, Planning and Programmes	3	Policy– Legislations, Regulations, Entities
Energy Finance & Economics	3	Project Appraisal, Techno-Commercial Appraisal, Evaluation Tools
Computing Tools and AI Applications in Energy Sector	3	Fundamentals, Regression, Clustering, Optimisation: S/W- PVSyst. WAsP, Energy Plus
ESG and Sustainability reporting	3	Corporate Commitments, ESG Practices &
Advancements in Energy Processes, Systems	3	Green hydrogen, Energy Storage Systems.
Technologies and Applications		Electric Vehicles, Carbon Capture & Utilization
Elective(s) from other programmes at TERI SAS	3	Geoinformatics/ Economics/ CSP/ ESRM/ MBA/ LLM/REEM
Total semester credits	24	
S	EMESTER-	4
Major Project/ Internship	20	Working on an industrial Problem
Total semester credits	20	
TOTAL PROGRAMME CREDITS	80	

LIST OF STUDENTS WHO WILL BE AWARDED DEGREES AND OTHER ACADEMIC TITLES BASED ON FINAL EXAMINATION 2023

Doctoral Degrees

Ser. No.	Name	Reg. No.	In recognition of the research work
1	Sujeet Kumar Thakur	1800341RSP	Synthesis and characterization of functionalized carbon nanomaterials and their application in biological systems
2	Priya Bhatnagar	1613RPA	Legal and regulatory framework of the Indian coal sector: A critical analysis
3	Nidhi Gautam	1236RPB	Emerging perspectives in Indian Micro, Small and Medium Enterprises (MSMEs) sector with special reference to textile sector
4	Priya Bhatnagar	1636RBB	Interaction of the dengue virus non-structural protein 5 (NS5) with host proteins
5	Prabhakaran T R	1700529RSP	Weather shocks, adaptation and impacts on rice producers
6	Varsha Srivastava	1336REB	Valorization of fruit and vegetable waste generated in hotels of National Capital Region for recovery of high value compounds
7	Aishwary Kant Gupta	1700607RSP	Economic analysis of non-tariff measures on trade of marine products
8	Prasanta Kumar Swain	1900520RSP	A study on the impact of digitalization of agricultural markets through the national agriculture market scheme (e-NAM)
9	Aaina Dutta	1623RPA	Investigating households' preferences for grid- connected solar rooftop systems: A case study of Jammu and Kashmir
10	Meenakshi Kumar	1434WSGB	Multifunctionality of urban green infrastructure for the competitive advantage of cities in India
11	Maya Chaturvedi	1800608RSP	Transcriptome profiling of gastric spheroid to determine the heterogeneity of gastric cancer cells
12	Asif Nazar	1629REB	Technical and economic aspects of electrical energy storage in grid balancing
13	Vivek Kumar Singh	1422RBA	Development of Cytoplasmic Genic Male Sterile (CGMS) lines in Bhut Jolokia (Capsicum chinense x Capsicum frutescens)

Ser No.	Name	Registration No.
1	Deeya Banerjee	2000053MAS
2	Aastha Chaudhary	2000250MAS
3	Akshata Sinha	2100020MAS
4	Ann Susan Mathew	2100021MAS
5	Arihant Jain	2100022MAS
6	Arpita Elisheba M Victor	2100023MAS
7	Aryamaan Sinha	2100025MAS
8	Himanshu Sharma	2100028MAS
9	R Jananni	2100029MAS
10	Janhvi Mishra	2100030MAS
11	Keara Bakshi	2100031MAS
12	Khushi Sehgal	2100032MAS
13	Kritika Sharma	2100033MAS
14	Kshitij Madan	2100034MAS
15	Mahima Malyan	2100035MAS
16	Meghna Menon	2100036MAS
17	Aniket Renatus Clytone	2100037MAS
18	Shivani Keshav Narvekar	2100041MAS
19	Shivansh Khandelwal	2100042MAS
20	Shreyasa Mukherjee	2100043MAS
21	Utkarsh Singh	2100045MAS
22	Vrinda Negi	2100046MAS
23	A K Yogesh Chandra	2100047MAS
24	Yukta Fotidar	2100048MAS
25	Yuvika Pharaswal	2100049MAS
26	B Pranava Lalitha	2100252MAS
27	Shama Parveen	2100253MAS
28	Chris Teresa Varghese	2100254MAS
29	Ayushi Saharan	2100255MAS
30	Mudra Shahi	2100256MAS
31	Deepak Kumar	2100257MAS
32	Simran Kaur Kalra	2100287MAS

MA (Sustainable Development Practice) - lass of 2021

M.Sc. (Environmental Studies and Resource Management) - class of 2021

Ser No.	Name	Registration No.
1	Aditi Sharma	2100132MSE
2	Aparajita	2100134MSE
3	Archana Pandey	2100135MSE
4	Archie Kapoor	2100136MSE
5	Arti Pandit	2100137MSE
6	Ayushi Kashyap	2100138MSE
7	Ayushi Singh	2100139MSE
8	Devaki B Nair	2100140MSE
9	Dipanshu Chaturvedi	2100141MSE
10	Gauranshi Chamoli	2100142MSE
11	Gourav Pandurang Mali	2100143MSE
12	Isha Narayan	2100145MSE
13	Lovish Raheja	2100146MSE
14	Mahima Kejriwal	2100147MSE
15	Manas Agrawal	2100148MSE

16	Minu Kumarswami	2100150MSE
17	Muskan Rawat	2100152MSE
18	Neha K N	2100153MSE
19	Prerna Goel	2100154MSE
20	Rajvidya Rajendra Wadalkar	2100155MSE
21	Ramsha Khan	2100156MSE
22	Ruby	2100157MSE
23	Sakshi Mishra	2100158MSE
24	Spandan Kumar	2100162MSE
25	Srihitha Veeranna	2100163MSE
26	Stefi Basumatary	2100164MSE
27	Surabhi Hemantkumar Modhiya	2100165MSE
28	Titikhya Barman	2100166MSE
29	Tiyasha Sengupta	2100167MSE
30	Ujjay Mohan	2100168MSE
31	Urvika Goel	2100169MSE
32	Vanshi Mayankkumar Shukla	2100170MSE
33	Varsha Yadav	2100172MSE
34	Wrishika Bhattacharya	2100174MSE
35	Aparna Binjola	2100272MSE
36	Shreya Satish Gadre	2100288MSE
37	Amlan Roy	2100133MSE
38	Vishal Bijani	2100173MSE

M.Sc (Geoinformatics) - class of 2021

Ser No.	Name	Registration No.
1	Aakash Warman	2100175MSG
2	Aayush Verma	2100176MSG
3	Afrin Zaidi	2100177MSG
4	Arkadipta Das	2100178MSG
5	Hemakshi Malik	2100179MSG
6	Isha Sharma	2100180MSG
7	Kanika Bhatia	2100181MSG
8	Kriti Dadhichi	2100182MSG
9	Kritika Singh	2100183MSG
10	Ohviya Raja Prakash	2100184MSG
11	Pratiksha	2100185MSG
12	Rajarshi Singh	2100187MSG
13	Ridhima Singh Dhankhar	2100188MSG
14	Shailesh Kumar Jha	2100189MSG
15	Uddipta Das	2100190MSG
16	Nandhini R	2100258MSG
17	Aswin S	2100259MSG
18	Kanchan Tomar	2100260MSG
19	Anandi Mathur	2100280MSG
20	Puspa Sharma	2100281MSG
21	Prisha Pareek	2100186MSG

M.Sc. (Plant Biotechnology) - class of 2021

Ser No.	Name	Registration No.
1	Afreen Siddiqui	2100215MSP
2	Diyotima Karfa	2100216MSP

3	Ishika Katiyar	2100217MSP
4	Mamta Negi	2100218MSP
5	Manika Bhatia	2100219MSP
6	Mehr Munjal	2100220MSP
7	Tanishka Uttam	2100221MSP
8	Devshree Singh	2100266MSP
9	Tanmai Saxena	2100267MSP

M.Sc. (Climate Science and Policy) - class of 2021

Ser No.	Name	Registration No.
1	Adhya Burman	2100050MSC
2	Akshita	2100051MSC
3	Arna Ghosh	2100052MSC
4	Bhoomika Ramesh	2100053MSC
5	Janhavi Bhujabal	2100054MSC
6	Manal Iqbal	2100055MSC
7	Neha Brajesh Singh	2100056MSC
8	Paritosh Joshi	2100058MSC
9	Pratyush Pranjal	2100059MSC
10	Shivanshi Patwal	2100060MSC
11	Shivika Tiwari	2100061MSC
12	Srishti Anand	2100062MSC

M.Sc (Economics) - class of 2021

Ser No.	Name	Registration No.
1	Aastha Dutt	2100063MSO
2	Aditya Singhai	2100064MSO
3	Amulya Varma	2100067MSO
4	Ankit Kumar	2100068MSO
5	Arpit Beniwal	2100070MSO
6	Dipali Gupta	2100075MSO
7	Divisha Garg	2100076MSO
8	Gayatri Capoor	2100077MSO
9	Ishita Tayal	2100078MSO
10	Khushboo Madaan	2100080MSO
11	Khushi Rani	2100081MSO
12	Kriti Sharma	2100082MSO
13	Krittika Dirghangi	2100083MSO
14	Maanya Garg	2100086MSO
15	Manvi Gupta	2100087MSO
16	Mehak	2100088MSO
17	Muskan Ailawadhi	2100089MSO
18	Muskan Mittal	2100090MSO
19	Nikita Malik	2100092MSO
20	Nishtha Munjal	2100093MSO
21	Radha Arora	2100098MSO
22	Raunak Jha	2100099MSO
23	Riddhi Mehan	2100100MSO
24	Riddhi Mukherjee	2100101MSO
25	Ridhima Joshi	2100103MSO
26	Rishabh Jain	2100104MSO
27	Roopam Singh	2100105MSO

28	Sakshi Bansal	2100106MSO
29	Sheen Bhayana	2100109MSO
30	Shreeya Shah	2100110MSO
31	Shreya Annie Mathew	2100111MSO
32	Shreya Gupta	2100112MSO
33	Shubhangi Chadha	2100113MSO
34	Simran Sukhija	2100114MSO
35	Soham Roy	2100115MSO
36	Uday Dubey	2100121MSO
37	Vandana Shankar Vidhani	2100123MSO
38	Vanshika Jain	2100125MSO
39	Vrinda Arora	2100129MSO
40	Ria Pal	2100284MSO

M.Sc. (Water Science and Governance) – class of 2021

Ser No.	Name	Registration No.
1	Bhumika Khatreja	2100222MSW
2	Kalpana Patel	2100223MSW
3	Karamveer Yogendrasinh Jadeja	2100310MSW

MBA (Sustainability Management) - class of 2021

Ser No.	Name	Registration No.
1	Aman Randhawa	2100202MBS
2	Charvie Mishra	2100203MBS
3	Farha Khan	2100204MBS
4	Maaz Nazar	2100205MBS
5	Mahima Mall	2100206MBS
6	Manshita Aggarwal	2100207MBS
7	Muralidharan Varadharajan	2100208MBS
8	Muskan Madhok	2100209MBS
9	Neeti Mahajan	2100210MBS
10	Rishika Dutt	2100212MBS
11	Robin Singh	2100213MBS
12	Swarna Singh	2100214MBS
13	Kaishvi Jha	2100250MBS
14	Gitanjali Diwan	2100251MBS
15	Chetna	2100275MBS
16	Anjali Bhaisora	2100277MBS
17	Arya Mishra	2100306MBS
18	Owais Rahman	2100307MBS
19	Shardul Arvind Venegurkar	2100308MBS

M.Tech (Renewable Energy Engineering and Management) – class of 2021

Ser No.	Name	Registration No.
1	Haritha Rajesh	2100001MTR
2	Nithin Manjooran Cherian	2100003MTR
3	Prafull Singh	2100004MTR
4	Pranayak Sharma	2100005MTR
5	Pratyaksh Sharma	2100006MTR
6	Saptarshi Kar	2100007MTR
7	Somya Katta	2100009MTR
8	Sonu Kumar	2100010MTR

9	Suparna Havelia	2100012MTR
10	Siva Prasad	2100013MTR
11	Yuga Pramod Bele	2100014MTR
12	Ganeshdeekshith Siragam	2100246MTR
13	R Vidyesh	2100268MTR
14	S Shruthi	2100270MTR
15	Gargi	2100271MTR
16	Yash Vipul Majithia	2100311MTR
17	Dwaipayan Chakraborty	2100312MTR
18	Naman Kansal	2100313MTR

M.Tech (Urban Development Management) – class of 2021

Ser No.	Name	Registration No.
1	Harsha Burnwal	2100192MTU
2	Megha Chauhan	2100193MTU
3	Tejashrri Kasar	2100195MTU
4	Harshita Katiyar	2100262MTU

M.Tech (Water Resources Engineering and Management) – class of 2021

Ser No.	Name	Registration No.
1	Adeel Ahmed Siddiqui	2100196MTW
2	Gaurav Fouzdar	2100197MTW
3	Sayyad Sahil Ahmed	2100200MTW
4	Yukti Sharma	2100201MTW
5	Aditya Nath	2100263MTW
6	Bharg Modi	2100264MTW
7	Mohammad Imroz	2100283MTW
8	Chetan Narayan Malusare	2100309MTW

M.A.(Public Policy and Sustainable Development) - class of 2021

Ser No.	Name	Registration No.
1	Aarti Sachdeva	2100015MAP
2	Brijendra Swaroop	2100016MAP
3	Ajay Kumar Singh	2100295MAP
4	Anirban Chakrabarti	2100017MAP
5	Deepa Parameswaran	2100018MAP
6	Roohi Khan	2100298MAP

LLM – class of 2022

Ser No.	Name	Registration No.
1	Debashish Dash	2200260LLM
2	Drishti Tiwari	2200261LLM
3	Jyoti Yadav	2200262LLM
4	Kunal Karan	2200263LLM
5	Meghna Sharma	2200264LLM
6	Mranal Sharma	2200265LLM
7	Parisha Vishnoi	2200266LLM
8	Paritosh Bisen	2200267LLM
9	Parul Sharma	2200268LLM
10	Priyabrat Kumar	2200269LLM
11	Rananjay Singh Aswal	2200271LLM

12	Sabeeha Ali	2200272LLM
13	Shivangi Vashishta	2200273LLM
14	Shubham Sharma	2200274LLM
15	Sparsh Peter	2200275LLM
16	Mohd Sufiyan Khan	2200276LLM
17	Sushree Sunanda Sahu	2200277LLM
18	Vanita Awasthi	2200278LLM
19	Yamini Rajora	2200279LLM
20	Yash Sharma	2200280LLM

Post Graduate Diploma in Public Policy and Sustainable Development

Ser No.	Name	Registration No.
1	Aishwarya	2100015MAP
2	Manju Maan	2100300MAP
3	Shubhjeet Shandilya	2100301MAP
4	Neeraj Singhal	2200307MAP
5	Tilotama Varma	2200311MAP
6	Yogesh Kumar	2200313MAP