M. Sc. (Physics) Programme

SYLLABI

(Semester - 1)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

P. D. PATEL INSTITUTE OF APPLIED SCIENCES MASTER OF SCIENCE

Syllabus Details

Effective Year 2019-20

Degree : M.Sc. (PHY) Semester : 1

Total Subjects : 9
Total Regular Subjects : 6
Total Elective Subjects : 3

Group Name : UNI. ELECTIVE-I

		Teaching Scheme			Examination Scheme								
Course Code	Course Title	CREDIT			тн		PR		Pi	રા			
Code		тн	PR	PRJ	TOTAL	TOTAL HOURS	Internal	External	Internal	External	Internal	External	TOTAL
MA771.01	RELIABILITY AND RISK ANALYSIS		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
EE781.01	OPTIMIZATION TECHNIQUES		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
ME781.01	OCCUPATIONAL HEALTH & SAFETY		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
CE772.01	RESEARCH METHODOLOGY		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
CA730	INTERNET AND WEB DESIGNING		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
PT795.01	HEALTH & PHYSICAL ACTIVITY		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
NR755	FIRST AID & LIFE SUPPORT		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
RD701.01	INTRODUCTION TO ANALYTICAL TECHNIQUES	-	2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
RD702.01	INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
MB650	CREATIVE LEADERSHIP		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
PH891	COMMUNITY PHARMACY OWNERSHIP		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
PD261	ASTROPHYSICS, SPACE AND COSMOS-I		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100

Date : 29/06/2019

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

P. D. PATEL INSTITUTE OF APPLIED SCIENCES MASTER OF SCIENCE

Syllabus Details

Effective Year 2019-20

Degree : M.Sc. (PHY) Semester : 1

Total Subjects : 9
Total Regular Subjects : 6
Total Elective Subjects : 3

Group Name : Regular

			Teaching Scheme			Examination Scheme							
Course Code	Course Title	CREDIT				тн		PR		PRJ			
Code		тн	PR	PRJ	TOTAL	TOTAL HOURS	Internal	External	Internal	External	Internal	External	TOTAL
PS725	MATHEMATICAL METHODS OF PHYSICS	4.00			4.00	4.00	0/30	28/70	-	-	-	-	100
PS726	CLASSICAL MECHANICS	4.00			4.00	4.00	0/30	28/70	-	-	-	-	100
PS727	ELECTRONICS	4.00			4.00	4.00	0/30	28/70	-	-	-	-	100
PS728	LABORATORY PHYSICS-I: ANALOG AND DIGITAL ELECTRONICS		4.00		4.00	6.00			0/50	40/100	-	-	150
PS729	LABORATORY PHYSICS-II: COMPUTER PROGRAMMING		4.00		4.00	6.00	-		0/50	40/100		-	150
PS730	SPECIAL THEORY OF RELATIVITY	2.00			2.00	2.00	0/15	14/35	-	-	-	-	50
					22.00	26.00							650

Group Name : HSS-PHY-I

		Teaching Scheme			Examination Scheme								
Course Code	Course Title	CREDIT		тн		TH P		R	PF	PRJ			
Code		тн	PR	PRJ	TOTAL	TOTAL HOURS	Internal	External	Internal	External	Internal	External	TOTAL
HS704 E	ACADEMIC SPEAKING		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100
1S703.01 E	LANGUAGES (FRENCH)		2.00		2.00	2.00	-	-	0/30	28/70	-	-	100

Total Credit for Regular Subjects : 22.00

Total Credit for Elective Subjects : 4.00

Total Credit : 26.00

Date: 29/06/2019

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

P. D. PATEL INSTITUTE OF APPLIED SCIENCES MASTER OF SCIENCE

Syllabus Details

Effective Year 2019-20

Degree : M.Sc. (PHY) Semester : 1

Total Subjects: 9Total Regular Subjects: 6Total Elective Subjects: 3

Examination Grade Range & Value

Grade	Grade Points	From Marks	To Marks
AA	10.00	80	100
AB	9.00	75	79
BB	8.00	70	74
BC	7.00	65	69
CC	6.00	60	64
CD	5.00	55	59
DD	4.00	50	54
FF	0.00	0	49

Date : 29/06/2019

PS725 Mathematical Methods of Physics

1.	1 *	ment/Centre/School	PHYSICS				
2.	Course	•	Mathematical Methods of Physics				
3.		structure	3-1-0				
4.	Credits		4				
5.		number	PS725				
6.		Status (Course Categor					
0.	1	mme Core for:	M.Sc. Physics				
7.		uisite(s)	NIL				
8.		vis-à-vis other courses	THE				
0.			ed by taking this course (significant or	verlan)			
	(a)	Significant Overlap with any UG/PG	NIL				
	course of the						
	1	Dept./Centre/ School Significant Overlap	NIL				
	\ /	with any UG/PG	NIL				
	course of other						
		Dept./Centre/ School					
9.	· · · · · ·	owed for	NIL				
10.		offered in	Semester -1				
11.			rse: Dr. Krunal Kachhia/Dr. Bhask	rar			
11.		Dr. Sweta Dabhi	isc. Di, Kianai Kacima/Di, Dhasi	Kui			
12.		e course require any	No				
		g faculty?					
13.		objectives					
	"To int	roduce students to various	ous mathematical methods useful in Pl	nysics. To			
	provide	e problem solving tech	niques using these mathematical met	hods "			
14.	Course	contents:					
	"Comp	lex functions, Analy	ytic function, Complex Integration	n, Cauchy's			
	theorem	n, residue theorem, tran	sformations of elementary functions,	conformable			
	1 * *		perators, inner product, orthogo-	•			
			oblem, diagonalization, Hilbert spac				
			ensors, inner and outer products, syn				
				oup Theory,			
			ac delta functions, Application to the	solutions of			
4.5		ntial equations "					
15.		Outline(with topics an		27 0			
	Module	2	Topic	No. of			
	no.		A 1 (' C (' C 1	hours			
	1	Complex function	,	14			
		Integration, Cauc					
		mappings of	elementary functions, conformable				
	2	11 0	rators, inner product, orthogonallity	10			
		and complet		10			
		1					
	diagonalization, Hilbert space						

	3		m, FT of Dirac delta functions,	6					
			solutions of differential equations						
	4	*	r and Levi Civita tensors, inner and	6					
			mmetric and antisymmetric tensors,						
		covariant and contr							
	5	Group Theory,	, .	6					
			oup representation, Lorentz group.						
16.	Brief de								
	Module	Description		No. of					
	no.								
	1	Analysis of Comp	Analysis of Complex functions, Analytic functions,						
		Cauchy theorem,	Cauchy integral formula, Residue						
		theorem.							
	2	Vector space, Linea	Vector space, Linear transformations, Hilbert space						
	3	Fourier transform a	and its applications	02					
	4	Introduction to Ten	nsors,	02					
	5	Group Theory		02					
17.	Brief de	escription of Practical /	Practice activities						
	Module	No. of							
	no.			hours					
18.	Brief de	g component							
			its would do self-learning from book						
		=	nments / term papers etc.)						
	Module	T-	Description						
	Module	1 1	Real Functions, Complex Numbers						
	Module	•	Matrices						
19.	Suggest	nitials, Title,							
	Edition.								
	1. F. W. Byron and R. W. Fuller, Mathematics of Classical and Quantum								
	Physics, Vol 1-2, Dover Publications, Inc., New York, 1992.								
	2. Complex Variables and Applications, J.W. Brown & R.V. Churchill, 7th Ed.								
	2003, Tata McGraw-Hill.								
	3. Mary L Boss, Mathematical Methods in Physical Sciences, 3rd Edition, John								
	Wiley & Sons, India.								
	4. Arfken& Weber, Mathematical Methods for Physicists (6th edition), Elsevier,								
	Academic Press (2012).								
			r Physicists and Engineers, by K.F.	Reily, M.P.					
	Hob	son and S.J. Bence.							
20.	Resourc	ces required for the cour	rse (itemized student access requirem	ents, if any)					
	20.1	Software	C/C++/Fortran compilers, Code	block					
	20.2	Hardware	Computers						
	20.3	Teaching aids (videos,	Not as such						
		etc.)							
	20.4	Laboratory	Computer Laboratory						
	20.5	Equipment	Computers						
	20.6	Classroom infrastructu	*						
	20.7	Site visits	Not required						
	20.8	Others (please specify)	<u> </u>						
		20.6 Others (pieuse speerly) Trone							

21.	Design content of the course (Percent of student time with examples, if possible)				
	Design-type problems	Nil			
	Open-ended problems	Nil			
	Project-type activity	Nil			
	Open-ended laboratory work	Nil			
	Others (please specify)	Nil			

PS726 CLASSICAL MECHANICS

1.	Department proposing to	t/Centre/School	PHYSICS				
2.	Course Title		Classical Mechanics				
3.	L-T-P struc		3-1-0				
4.	Credits	tare	4				
5.	Course num	nher	PS726				
6.		tus (Course Category f					
	Programme		M.Sc. Physics				
7.	Pre-requisit		NIL				
8.		-vis other courses	1112				
			by taking this course (significant overlap)				
	(a) Sigrany	nificant Overlap with UG/PG course of Dept./Centre/ School	NIL				
	any	nificant Overlap with UG/PG course of or Dept./Centre/ool					
9.	Not allowed	d for	NIL				
10.	Course offe	ered in	Semester 1				
11.	Faculty who Shah, Shwe		: Kinnari Parekh, Bhaskar Bo	rah, Manan			
12.	Will the covining factor	urse require any ulty?	No				
13.	Course obje	ectives sful completion of this	course, a student should be all and its formal aspects thorous				
14.	Course conconstraints,	tents: generalized coordinat n laws, Hamilton's eq	es, action principle, symmetric uations, poisson brackets, can-	es and onical			
15.	Lecture Ou	tline(with topics and n	umber of lectures)				
	Module no.		Topic	No. of hours			
	1	Constraints and Principle of virtual v Examples.	generalized coordinates, work, D'Alembert's Principle,	4			
	2	Action principle, La motion and its applic undetermined multip	pliers, velocity dependent on function, applications of				
	3	Symmetries and con and Noether's theore	nservation laws, invariance 4				
	4		nd cyclic coordinates, of motion (Hamiltonian	8			

	1	T	
		formalism and equations of motion), Poisson	
		brackets and canonical transformations,	
		examples, phase space, Liouville's equation	
	5	Central force motions, Motion in Central force,	6
		classification of orbits, Kepler's laws, scattering	
		in a central field	
	6	Small oscillations, coupled oscillations, normal	6
		modes, characteristic frequencies, forced	
		oscillations	
	7	Rigid body motions and pseudo forces, Rigid	8
		body dynamics, moment of inertia tensor, Non-	
		inertial frames and pseudo forces, Euler's angle,	
		Euler's equations, symmetric top	
16.	Brief descr	iption of tutorial activities:	
	Module	Description	No. of hours
	no.		
	1	Problem sessions constraints & D'Alembert's	1
		principle	
	2	Problem sessions for , Lagrangian equations of	3
		motion and its applications, Lagrange	
		undetermined multipliers,	
	3	Symmetries and conservation laws, invariance	1
		and Noether's theorem	
	4	Hamiltonian formalism and equations of	2
		motion), Poisson brackets and canonical	
		transformations	
	5	Central force motions	2
	6	Small oscillations, normal modes, characteristic	3
	7	Rigid body motions & Dynamics	2
17.	Brief descr	iption of Practical / Practice activities	•
	Module	Description	No. of hours
	no.		
		NIL	
18.	Brief descr	iption of module-wise activities pertaining to self-le	arning
		(Include topics that the students would do self learn	
	resource m	aterials: Do not Include assignments / term papers e	tc.)
	Module no	. Description	
19.	Suggested	texts and reference materials STYLE: Author name	and initials,
		on, Publisher, Year	
	1. "Classica	al Mechanics" (Addison Wesley, Third Edition) - H	I. Goldstein, C.
	Poole and J	J. Safko.	
	2. "Mechan	nics (Theoretical Physics Vol. 1) - L. Landau and E.	Lifschitz.
	3. Classica	l Mechanics - System of particles and Hamiltoni	an Dynamics' by
	Greiner, Sp	oringer International Ed. 2006	
		l Mechanics by G.Aruldhas, PHI	
		l Mechanics – N C Rana and P S Jog, Tata McGraw	Hill 1991
		l Mechanics,- YaswantWaghmere	11111, 1771
		•	na DavidMani
	/. Introduc	tory Classical Mechanics with problems and solution	ons- David Morin

20.	Resourc	es required for the course (iter	mized student access requirements, if any)			
	20.1	Software	NIL			
	20.2	Hardware	NIL			
	20.3	Teaching aids (videos,	NIL			
		etc.)				
	20.4	Laboratory	NIL			
	20.5	Equipment	NIL			
	20.6	Classroom infrastructure	Blackboard-choke			
	20.7	Site visits	NIL			
	20.8	Others (please specify)	NIL			
21.	Design o	content of the course (Percent	of student time with examples, if			
	possible					
	Design-	type problems	NIL			
	Open-en	ded problems	NIL			
	Project-1	type activity	NIL			
	Open-en	ded laboratory work	NIL			
	Others (please specify)	NIL			

PS727 Electronics

1.	Dep	artment/Centre/School proposing the	PHYSICS				
2.		rse Title	Electronics				
		-P structure	3-1-0				
4.	+		4				
5.	_	rse number	PS727				
6.		rse Status (Course Category for Progra					
		gramme Core for:	M.Sc. Physics				
7.	Pre-	requisite(s)	Knowledge of I-V characteristics of				
		•	transistor and fundamental laws of				
			electronics				
8.	Stat	us vis-à-vis other courses					
	:	3.1 List of courses precluded by taking	this course (significant overlap)				
	(a)	Significant Overlap with any UG/PG	M.Sc. (Physics) Sem-I Laboratory				
		course of the Dept./Centre/ School	Physics Course-1 : Analog and Dig	ital			
			Electronics				
	(b)	Significant Overlap with any UG/PG	Some points like basic of Op-Amps				
		course of other Dept./Centre/ School	digital electronics are usually cover				
			B.Sc. syllabus. However, for the sa				
			continuity it is covered in the prese	nt			
			syllabus.				
9.	+	allowed for					
-		rse offered in	Semester 1	-			
11		ulty who will teach the course: Dr. Rud	cha Desai, Dr. C K Sumesh, Prof. R V				
10		dhyay	N				
12	1	the course require any visiting	No				
12	facu	rse objectives					
13	1	objective of the course is to explain	the importance of electronic circuits	and its			
		ications. Nowadays, most of the circ					
		the this course discusses the fundamen		· ·			
		equently its applications. As this cours					
		analog and Digital Electronics, students					
		effect of variation of different compos					
		ering the circuits student will verify the					
14	Cou	rse contents:					
	Line	ear and analog integrated circuits, times	circuits, frequency and phase modula	ations,			
	digi	tal circuits, shift registers, counters, int	roduction to microprocessor				
15	Lect	ture Outline(with topics and number of	lectures)				
	Mod	lule	Topic	No.			
	no.			of			
				hours			
	1	Op-Amp (IC-741):		10			
		Internal Structure (Block Diag					
		Response and Compensation, A	Applications (Linear and Non-				
		Linear).					
	2	Timer (IC-555):		07			

			e (Block Diagram) Operation, Astable, Monostable					
		and Applications						
	3	Phase Locked Lo	± ', '	04				
			re (Block) Diagram) Application as Frequency					
			Division FSK and FM Demodulation.					
	4	Digital ICs-I:		09				
			OS Gates, Parrallel Binary adder/subtractor, BCD					
		Addition/Subtract	ion, Encoder, Decoder, MUX, DE-MUX, Flip-Flops					
	5	Digital ICs-II:		09				
		Shift Resister, O	ter, Counter, Memory Concept, RAM and ROM.					
		Introduction to I	Microprocessor 8085					
16	Brief desc	ription of tutorial a	activities: Problem sessions and clarification of doubt	ts				
	Module	Topic Descriptio	n	No.				
	no.	1		of				
				hours				
	1	Op-Amp (IC-741	1): Internal Structure (Block Diagram) Slew Rate,	04				
	_		nency Response and Compensation, Applications (Linear and					
		Non- Linear).	constraint (Zinom with					
	2		Internal Structure (Block Diagram) Operation,	03				
	_		Astable, Monostable and Applications.					
	3		pops (IC-565): Internal Structure (Block) Diagram)	02				
	3		Frequency Multiplication, Division FSK and FM	02				
		Demodulation	requency Multiplication, Division 13K and 1W					
	1		100 and CN100 Catas Darrallal Binary addar/cyletrastar	04				
	4 Digital ICs-I: TTI, MOS and CMOS Gates, Parrallel Binary adder/subtracto							
	BCD Addition/Subtraction, Encoder, Decoder, MUX, DE-MUX, Flip-Flops							
	5	_	hift Resister, Counter, Memory Concept, RAM oduction to Microprocessor 8085	04				
17	Brief desc		1 / Practice activities: Refer to Laboratory Physics Co	uirse-				
1 /		and Digital Electr		uisc				
	Module no		Description	No.				
	Wiodule lie	•	Description	of				
				hours				
1.0	D ' C 1	· C 1.1						
18		•	wise activities pertaining to self-learning component					
	,	*	ents would do self-learning from books / resource					
			signments / term papers etc.)					
	Module no		cription					
	1		Amp (IC-741): Linear and Non-Linear applications					
	2		ner (IC-555): Applications of multivibrators					
	3		se Locked Loops (IC-565): examples of FSK and FM	M				
		Den	modulation					
	4	Digit	tal ICs-I: examples					
	5	Dig	ital ICs-II: examples					
19	Suggested		e materials STYLE: Author name and initials, Title,					
	Edition, Po	ıblisher, Year						
	1) Ram	akant A.Ga yakw a	rd- Op-Amps and linear integrated circuits-Pearson					
	Educ	ation.						
	2) A. A	nand Kumar - Fun	damentals of Digital Circuits					
	*		<u>~</u>					

	3) Ramesh Goankar- Microprocessor Architecture, Programming and application with the 8085-Penram International Publishing Company.			
20	Resources required for the course (itemized student access requirements, if any)			
	20.1	Software	LSpice/PSpice – openware	
	20.2	Hardware	Window based computer system (window 10 or higher)	
	20.3	Teaching aids (videos, etc.)	Writing board, projector	
	20.4	Laboratory	Lab. Equipped to perform electronics experiments	
	20.5	Equipment	Common essential requirements: Fixed voltage power supply (±5 V, ± 15 V), variable power supply (0 – 30 V), CRO, DMM, Frequency generator (amplitude range microvolt to volts)	
	20.6	Classroom infrastructure	Yes	
	20.7	Site visits	Yes	
	20.8	Others (please specify)	Nil	
21	Design content of t	he course (Percent of stud	dent time with examples, if possible)	
	Design-type problems		25% of student time of tutorial/assignment: Basic circuit design exercise	
	Open-ended proble	ems	10-15% of student time	
	Project-type activit	У	10-15% of student time	
	Open-ended labora	•	10-15% of student time	
	Others (please spec	eify)	Nil	

PS728 Laboratory Physics-1 : Analog and Digital Electronics

1.	Department/Centre/the course	School proposing	PHYSICS	
2.	Course Title		Laboratory Physics Course and Digital Electronics	-1 : Analog
3.	L-T-P structure		0-0-6	
4.	Credits		4	
5.	Course number		PS728	
6.	Course Status (Cou	rse Category for Prog		
	Programme Core fo		M.Sc. Physics	
7.	Pre-requisite(s)		Knowledge of I-V characte transistor and fundamental electronics	
8.	Status vis-à-vis othe	er courses		
	8.1 List of cours	ses precluded by takin	g this course (significant ove	rlap)
	v	significant Overlap with any UG/PG ourse of the Dept./Centre/ School	M.Sc. (Physics) Sem-I Electronics	tronics theory
	(b) S v c	bignificant Overlap with any UG/PG ourse of other Dept./Centre/ School	Some points like basic of C digital electronics are usual B.Sc. syllabus. However, for continuity it is covered in the syllabus.	ly covered in or the sake of
9.	Not allowed for		Nil	
10.	Course offered in		Semester -1	
11.	Faculty who will tea Upadhyay	ach the course: Dr. R	ucha Desai, Dr. C K Sumesh	, Prof. R V
12.	Will the course requestion faculty?	iire any visiting	No	
13.		*	e, a student should be able to wed experimental verification	· ·
14.	Course contents: Linear and analog in		er circuits, frequency and phars, counters, introduction to n	
15.	Lecture Outline(wit Electronics (theory)	*	of lectures): Lectures covered	l in
	Module no.		Topic	No. of hours
			-r -	
16.	Brief description of sessions.	tutorial activities: Do	ubts will be solved during pr	actical
	Module no.	Description		No. of hours
			1.1	
		Total Tutoria	il hours	

17.	Brief desc	ription of Practical / Practic	e activities	
	Module	Description		No.
	no.	1		of
				hours
	1	Op-Amp (IC-741): Intern	al Structure (Block Diagram) Slew	30
			and Compensation, Applications	
		(Linear and Non- Linear).	und compensation, rapproduced	
	2	· · · · · · · · · · · · · · · · · · ·	tructure (Block Diagram) Operation,	20
	2	Astable, Monostable and A		20
	3	1	565): Internal Structure (Block)	06
	3			00
			Frequency Multiplication, Division	
	4	FSK and FM Demodulat		12
	4	Digital ICs-I: TTI, MOS and CI		13
			ion/Subtraction, Encoder, Decoder, MUX,	
	7	DE-MUX, Flip-Flops		1.5
	5		ter, Counter, Memory Concept,	15
10	D : 61		action to Microprocessor 8085	L
18.		-	vities pertaining to self-learning compon	ent
		-	d do self-learning from books / resource	
		Do not Include assignments	s / term papers etc.)	
	Module	Description		
	no.			
	1		ect of experiments related to Op-Amp (l	IC-
		741)		
	2	Simulation and design asp	ect of experiments related Timer (IC-55	5)
	3	Simulation and design asp	ect of experiments related Phase Locked	1
		Loops (IC-565)	1	
	4		t of experiments related Digital ICs-I	
	5	+	ect of experiments related Digital ICs-II	-
19.	Suggested		ls STYLE: Author name and initials, Ti	
17.		ublisher, Year	10 51 122. Hathor hame and mittals, 11	,
		<u> </u>	mps and linear integrated circuits-Pearso	n .
	· /	eation	imps and initial integrated eneuris 1 ears	011
	2440	nand Kumar - Fundamental	s of Digital Circuits	
			or Architecture, Programming and appli	cation
	,	the 8085-Penram Internatio		cation
20.			mized student access requirements, if an	v)
20.	20.1	Software Software	LSpice/PSpice – openware	· <i>J)</i>
	20.1	Hardware	Window based computer system (wind	low 10
	40.4	Tialuwaic	or higher)	10 W 10
	20.3	Teaching aids (videos,	Writing board, projector	
	40.3	etc.)	witting board, projector	
	20.4	Laboratory	Lab. Equipped to perform electronics	
	∠ ∪.¬	Laboratory	experiments	
	20.5	Equipment	Common essential requirements: Fixed	1
	20.3	Equipment		1
			voltage power supply $(\pm 5 \text{ V}, \pm 15 \text{ V})$,	`
			variable power supply $(0 - 30 \text{ V})$, CRC	J,

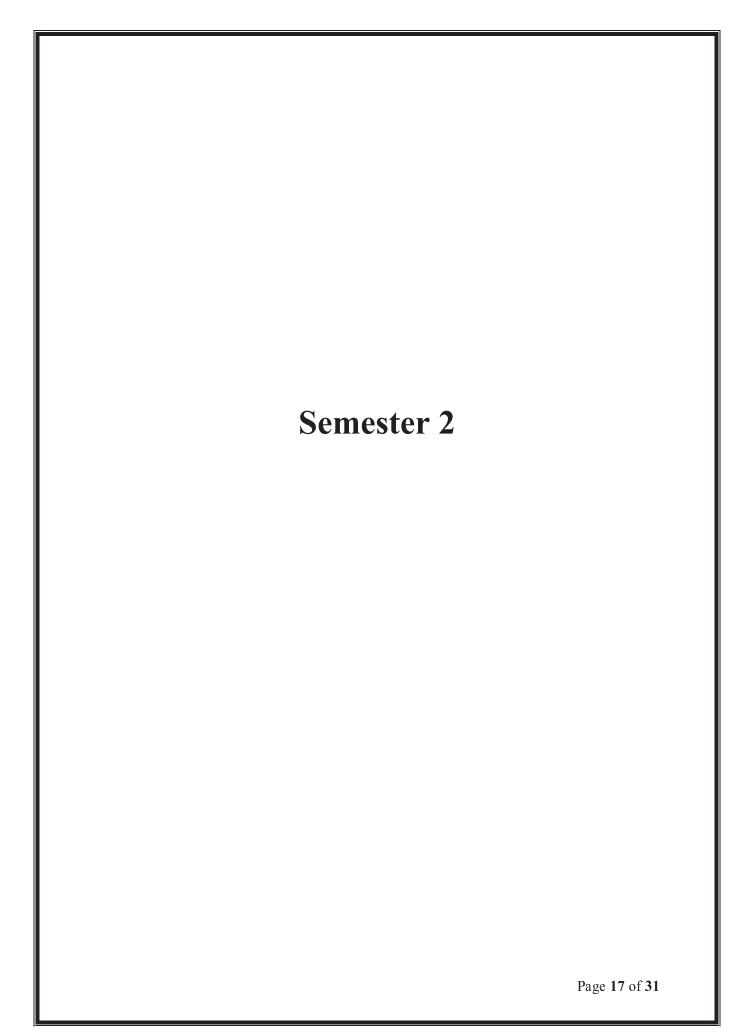
			DMM, Frequency generator (amplitude range microvolt to volts)
	20.6	Classroom infrastructure	Yes
	20.7	Site visits	No
	20.8	Others (please specify)	
21.	Design con	ntent of the course (Percent	of student time with examples, if possible)
	Design-typ	pe problems	25% of student time of tutorial/assignment:
			Basic circuit design exercise
	Open-ende	ed problems	10-15% of student time
	Project-typ	oe activity	10-15% of student time
	Open-ende	ed laboratory work	10-15% of student time
	Others (ple	ease specify)	Nil

PS729 Laboratory Physics-2: Computer Programming

1.	Department	/Centre/School	PHYSICS	
	proposing the	he course		
2.	Course Title	3	Laboratory Physics Course 2: Cor Programming	nputer
3.	L-T-P struc	ture	1-1-4	
4.	Credits		4	
5.	Course num	ıber	PS729	
6.	Course Stat	us (Course Category f	or Program) PG	
	Programme	Core for:	M.Sc. Physics	
7.	Pre-requisite(s)		Preferable: Introduction to compu	iter, types
			of programming languages	
8.		-vis other courses		
			by taking this course (significant ov	verlap)
		nificant Overlap with	NIL	
		UG/PG course of		
		Dept./Centre/ School		
		nificant Overlap with	NIL	
		UG/PG course of		
	Scho	r Dept./Centre/		
9.	Not allowed		NIL	
10.	Course offe		Semester 1	
11.			: Dr. Rucha Desai, Dr. Bhaskar Boi	rah Dr
	Shweta Dab	ohi	. Di. Rucha Desai, Di. Bhaskar Boi	ian, Di.
12.	Will the cou	arse require any alty?	No	
13.	Course obje	ectives		
	a. The obj	ective of the course is	to introduce students to computer	
	progran			
	_	<u> </u>	development for writing various pro	~
			programs to solve scientific theories	s/equations.
14.	Course con			
			ole programming, Control and loop	structures,
15.	Arrays and		umb on a file atumes)	
13.	Module	tline(with topics and n	Topic	No. of
	no.		Topic	hours
	1	Introduction to langu	nage and simple programming:	04
			point arithmetic, Precision,	04
			metic statements, Input and	
			xecutable and non-executable	
		statements, Operatin		
	2	Control and loop stru		05
		Control structures		
	3	Arrays and functions	S:	05
		1	nd logical structures, Subroutines	
		and functions, Opera	ation with files	
				

16.	16. Brief description of tutorial activities: Problem sessions and clarification doubts.		
	Module	Description	No. of hours
	1	Introduction to language and simple programming: Integer and floating point arithmetic, Precision, Variable types, Arithmetic statements, Input and output statements,	04
	2	Control and loop structures: Control structures, Executable and non-executable statements	05
	3	Arrays and functions: Arrays, Repetitive and logical structures, Subroutines and functions, Operation with files, Operating systems, Creation of executable programs	05
17.		ption of Practical / Practice activities	
	Module no.	Description	No. of hours
	1	Introduction to language and simple programming: Integer and floating point arithmetic, Precision, Variable types, Arithmetic statements, Input and output statements,	16
	2	Control and loop structures: Control structures, Executable and non-executable statements	20
	3	Arrays and functions: Arrays, Repetitive and logical structures, Subroutines and functions, Operation with files, Operating systems, Creation of executable programs	20
18.	component	ption of module-wise activities pertaining to self-learning (Include topics that the students would do self-learning faterials: Do not Include assignments / term papers etc.)	
	Module no.	Description	
	1	Simple program including basic syntax	
	2	Programs including looping structure	
	3	Programs including concepts of arrays and functions	
19.	1. Pro	exts and reference materials : gramming in C, E Balagurusamy, Tata McGraw-Hill Edu Us C, Yashwant P Kanetkar, BPB Publications	cation
	3. C La Inter 4. Prog Publ	inguage and Numerical Methods by C. Xavier, New Age rnational Publication tramming with C, Byron Gottfried, Schaum's outlines, Mications	
_	6. Com	r Beginners, Madhusudan Mothe, Shroff pubshers aputer Oriented Numerical Methods, V. Rajaraman, PHI isher	
20.		equired for the course (itemized student access requirements) "C" or "C++" supported come	
	20.1	C of C++ supported conf	P1101

	20.2	Hardware	Computer system (Window 10 or
			higher)
	20.3	Teaching aids (videos,	Writing board, Projection System
		etc.)	
	20.4	Laboratory	Computer lab
	20.5	Equipment	Nil
	20.6	Classroom infrastructure	Yes
	20.7	Site visits	Nil
	20.8	Others (please specify)	
21.	Design of	content of the course (Percent	of student time with examples, if
	possible		
	Design-	type problems	20% of student time of practice hours
	Open-er	nded problems	Nil
	Project-type activity		Nil
	Open-er	nded laboratory work	Nil
	Others (please specify)	Nil



PS751 Electrodynamics

1.	Departmen	nt/Centre/School	PHYSICS	
	proposing			
2.	Course Tit		Electrodynamics	
3.	L-T-P stru	cture	3-1-0	
4.	Credits		4	
5.	Course number		PS751	
6.	Course Sta	itus (Course Categor		
		e Core for:	M.Sc. Physics	
7.	Pre-requisi		NIL	
8.	-	à-vis other courses	I	
			ed by taking this course (sign	ificant overlap)
		nificant Overlap	NIL	P)
	· /	n any UG/PG		
		rse of the		
		ot./Centre/ School		
		nificant Overlap	NIL	
	· / /	n any UG/PG		
	cou	rse of other		
	Dep	ot./Centre/ School		
9.	Not allowe	ed for	NIL	
10.	Course off	ered in	Semester 2	
11.	Faculty wh	no will teach the cou	rse: Dr. Bhaskar Borah/Dr. S	weta Dabhi/Prof. R.
	V. Upadhy	'ay		
12.	Will the co	ourse require any	No	
	visiting fac	culty?		
13.	Course obj			
			this course, a student should be	
	the advanc	e concepts of electro	omagnetic theory and applica	tions"
14.	Course con			
			d Magnetostatics, Faraday	
			tentials, Concepts of Gauge a	
			vation laws, boundary condit	_
			medium, reflection and trans	
			es, resonant cavities, Lore	·
		=	: 4-vectors and tensors, cov	
			for EM field, motion of a ch	- 1
			uadrapole and magnetic dipo	le radiation, radiation
1.5	by a moving charge Lecture Outline(with topics and number of lectures)			
15.		itiine(with topics and		NI £1
	Module		Topic	No. of hours
	1 no.	Review of alastra	statics and Magnetostatics,	6
	1		faxwell's equations, Scalar	U
		-	als, Concepts of Gauge and	
		_	Poynting's theorem and	
			boundary conditions	
	<u> </u>	1 conscivation laws,	Journary Conditions	

	2		ve propagation in space and and transmission of EM	10
		· ·	ace, wave guides, resonant	
	3		tions, covariance of	16
]		vectors and tensors,	10
		1	on of Electrodynamics,	
			ld tensor, Lagrangian for	
			f a charged particle in EM	
		fields		
	4	electric dipole, elec		10
			iation, radiation by a	
		moving charge		
16.			ription of tutorial activities:	
	Module	Description		No. of hours
	no.			
	1	Tutorials will be dis	scussed on electrostatics	4
		and magnetostatics	and other topics	
	2	Discussions of appl	ication of various concepts	3
		of different topics to	o solve numerical	
		problems		
	3	Problem solution se	ssions and clarification of	4
		doubts		
	4	Problem solution se	ssions and clarification of	3
		doubts		
17.	Brief desc	cription of Practical / I	Practice activities	
	Module	Description		No. of hours
	no.			
18.	Brief desc	cription of module-wis	se activities pertaining to sel	f-learning
	componer	nt (Include topics that	the students would do self-	learning from books /
	resource	materials: Do not Inclu	ide assignments / term pape	rs etc.)
	Module n	io.	Description	
	Module 1	I	Electrostatics and Magnetost	atics
	Module 2		Basics of waves and polariza	
	Module 3		Basics of special theory of re	
			ntroduction to tensors	•
19.	Suggestee		naterials STYLE: Author na	me and initials, Title,
		Publisher, Year		, ,
			duction to Electrodynamics,	4 th edition, Pearson
		ew International Edition		, , , , , , , , , , , , , , , , , , ,
			Principles of Electromagnet	ics, 4 th edition,
		x ford international Stu		, ,
			al electrodynamics, Springe	r, Paperback, 2006
20.	1		se (itemized student access	
	 	Software	No software required	
	+ +	Hardware	No hardware required	
		Teaching aids (videos,	Not as such	
		etc.)		
L		/	I	

	20.4	Laboratory	No Laboratory required
	20.5	Equipment	No equipment required
	20.6	Classroom infrastructure	No specific facility required
	20.7	Site visits	Not required
	20.8	Others (please specify)	None
21.	Design	content of the course (Perco	ent of student time with examples, if possible)
	Design-type problems		Nil
	Open-e	nded problems	Nil
	Project-	-type activity	Nil
	¤	Open-ended laboratory	Nil
		work	
	Others	(please specify)	Nil

PS752 Thermodynamics and Statistical Mechanics

1.	Departmen	t/Centre/School	PHYSICS	
	proposing	the course		
2.	Course Tit	le	Thermodynamics and Statistical Mechani	cs
3.	L-T-P structure		3-1-0	
4.	Credits		4	
5.	Course nui	mber	PS752	
6.	Course Sta	tus (Course Category for	Program) PG	
	Programm	· · · · · · · · · · · · · · · · · · ·	M.Sc. Physics	
7.	Pre-requisi	ite(s)	NIL	
8.		à-vis other courses		
			taking this course (significant overlap)	
	(a)	Significant Overlap	NIL	
		with any UG/PG		
		course of the		
		Dept./Centre/ School		
	(b)	Significant Overlap	NIL	
		with any UG/PG		
		course of other		
		Dept./Centre/ School		
9.	Not allowe	*	NIL	
10.	Course off	ered in	Semester-2	
11.	Faculty wh	no will teach the course:	Dr. Bhaskar Borah/Dr. Sweta Dabhi	
12.		ourse require any visiting	No	
	faculty?	1 2		
13.	Course obj	ectives		
	"On succe	ssful completion of this	course, a student should be able to unc	derstand
		-	elp in studying thermodynamics of a maci	
			on how the macroscopic behavior of a syst	
	thermodyn	amics, is related to the m	nicroscopic arrangements of the constituen	it atoms
		ules of a given system."		
14.	Course cor	ntents:		
	Laws of th	ermodynamics, thermody	namic potentials and stability conditions, c	oncepts
	of phase s	pace and Liouville's the	orem, elementary probability theory, dist	ribution
	functions,	central limit theorem, cou	nting principles, formulation of classical st	atistical
	mechanics	, ensemble theory, flu	ctuations, statistics of paramagnetic s	systems,
	equipartitio	on theorem, formulation o	f quantum statistics, introduction to density	matrix,
	Bose-Einst	tein and Fermi-Dirac statis	tics, ideal Fermi gas, ideal Bose gas, Specif	fic heats
	of solids, Fermi energy and mean energy, Fermi temperature, electron degeneracy and			
	white dwa	rf stars		
15.	Lecture Ou	ttline(with topics and num	iber of lectures)	
	Module		Topic	No. of
	no.			hours
	1	Laws of thermodynamics	s, thermodynamics potentials and stability	6
		conditions, concepts of p	hase space and Liouville's theorem	
	2		neory, distribution functions, central limit	6
		theorem, counting princi	ples	

	3		tistical mechanics, ensemble theory,	10
		theorem	paramagnetic systems, equipartition	
			istics, introduction to density matrix,	10
		Bose-Einstein and Fermi-Di		10
	-		gas, Fermi energy and mean energy,	10
		9 '	degeneracy and white dwarfs stars	10
16.		ption of tutorial activities:	argeneracy and winter a warre	
10.		Description Description		No. of
	no.	_ • • • • • • • • • • • • • • • • • • •		hours
	1	Tutorials on laws of thermod	lynamics and phase space	2
	2	Probability theory and Proba	· · ·	2
		Ideal gas, Paramagnetic system		4
	4		ems, specific heats of solid, metals,	3
		harmonic oscillator	·····, ··· ··· ··· ··· ··· ··· ··· ···	
	5	Electron degeneracy and var	ious applications	3
		•		
17.	Brief descri	ption of Practical / Practice a	ectivities	
	Module	Description		No. of
	no.			hours
18.	Brief descri	ption of module-wise activity	ies pertaining to self-learning compone	nt
	(Include top	pics that the students would d	lo self-learning from books / resource	
	materials: I	Oo not Include assignments /	term papers etc.)	
	Module no.	Description		
	Module 1	Hamiltonian mechanics fi	com classical mechanics	
	Module 2	Permutation and combina	tion, combinatorics, counting principle	S
	Module 4	States of a system in quar	tum mechanics, Solutions of Schrodin	ger
		equation for simple proble	ems like particle in a box, harmonic os	cillator
19.			STYLE: Author name and initials, Titl	e,
		blisher, Year		
	1. R.K	K. Pathria and Paul D. Beale,	Statistical Mechanics, 3 rd Edition, Aca	demic
	Pres	s, 2012		
	2. F. R	eif, Fundamentals of Statistic	cal and Thermal Physics, International	Student
		McGraw Hill.		
		nansky and Dittman, Heat and		
	4. She	ng-Keng Ma, Statistical Mec	hanics, World Scientific	
20.	Resources r	equired for the course (itemi	zed student access requirements, if any	·)
	20.1	Software	No software required	
	20.2	Hardware	No hardware required	
	20.3	Teaching aids (videos,	Not as such	
		etc.)		
	20.4	Laboratory	No Laboratory required	
	20.5	Equipment	No equipment required	
	20.6	Classroom infrastructure	No specific facility required	
	20.7	Site visits	Not required	
	20.8	Others (please specify)	None	
21.	Design con	tent of the course (Percent of	student time with examples, if possibl	e)
	Design-type	e problems	Nil	
				

Open-ended problems	Nil
Project-type activity	Nil
Open-ended laboratory work	Nil
Others (please specify)	Nil

PS753 Quantum Mechanics – I

1.	_	ent/Centre/School	PHYSICS			
		g the course				
2.	Course Title		Quantum Mechanics – I			
3.	L-T-P st	ructure	3-1-0			
4.	Credits		4			
5.	Course r		PS753			
6.	_	Status (Course Category for	1			
		me Core for:	M.Sc. Physics			
7.	Pre-requ	isite(s)	Concepts of vector space, Hilbert space,			
			Dirac notations			
8.		is-à-vis other courses				
	_		taking this course (significant overlap))		
	(a)	Significant Overlap with	NIL			
		any UG/PG course of				
		the Dept./Centre/ School				
	(b)	Significant Overlap with	NIL			
		any UG/PG course of				
		other Dept./Centre/				
	27 . 11	School	2777			
9.	Not allo		NIL			
10.		offered in	Semester -2			
11.		who will teach the course:	Dr. Bhaskar Borah/Dr. Sweta Dabl	h1		
12.		course require any	No			
13.		visiting faculty?				
13.		Course objectives				
		"On successful completion of this course, a student should be able to understand the basics and the formulation of quantum mechanics with some applications"				
14.	_	Course contents:				
17.			ne-dimensional problems. Tunneling p	roblem		
		Postulates of quantum mechanics, one-dimensional problems, Tunneling problem, 3D problems, symmetry and degeneracy, Angular momentum algebra, hydrogen				
	_	atom, Time independent and time dependent perturbation theory, Zeeman and				
		Sect, Variational method	ependent perturbation theory, Zeeman	una		
15.		Outline(with topics and nun	nber of lectures)			
	Module		Topic	No.		
	no.		1	of		
				hours		
	1	Dirac notations and bra ket algebra		2		
	2	Postulates of quantum mechanics, one dimensional problems		6		
	3	1	nd degeneracy, tunneling problem	8		
	4	Angular momentum algeb	<u> </u>	8		
	5	Time independent perturb		10		
	6					
16.	Brief des	scription of tutorial activitie	·S:			
	Module	Description		No.		
	no.			of		
				hours		

	1	Tutorials and problem solution	n related to eigenvalue problem,	2	
	1		r dependency of vectors, basis	~	
		transformation	r dependency of vectors, busis		
	2	Problem sessions and clarification	ation of doubts related to the	2	
		postulates of quantum mechan		2	
	3	Discussion of various 3D prob	11	2	
	4	-	um algebra and related numerical of	2	
		hydrogenic systems	im argeora and related numerical or		
	5	Problem sessions and clarification	ation of doubts	2	
	6	Problem sessions and clarification		2	
17.	ļ -	scription of Practical / Practice			
	Module	Description		No.	
	no.	Beschiption		of	
	110.			hours	
	Module	Solving Schrodinger equation	and plotting wave functions and	2	
	2		scilab for some simple problems.		
	Module	Plotting wave functions and p	* *	2	
	4	energy states using scilab/mat			
18.	Brief des		ies pertaining to self-learning compo	nent	
	(Include topics that the students would do self-learning from books / resource				
	`	s: Do not Include assignments /	e e		
	Module 1	no. Description			
	Module	1 Matrix algebra: symmet	Matrix algebra: symmetric and antisymmetric matrix, Hermitian		
		matrix, unitary matrix, i	dentity matrix, inverse of a matrix, s	olving	
		eigenvalue problem, dia	gonalization of a matrix	_	
	Module 2 Properties of wave functions and implication of boundary				
		conditions in solving di	conditions in solving differential equations		
	Module 4	4 Coordinate transformati	ons and derivation of the angular		
		momentum operators in terms of spherical coordinates			
19.	Suggeste	ed texts and reference materials	STYLE: Author name and initials, T	Title,	
	Edition, Publisher, Year				
	1. Quantum Mechanics Concepts and Applications, N. Zettilli, (Wiley)				
	2. Introductory Quantum Mechanics, Richard L. Liboff (Pearson).				
	3. Quantum Mechanics, David J. Griffiths (Cambridge University)				
	4. Quantum Mechanics, L. I. Schiff, (McGraw-Hill).				
20.	Resource	es required for the course (itemi	zed student access requirements, if a	any)	
	20.1	Software	Scilab/mathematics	-	
	20.2	Hardware	No hardware required		
	20.3	Teaching aids (videos,	Not as such		
		etc.)			
	20.4	Laboratory	Computer Laboratory		
	20.5	Equipment	Computers		
	20.6	Classroom infrastructure	No specific facility required		
	20.7	Site visits	Not required		
	20.8	Others (please specify)	None		
21.	Design c	ontent of the course (Percent of	student time with examples, if poss	ible)	
	Design-t	ype problems	Nil		
	1 2001511	J 1 1			
		ded problems	Nil		

Open-ended laboratory work	Nil
Others (please specify)	Nil

PS754 Laboratory Physics3: Numerical Analysis

		PS754 Laboratory Phys	sics3: Numerical Analysis	
1.	Departi	ment/Centre/School	PHYSIC	
	proposi	ing the course		
2.	Course Title		Laboratory Physics Course 3: Nur	nerical
			Analysis	
3.	L-T-P structure		1-1-4	
4.	Credits		4	
5.	Course	number	PS754	
6.	Course	Status (Course Category f	for Program) PG	
	Prograi	mme Core for:	M.Sc. Physics	
7.	Pre-req	uisite(s)	Basic knowledge of computer programming	
			language. Student should be completed	
			M.Sc. (sem-I) course on Laborato	
			Course – 2 : Computer Programm	ing
8.		vis-à-vis other courses		
			by taking this course (significant ov	erlap)
	(a)	Significant Overlap with	NIL	
		any UG/PG course of		
		the Dept./Centre/ School		
	(b)	Significant Overlap with	NIL	
		any UG/PG course of		
		other Dept./Centre/		
	NT 4 11	School	NIII	
9.		owed for	NIL	
10.		offered in	Semester 2	1. D.:
11.	_		: Dr. Rucha Desai, Dr. Bhaskar Bo	ran, Dr.
12.	Shweta		No	
12.		e course require any g faculty?	INO	
13.		objectives		
13.		2	course, a student should be able to	
			ds and implement them in analysis'	
14.	1	contents:	as and implement them in analysis	
11.			Least square fitting, Roots of function	ons
		1	nerical Integration, and Ordinary di	*
	equatio	<u> </u>	nerieur integration, and oramary ar	
15.		e Outline(with topics and n	umber of lectures)	
	Module		Topic	No. of
	no.		1	hours
	1	Data Interpretation a	nd analysis	06
		-	acy, error analysis, propagation of	
		errors, Numerical er		
	2	Simple Least square	fitting	03
		Linear and non-linea	r fit, chi-square test	
	3	Roots of functions		03
	1			

		Bisection, Regula- falsi and Newton-Raphson, secant			
		method, fixed point iteration method			
	4	Interpolation – extrapolation	02		
		Lagrange interpolation, Divided difference method, Spline			
		interpolation			
	5	Numerical Integration:	02		
		Trapezoidal, Simpson			
	6	Ordinary differential equation	02		
		Solution of ordinary differential equation using			
		Runge-Kutta and Euler methods			
16.	Brief descri	ption of tutorial activities: Problem sessions and clarifica	tion of		
	doubts.				
	Module	Description	No. of		
	no.		hours		
	1	Data Interpretation and analysis: Precision and	02		
		accuracy, error analysis, propagation of errors,			
		binomial, poison and normal distributions			
	2	Least square fitting: Linear and non-linear fit, chi-	03		
		square test			
	3	Roots of functions: Bisection, Regula- falsi and	03		
		Newton-Raphson, secant method			
	4	Interpolation – extrapolation: Lagrange interpolation,	02		
	'	Divided difference method, Spline interpolation	02		
	5	Numerical Integration: Trapezoidal, Simpson	02		
	6	Ordinary differential equation: Solution of ordinary	02		
		differential equation using Runge-Kutta and Euler	02		
		methods			
17.	Brief description of Practical / Practice activities				
1 / .	Module	Description Description	No. of		
		Description	hours		
	no.	Data Interpretation and analysis: Precision and	08		
	1	•	08		
		accuracy, error analysis, propagation of errors,			
	12	binomial, poison and normal distributions	1.2		
	2	Least square fitting: Linear and non-linear fit, chi-	12		
	12	square test	1.2		
	3	Roots of functions: Bisection, Regula- falsi and	12		
	1	Newton-Raphson, secant method	0.0		
	4	Interpolation – extrapolation: Lagrange interpolation,	08		
	1 -	Divided difference method, Spline interpolation	0.0		
	5	Numerical Integration: Trapezoidal, Simpson	08		
	6	Ordinary differential equation: Solution of ordinary	08		
		differential equation using Runge-Kutta and Euler			
		methods			
18.		ption of module-wise activities pertaining to self-learning			
	(Include topics that the students would do self-learning from books / resource				
	_	Do not Include assignments / term papers etc.)			
	Module no.				
	1	Include data interpretation and analysis methods in lab	oratory		
	1 *	1	•		

	2		Perform least square fitting in the experimental data and do error analysis		
	3		ection, Regula- falsi and Newton-Raphson,		
		secant method - Examp			
	4		tion: Lagrange interpolation, Divided		
		difference method, Spline	difference method, Spline interpolation - Examples		
	5	Numerical Integration: Tr	apezoidal, Simpson - Examples		
	6	Ordinary differential eq	uation: Solution of first order differential		
		equation using Runge-I	Kutta and Euler methods - Examples		
19.	Suggest	ed texts and reference materia	als STYLE:		
	1)	Numerical methods for engin	eers, Chapra and canale, Mc Graw Hill		
	2)	Introductory methods for num	nerical analysis, S S Sastry,		
20.	Resourc	ces required for the course (ite	emized student access requirements, if any)		
	20.1	Software	Microsoft Excel or open ware		
			spreadsheet, "C" or "C++" supported		
			compiler		
	20.2	Hardware	Computer system (Window 10 or		
			higher)		
	20.3	Teaching aids (videos,	Writing board, Projection System		
		etc.)			
	20.4	Laboratory	Computer lab		
	20.5	Equipment	Nil		
	20.6	Classroom infrastructure	Yes		
	20.7	Site visits	Nil		
	20.8	Others (please specify)			
21.	Design content of the course (Percent of student time with examples, if				
	possible)				
	Design-type problems		20% of student time of practice hours		
	Open-ended problems		Nil		
		type activity	Nil		
	Open-ended laboratory work		Nil		
	Others ((please specify)	Nil		

PS755 Laboratory Physics -4: Computational Physics

1.	Depart	ment/Centre/School	PHYSICS		
	proposing the course				
2.	Course Title		Laboratory Physics Course- Physics	4: Computational	
3.	L-T-P structure		3-1-0		
4.	Credits		4		
5.	_	number	PS755		
6.		e Status (Course Categor			
0.		mme Core for:	M.Sc. Physics		
7.		quisite(s)	High Level Programming L	anguage –	
, ,		10-5-10 (b)	C/C++/Fortran	88.	
8.	Status	vis-à-vis other courses	0.0 , 5 0500		
			ed by taking this course (sign	ificant overlap)	
		Significant Overlap	NIL	1/	
	` ´	with any UG/PG			
		course of the			
		Dept./Centre/ School			
		Significant Overlap	NIL		
	1 ' ' 1	with any UG/PG			
	1	course of other			
	Dept./Centre/ School				
9.		owed for	NIL		
10.		e offered in	Semester 2		
11.		y who will teach the cou		Sweta Dabhi	
12.		ie course require any	No	. 5 ,, 6 ta 2 a 6 111	
12.		g faculty?			
13.		e objectives			
	"On su	accessful completion of t	this course, a student should b	be able to apply	
	various techniques to solve any physics problem. Students will understand ho		will understand how		
	to solve a complex physics problem using computer tools"				
14.	Course	e contents:			
	Errors	in computation, Euler a	algorithm to solve ordinary d	lifferential equations:	
	radioac	ctive decay, air resistar	nce, projectile motion, perio	odic motions; Verlet	
	algorit	hm, Computing phase	space trajectories of particle	e moving in various	
			llator, hard sphere, soft sph		
	genera	tors, proving central lim	it theorem, Monte Carlo meth	nods of integration by	
	rejection	on and importance s	ampling; curve fitting en	nploying regression,	
	Introdu	action to parallel progr	ramming, parallelizing the i	natrix multiplication	
	progra	m		-	
15.	Lectur	e Outline(with topics an	d number of lectures)		
	Modul	e	Topic	No. of hours	
	no.	no.			
	1	Errors in computat	ion	4	
	2	Euler algorithm to	solve ordinary differential	2	
		equations for radio	pactive decay, air resistance,		
	projectile motion, periodic motions, Verlet				
		algorithm, Comput	ting phase space trajectories		

					,	
				various potential, i.e.,		
	12			rd sphere, soft sphere	2	
	3	central limit theor		d generators, proving	2	
	4			de of integration by	2	
	4	rejection and impo		ds of integration by	Δ	
	5	Curve fitting	ortani	ce sampling	3	
	6		to no	rallel programming	10	
16.	, and the second				10	
10.	Brief description of tutorial activities: Module Description		No. of hours			
	no.	Description			INO. Of Hours	
	 	Total Tuto	rial h	Ollre		
17.	Brief desc	ription of Practical				
17.	Module	Description	/ 11ac	thee activities	No. of hours	
	no.	Description			140. Of Hours	
	Module 2	Employ Euler and	Ver	let algorithm to solving	15	
	11100000	physics problems	. , от	iet argorium to sorving		
	Module 3	1 1 1	r simi	ple random number	12	
				congruence, test for		
		randomness, prov				
	Module 4				12	
		integration of a given function using rejection				
		technique, improv				
		importance sampl				
	Module 5	Curve fitting to data such as the binding			10	
		energy curve				
	Module 6				10	
18.	Brief description of module-wise activities pertaining to self-learning					
	component (Include topics that the students would do self-learning from books /					
		source materials: Do not Include			rs etc.)	
	Module no	D	Des	cription		
			-			
19.			mate	erials STYLE: Author na	me and initials, Title,	
	Edition, Publisher, Year					
	1. Computational Physics: An Introduction to Monte Carlo Simulations					
	of Matrix Field Theory, Badis Ydri,					
	https://arxiv.org/pdf/1506.02567.pdf					
	2. Computational Physics, J. M. Thijssen, Cambridge University Press					
20.	Resources	required for the co	urse (itemized student access	requirements, if any)	
	+	oftware	(C/C++/Fortran compile		
		ardware		Computers	,	
		eaching aids (video	s,	Not as such		
		tc.)	,			
		aboratory		Computer Laboratory		
	+	quipment		Computers		
		lassroom infrastruc	ture	Black board and projec	tor	
	20.7 S	ite visits		Not required		
			1.01.040.00			

	20.8	Others (please specify)	None
21.	Design	content of the course (Perc	ent of student time with examples, if possible)
	Design-	type problems	NIL
	Open-er	nded problems	NIL
	Project-type activity		NIL
		Open-ended laboratory work	NIL
	Others	(please specify)	NIL