भारतीय प्रौद्योगिकी संस्थान रूड़की रूड़की — 247 667 (भारत) INDIAN INSTITUTE OF TECHNOLOGY ROORKEE ROORKEE - 247 667 (INDIA)



सीनेट की नवासीवीं बैठक हेतु कार्यसूची AGENDA FOR THE 89th MEETING OF THE SENATE

बैठक सं0	:	नवासीवीं
MEETING NO.	:	89 th
स्थान	:	सीनेट हॉल, भा0प्रौ0सं0रूड़की
VENUE	:	Senate Hall, IIT Roorkee
दिनांक	:	09 दिसम्बर 2021
DATE	:	09 th December 2021
समय	:	04.00 बजे अपरान्ह
ТІМЕ	:	04.00 P.M.

भारतीय प्रौद्योगिकी संस्थान रूड़की INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

रूड़की 247 667 ROORKEE – 247 667



<u>कार्यसूची∕AGENDA</u>

मुद्दा सं0 / Item No.	विवरण / Particulars	पृष्ठ / Page(s)
89.1	सीनेट की दिनांक 03.09.2021 को आयोजित हुई 88वीं बैठक के कार्यवृत्त की पुष्टि करना। To confirm the minutes of the 88 th meeting of the Senate held on 03.09.2021.	1
89.2	सीनेट की दिनांक 03.09.2021 को आयोजित हुई 88वीं बैठक में लिए गए निर्णयों के कियान्वयन हेतु की गई कार्यवाही को रिपोर्ट करना। To report on the actions taken to implement the decisions of the Senate taken in its 88 th meeting held on 03.09.2021.	2-4
89.3	कक्षाओं को ऑफलाइन मोड में आयोजित करने के प्रस्ताव पर विचार करना। To consider the proposal of conducting the classes in offline mode.	5
89.4	बीएस–एमएस कार्यक्रमों की सामान्य संरचना और द्वितीय वर्ष के बाद के पाठयक्रम के लिए पर निम्नानुसार विचार करनाः 1. बी.एस–एमएस कार्यक्रमों के लिए सामान्य संरचना 2. (i) बीएस–एमएस (गणित और कंप्यूटिंग) (ii) बीएस–एमएस (रासायनिक विज्ञान) To consider the common structure for the BS-MS programmes and II year onwards curriculum as given below: 1. Common structure for BS-MS Programmes 2. (i) BS-MS (Mathematics and Computing) (ii) BS-MS (Chemical Sciences)	6-26

89.5	जल और नवीकरणीय ऊर्जा विभाग के मौजूदा एम.टेक प्रौगाम का नाम 'वैकल्पिक जल ऊर्जा प्रणाली' से 'नवीकरणीय और जल ऊर्जा' बदलने और इसकी संरचना को संशोधित करने के प्रस्ताव पर विचार करना। To consider the proposal of Department of Hydro and Renewable Energy to rename the existing M.Tech. program on 'Alternate Hydro Energy System' as "Renewable and Hydro Energy" and to revise its structure.	27-30
89.6	यूजी नियमो के समान सहयोगी संस्थानों से मास्टर छात्रों के लिए क्रेडिट ट्रांसफर के प्रस्ताव पर विचार करना। To consider the proposal of credit transfer for Master students from partner institutes similar to UG regulation.	31-32
89.7	एम-डेस (औद्योगिक डिजाइन) और एमआईएम (नवाचार प्रबंधन में परास्नातक) कार्यक्रम की संरचनाओं को संशोधित करने के डिजाइन विभाग के प्रस्ताव पर विचार करना। To consider the proposal of Department of Design to revise the structures of M. Des. (Industrial Design) and MIM (Masters in Innovation Management) programs.	33-43
89.8	पी.एच.डी कार्यक्रम में चयन के समय प्रवेश में द्वितीय सूची सृजित करने के प्रस्ताव पर विचार करना। To consider the proposal to create second list in the admission to Ph. D. programme at the time of selection.	44
89.9	जल संसाधन विकास एवम् प्रबंधन विभाग में पीएचडी कार्यक्रम में प्रवेश हेतु न्यूनतम शैक्षिक योग्यता (एमईक्यू) पर विचार करना। To consider the Minimum Educational Qualification (MEQ) for admission in Ph. D. programme in Water Resources Development and Management Department.	45
89.10	अध्यक्ष, सीनेट द्वारा दी गई मंजूरी को रिपोर्ट करना। To report the approvals accorded by the Chairman, Senate	46-51
अन्य मुद	दे अध्यक्ष की अनुमति से/Under any other item with the permissio Chair.	on of the

Item No. 89.1: To confirm the minutes of the 88th Senate meeting held on 03.09.2021.

The minutes of the 88th Senate meeting held on 03.09.2021 were circulated to the members vide e-mail dated 12.10.2021. No comments have been received.

The Senate may consider and confirm the said minutes.

Item No. 89.2: To report on the actions taken to implement the decisions of the Senate taken in its 88th meeting held on 03.09.2021.

Item No.	Reference to the Senate minutes	Extracts of the Minutes	Status of
			taken
88.3	To consider award of Degrees/Diplomas to the students who have qualified for the award of	The Senate considered and recommended to the Board of Governors the award of Degrees to 1804 students who have duly qualified for the same, as given below:	Approved and awarded.
	degrees/diplomas in various disciplines/courses for the session 2020- 21.	Sr. No.Name of the DegreesNo.No.of studenNo.StudenstudentstudenttsgivenrecommPDCendedfor receivingDegrees	
		1. B.Arch./B.Tech./I.D.D. 912 912 /I.M.T. / I.M.S. 912 912	
		2. M.Arch. / M.Tech. / 685 685 M.Sc. / M.U.R.P. / M.B.A. / P.G. Diplomas 685	
		3. Ph.D. Degree / Ph.D Dual Degree *83 degrees are presented for consideration of the Senate (124 degrees were already recommended). 207* 207	
		Total 1804 1804	
88.4	To consider the revised report of the committee constituted to review the current thesis evaluation process for M.Tech./IMT/IDD.	The Senate accepted the report. Further, the Senate advised that, if required, the evaluation process may be reviewed after two years.	Notified

88.5	To consider the	Chairman, SCSP presented the	Awarded
	awards, Medals and	recommendations on the Awards, Medals	
	Cash Prizes for	and Cash Prizes for Convocation 2021.	
	Convocation 2021.	The Senate approved the awards, medals	
		and prizes.	
88.7	To consider the	The Senate considered and approved the	Notified
	proposals of the	proposals for restructuring and re-	
	Department of	naming of the IMS Programs into BS-MS	
	Mathematics	Dual Degree programs with exit option	
	Department of	after four years with a BS degree.	
	Physics and		
	Department of	Further, the Senate approved the first	
	Chemistry for	vear course structures of these three	
	restructuring and	programs.	
	renaming their 5-	r o o o	
	year Integrated		
	Master of Science		
	programme (IMS)		
	into 5-year $(4+1)$ BS-		
	MS Dual Degree		
	programme with exit		
	option after four		
	years with BS		
	Degree:		
88.8	To consider	The Senate considered and approved the	Notified
	renaming of the MS	proposal to name the program as BS-MS	
	Economics program	dual degree program with exit option	
	of Department of	after four years with a BS degree.	
	Humanities and		
	Social Sciences as		
	"BS-MS		
	(Economics)" a 5-		
	vear MS programme		
	J P		
88.9	To consider the	The Senate considered and approved the	Notified
	following proposals of	proposals along with the course structure.	
	Department of		
	Electronics &		
	Communication		
	Engg. regarding		
	M.Tech. (VLSI):		
	(a) Course		
	structure of the		
	program "M.Tech.		
	(VLSI)"		

	(b) The		
	permissible		
	range of		
	creates in a		
	04-16 credits		
88.10	To consider the	The Senate considered and approved the	Notified
00.10	proposal of	following:	nounca
	Department of	10110 11 11 21	
	Biosciences and	1. The merit list will be prepared in the	
	Bioengineering w.r.t.	ratio of 1:5 according to the seat	
	admission to DBT	matrix, in order of merit of GAT-B	
	supported M.Sc. (BT)	Score/Rank.	
	programme for	2. Transfer of registered students to other	
	session 2021-22.	institutions will be allowed within the	
		scheduled date for such transfer. Any	
		due to a possible transfer shall be	
		filled only from our own wait list	
		according to merit Transfer request of	
		candidates, admitted through GAT-B or	
		other entrance examination. from other	
		institutions to IIT Roorkee MSc (BT)	
		programme will not be considered for	
		admission.	
		3. The admission schedule for the MSc	
		(BT) program will be prepared keeping	
		in view the schedule announced by	
00.11	m 11 1	DBT.	<u> </u>
88.11	To consider the	The Senate recommended to the Board the	Recommenda
	proposal for the	proposal to convert the Centre for Al and	nlaced before
	Mehto Family School	DS into Menta Family School of Data	the 63 rd
	of Data Science &	Science and Artificial Intelligence once the	meeting of
	Artificial Intelligence.	Mou between the Menta Family	the Board.
	in anotai intoingoireoi	Foundation and III Roorkee is signed.	The Board
			approved the
			proposal. The
			same was
			notified.
88.6 wa	s only the reporting item.		

Item No. 89.3 To consider the proposal of conducting the classes in offline (physical class-room) mode.

Following the onset of the COVID-19 pandemic in the first part of the year 2020, the Institute has been continuing its academic activities online till date. Teaching and research in the online mode have been challenging and there are requests from students, their parents/guardians and the faculty members for starting the academic activities again in offline mode w.e.f. the Spring semester, 2021 – 2022.

In view of improvements in the pandemic situation, our Institute has called back the students in batches, except the first year UG & Masters students, to the campus following a set of relevant guidelines and advising them to follow COVID appropriate protocols. Presently, there are approximately 3500 students in the campus. Most of the faculty members and the staff are also in the campus. The central and the state Governments have significantly relaxed the COVID-19 related protocols.

In view of the above, the following are proposed:

- (a) All academic activities, except the classes of the UG first year, will continue in the offline mode as in the prepandemic sessions w.e.f. the January 01, 2022 (Spring semester, 2021 – 2022).
- (b) All academic activities of the UG first year will continue in the offline mode as in the pre-pandemic sessions w.e.f. January 31, 2022.

The above is submitted for the consideration and approval of the Senate.

- Item No. 89.4 To consider the common structure for the BS-MS programmes and II year onwards curriculum as given below:
 - 1. (i) BS-MS (Mathematics and Computing) (Appendix-A) (ii) BS-MS (Chemical Sciences) (Appendix-B)
 - 2. Common structure for BS-MS Programmes (Appendix-C)
 - 3. BS-MS (Physics) (Appendix-D)

The BS-MS (Mathematics and Computing), offered by the Department of Mathematics, BS-MS (Chemical Sciences), offered by the Department of Chemistry, and BS—MS (Physics), offered by the Department of Physics, programmes were approved by the Senate in its 88th meeting held on 03.09.2021. The Senate also approved the curricula of the I year of the programmes.

The IAPC in its 113th meeting considered the proposed structures from II year to V Year for the BS-MS programmes offered by the Department of Mathematics, Chemistry and Physics. The IAPC also formulated a common structure for all BS-MS programmes.

The IAPC recommended the curricula of both the programmes with modifications.

The recommended curricula for BS-MS (Mathematics and Computing), BS-MS (Chemical Sciences), BS-MS (Physics) and a common structure/framework for BS-MS programmes are placed as (**Appendics-A, B, C and D**) respectively.

The above is submitted for the consideration and approval of the Senate.

Credit distribution in proposed BS- MS (Mathematics and Computing) Program

CURRICULAR COMPONENTS	CREDITS	REMARK
(a) Institute Core Courses		•
(i) Humanities and Social Sciences (HSSC)	04	*From Mathematics Department
(ii) Basic Sciences (BSC)	16 (4** +12*)	** From other departments
(iii) Engineering Sciences (ESC)	08**	
(iv) General Sciences (GSC)	03	
Total =	31	
(b) Programme Core Courses (PCC)		•
(i) Class Contact Core Courses	92	* 4 Credits for Stage 1 and 12 Credits for
(ii) Introduction to (discipline)Eng./Science	02	Stage 2
(iii) Technical Communication	02	
(iv) Project/Thesis	16 (4 +12) *	
(v) Seminar	-	
(vi) Educational Tour	-	
Total =	112	
(c) Humanities, Social Science and		
Management Elective Courses (HSSMEC)		
(i) Humanities & Social Science	03	
(ii) Management Studies	03	
Total =	06	
(d) Open Elective Course (OEC)	03-06	
(e) Program Elective Courses (PEC)	32	
(f) Co-curricular Activities (CCA)		
(i) Discipline (To be awarded after Final Year)	02	
(ii) NCC/NSO/NSS (First Year)*	-	
Total =	02	
Grand Total (a+b+c+d+e+f) =	186-189	158-161 Credits for BS degree 176-181 Credits for BS degree with MSC) 204-209 Credits for BS-MS degree with MSC

*The students opting for these proficiencies at first year level may be given certificate with the remark

excellent/very good/ good/satisfactory/ unsatisfactory.

Program Code : 312 BS-MS (Mathematics and Computing)

Department : MA MATHEMATICS

Teaching Scheme

;			
Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (year-wise)
L	21	20	41
2	20	21	41
3	19-22	16-19	38-41
4	16	20	36
5	16	12	28
Extra-Curricular			02
Grand Total	92-95	89-92	186-189 for BS-MS degree 158-161 for BS degree
Grand Total with Minor Specialization Courses	5 more course with add	ditional credits 18-20	204-209 for BS-MS degree 176-181 for BS degree

BS-MS (Mathematics and Computing)

Program Code

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		SWO		20-35	20-35	20-35	20-35	20-35	20-35			20-35	20-35	20-35	20-35	20-35	20-35	
	am tion s.)	Practical		0	0	0	0	0	0			0	0	0	0	0	0	
	Exa Dura (Hr	Theory		з	3	3	ю	ю	3			с	3	ю	3	3	3	
	eek	Р		0	0	0	0	0	0	0		0	0	0	0	0	0	0
	ontact urs/W	T	ster	-	-	-	-	0	0	4	<u> </u>	-	L	-	١	0	1/0	4/5
ting)	Hot Cc	Γ	Seme	3	3	3	3	3	3	15	neste	ю	8	3	3	3	8	18
Compu		Credits	utumn	4	4	4	4	с	3	19-22	ing Ser	4	4	4	4	3	3/4	16-23
natics and S		Subject Area	•	ESC	PCC	PCC	PCC	HSSMEC	OEC	Fotal	Spr	PCC	PCC	PEC	PEC	OEC	MSC	al
: 312 BS-MS (Mathen : MA MATHEMATIC : III	Teaching Scheme	Course Title		Database Management System	Fluid Dynamics	Numerical Analysis	Operations Research	Management Elective Course	Institute Open Elective			Mathematical Modeling and Simulation	Theory of Computation	Program Elective – 1	Program Elective – 2	Institute Open Elective	Minor Specialization Course-1	Tot
am Code tment		Subject Code		CSN-351	MA-301	MA-303	MA-305	MS-ELE	*OEC-1			MA-302	MA-304	MA-ELE	MA-ELE	*OEC-2	MSC-1	
Progr Depar Year		.oN .S		1.	5	Э.	4.	5.	6.			. .	2.	Э.	4.	5.	6.	

*Students can take one or both courses under OEC category.

DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE Proposed Structure (To be implemented from the session 2021-2022)

BS-MS (Mathematics and Computing)

312

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Program Code

Depa Year	rtment	MA 	ІАТНЕМАТІ	CS											
		Teaching Schei	me			noH C	ontaci Irs/We	ek	Exa Dura (Hrs	ım tion s.)		Rela	ative Weig	ght (%)	
.oN .S	Subject Code	Course Titl	Φ	Subject Area	Credits		F	٩	Lheory	Practical	SWO	୧୨୨୨	ЭТМ	313	РЯЕ
					Autum	າ Seme	ester								
. .	MA-401	Abstract Algebra		PCC	4	3	-	0	с	0	20-35	ı	20-30	40-50	20-35
i,	MA-409	Real Analysis		PCC	4	3	-	0	с	0	20-35		20-30	40-50	20-35
ю.	MA-411	Theory of Ordinary Diff Equations	erential	PCC	4	3	~	0	с	0	20-35		20-30	40-50	20-35
4.	MA-ELE	Program Elective-3		PEC	4	8	1	0	3	0	20-35	·	20-30	40-50	20-35
5.	MSC-2	Minor Specialization Co	ourse-2	MSC	3/4	3	0/1	0	с	0	20-35	ı	20-30	40-50	20-35
0	MSC-3	Minor Specialization Co	ourse-3	MSC	3/4	3	0/1	0	ю	0	20-35		20-30	40-50	20-35
			Tota		16-24	12/18	4/6	0							
					Spring	Seme	ster								
. .	MAN-404	Functional Analysis		PCC	4	3	-	0	e	0	20-35	ı	20-30	40-50	20-35
2.	MAN-408	Theory of Partial Differe Equations	ential	PCC	4	3	~	0	с	0	20-35		20-30	40-50	20-35
ы. С	MAN-410	Topology		PCC	4	з	-	0	с	0	20-35	ı	20-30	40-50	20-35
4.	MA-ELE	Program Elective -4	MAN-400	PEC	4	3	-	0	ю	0	20-35		20-30	40-50	20-35
5.	MA-ELE	Program Elective -5	Project*	PEC	4	3	~	0	с	0	20-35	ı	20-30	40-50	20-35
Ö	MSC-4	Minor Specialization Co	ourse-4	MSC	3/4	з	0/1	0	с	0	20-35	·	20-30	40-50	20-35
7.	MSC-5	Minor Specialization Co	ourse-5	MSC	3/4	3	0/1	0	с	0	20-35	ı	20-30	40-50	20-35
			Total		20-28	15/21	5/7	0							
*Stuc	lents can tal	ke either Department Ele	ectives 4 and	5 or Pro	pject to	comple	ete 8 c	redits	under	PEC 0	ategory	in 8 th S	emester.		

NOTE: The students wishing to exit the program with BS degree must inform the Department/Institute before subject registration for 5th Year.

MA-NOV2021

BS-MS (Mathematics and Computing)

Program Code

ī ı ı ı ı РЯЕ 40-50 40-50 40-50 Relative Weight (%) 20 ETE 2 20-30 20-30 20-30 30 30 MTE **SA** ī ī ī ı. ı 20-35 20-35 20-35 SMO ı. ı. Duration (Hrs.) Practical 0 0 0 0 0 Exam Тһеогу **Autumn Semester** 0 ო ო 0 က Spring Semester Δ 0 0 0 0 0 0 0 Hours/Week Contact 0 ო 0 0 F <u>____</u> <u>____</u> ~ _ 0 ო c ო റ 0 0 MATHEMATICS 16 42 42 **Stiber**O 4 4 4 4 Area PCC PEC PEC PEC PCC Subject Total Total Program Elective - 8 Program Elective - 6 Program Elective - 7 **Teaching Scheme Course Title** Thesis Stage-2 Thesis Stage-1 312 MA < **MAN-500A MAN-500B** Subject Code **MA-ELE** MA-ELE MA-ELE Department Year .. 4. . -.oN .S с і *с*і

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List of the Program Elective Courses

Pro Dep	gram Code artment	: 312 : MA	BS-MS in Mathemat MATHEMATICS	tics and	Comp	outing									
		Tea	iching heme			Col Hour	ntact s/Wee	k	Exa Durat (Hrs	m tion		Rela	ıtive Weiç	Jht (%)	
	Subject Code	Course	, Title	Subject Area	Credits		F	٩	Theory	Practical	SWO	SA9	ЭТМ	ЭТЭ	БЯЕ
		Progran	n Elective Courses (El	ective-1	and E	lectiv	e-2) t	o be	chos	en in	Third Y	ear		-	
-	MA-411	Analytic Number T	heory	PEC	4	з	-	0	e	0	20-35	ı	20-30	40-50	ı
N N	MA-412	Combinatorial Mat	hematics	PEC	4	ю	-	0	e	0	20-35	•	20-30	40-50	1
С	MA-413	Credit Risk Manag	Jement	PEC	4	ю	-	0	e	0	20-35	ı	20-30	40-50	ı
4	MA-414	Differential Geome	etry	PEC	4	ю	-	0	e	0	20-35	ı	20-30	40-50	ı
5.	MA-415	Financial Risk Mar	nagement	PEC	4	з	-	0	e	0	20-35	ı	20-30	40-50	1
Ö	MA-416	Graph Theory		PEC	4	ю	-	0	e	0	20-35	ı	20-30	40-50	ı
7.	MA-417	Mathematical Image	ge Processing	PEC	4	ю	-	0	e	0	20-35	ı	20-30	40-50	ı
σ	MA-418	Numerical Optimiz	ation	PEC	4	с	-	0	ო	0	20-35	•	20-30	40-50	•
		Program E	lective Courses (Electi	ve-3 to	Electiv	/e-8) t	o be	chos	en in	N Y€	er and	V Ye	ar		
-	MA-400	Project		PEC	8	0	0	0	0	0	1	ı	30	70	ı
N.	MA-511	Abstract Harmonic	: Analysis	PEC	4	з	-	0	e	0	20-35	ı	20-30	40-50	ı
ы. С	MA-512	Advanced Comple	x Analysis	PEC	4	ო	-	0	ო	0	20-35	ı	20-30	40-50	ı
4	MA-513	Advanced Matrix 1	Theory	PEC	4	ო	-	0	ო	0	20-35	ı	20-30	40-50	ı
5.	MA-514	Advanced Numeri	cal Analysis	PEC	4	з	-	0	e	0	20-35	ı	20-30	40-50	ı
Ö	MA-515	Advanced Operati	ons Research	PEC	4	з	-	0	e	0	20-35	ı	20-30	40-50	ı
7.	MA-516	Advanced Partial [Differential Equations	PEC	4	с	-	0	ო	0	20-35	ı	20-30	40-50	ı
σ	MA-517	Algebraic Number	Theory	PEC	4	ო	-	0	ო	0	20-35	ı	20-30	40-50	ı
ດ	MA-518	Algebraic Topolog	λ	PEC	4	ო	-	0	ო	0	20-35	ı	20-30	40-50	ı
10). MA-519	Approximation The	sory	PEC	4	З	١	0	З	0	20-35	I	20-30	40-50	ı

11.	MA-520	Coding Theory	PEC	4	ю	-	0	e	0	20-35		20-30	40-50	ı
12.	MA-521	Commutative Algebra	PEC	4	с	-	0	ε	0	20-35		20-30	40-50	1
13.	MA-522	Computational Fluid Dynamics	PEC	4	3	-	0	ю	0	20-35	ı	20-30	40-50	1
14.	MA-523	Control Theory	PEC	4	3	-	0	з	0	20-35	ı	20-30	40-50	I
15.	MA-524	Dynamical Systems	PEC	4	з	-	0	ю	0	20-35	ı	20-30	40-50	1
16.	MA-525	Financial Mathematics	PEC	4	3	-	0	З	0	20-35	ı	20-30	40-50	I
17.	MA-526	Finite Element Methods	PEC	4	3	-	0	з	0	20-35	ı	20-30	40-50	I
18.	MA-527	Fuzzy Sets and Fuzzy Systems	PEC	4	3	-	0	З	0	20-35	ı	20-30	40-50	I
19.	MA-528	Hyperbolic Conservation Laws	PEC	4	ю	-	0	ю	0	20-35	ı	20-30	40-50	ı
20.	MA-529	Integral Equations and Calculus of Variations	PEC	4	с	-	0	ო	0	20-35	ı	20-30	40-50	I
21.	MA-530	Machine Learning in Finance	PEC	4	ю	-	0	ო	0	20-35	ı	20-30	40-50	I
22.	MA-531	Mathematical Biology	PEC	4	ю	-	0	ო	0	20-35	ı	20-30	40-50	I
23.	MA-532	Mathematical Cryptography	PEC	4	с	-	0	ო	0	20-35		20-30	40-50	
24.	MA-533	Measure Theory	PEC	4	ю	~	0	ო	0	20-35	ı	20-30	40-50	ı
25.	MA-534	Multivariate Techniques	PEC	4	3	-	0	ю	0	20-35	ı	20-30	40-50	I
26.	MA-535	Numerical Linear Algebra	PEC	4	3	-	0	ю	0	20-35	I	20-30	40-50	I
27.	MA-536	Operator Theory	PEC	4	3	-	0	ю	0	20-35	I	20-30	40-50	ı
28.	MA-537	Optimal Control Theory	PEC	4	ю	-	0	ю	0	20-35	ı	20-30	40-50	ı
29.	MA-538	Orthogonal Polynomials and Special Functions	PEC	4	3	-	0	з	0	20-35	ı	20-30	40-50	I
30.	MA-539	Portfolio Optimization	PEC	4	с	-	0	с	0	20-35	ı	20-30	40-50	ı
31.	MA-540	Regularization Theory for Inverse Problems	PEC	4	ю	-	0	ო	0	20-35	ı	20-30	40-50	I
32.	MA-541	Representation Theory of Finite Groups	PEC	4	3	-	0	с	0	20-35	I	20-30	40-50	ı
33.	MA-542	Semigroup Theory and Applications	PEC	4	3	-	0	ю	0	20-35	I	20-30	40-50	ı
34.	MA-543	Sobolev Spaces and Applications	PEC	4	с	~	0	с	0	20-35	ı	20-30	40-50	ı
35.	MA-544	Statistical Inference	PEC	4	3	-	0	ю	0	20-35	I	20-30	40-50	ı
36.	MA-545	Stochastic Differential Equations	PEC	4	с	-	0	с	0	20-35	ı	20-30	40-50	ı
37.	MA-546	Stochastic Partial Differential Equations	PEC	4	3	-	0	ю	0	20-35	I	20-30	40-50	
38.	MA-547	Wavelet Analysis	PEC	4	с	-	0	З	0	20-35		20-30	40-50	I

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Program Overview
Chemistry Department proposes to replace the existing 5-year integrated M.Sc. in Chemistry by (4+1) year BS-MS Dual Degree in Chemical Sciences with an exit option to earn BS degree after successful completion of 4 years.
Program Salient Features
Exit option: The students willing to exit the program with BS degree can apply before the end of 7 th semester.
For BS Degree: All the essential fundamentals will be covered including sufficient practical exposure up to 8 th semester. Students will gain
fundamental knowledge on all the specializations (analytical, physical, inorganic, organic, materials, computational & theoretical chemistry)
and a research project. The students qualifying with BS degree will have career prospects in chemical industry and for higher studies.
For MS Degree: 5 th Year will be extensively research-oriented with dissertation work and advanced elective courses. Students continuing
and completing 5 years of study will obtain dual degree (BS-MS in Chemical Sciences). Students will gain advanced knowledge and research
exposure. The qualifying students will have prospects for higher studies and eligibility for scientists posts in scientific and industrial
laboratories.

Proposal for BS-MS in Chemical Sciences (4+1 Year Dual Degree Programme) Appendix - B Item No. Senate / 89.4

-16-

XX BS-MS (Chemical Sciences) CY Chemistry Program Code:

Department:

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	21	23	44
2	23	24	47
3	21	19	40
4	16	17	33
5	15	12	27
Co-curricular Activities			02
Grand Total	96	95	193 for BS-MS Degree
			166 for BS Degree
Total with Minor	with additional	18-20 credits	211-213 for BS-MS Degree
Specialization Courses			184-186 for BS Degree

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Curricular Components	Credit Distribution for
	for BS-MS (Chemical Sciences)
(a) Institute Core Courses	
Humanities and Social Sciences (HSSC)	04
Basic Sciences (BSC)	20
Engineering Sciences (ESC)	12
General Sciences (GSC)	03
Total	39
(b) Program Elective Courses (PCC)	
Class Contact Core Courses	95
Introduction to discipline	02
Technical Communication	02
Project/Dissertation	16
Seminar	02
Educational Tour	S/U [#]
Total	117
(c) Humanities, Social Science and Management	
Elective Courses (HSSMEC)	
Humanities & Social Science	03
Management Studies	03
Total	06
(d) Open Elective Courses (OEC) Total	03
(e) Program Elective Courses (PEC) Total	26
(f) Co-curricular Activities	
Discipline (to be awarded after final year)	02
NCC/NSO/NSS (First year)*	1
Grand Total	193
S 11	

Credit Distribution for BS-MS Programme in Chemical Sciences

*S/U refers Satisfactory/Unsatisfactory

* The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

XX BS-MS (Chemical Sciences) CY Chemistry Program Code:

Department: Year:

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		Teaching Scheme			(Cont	act	Exam.		Relative Weight (%)					
		-			Но	urs/	Week	Du	ration			_			
S. No.	Sub	Courses Title	Sub.	Credits	L	Т	Р		ս	CWS	PRS	MTE	ETE	PRE	
	Code		Area					Theory	Practics						
		•	Se	emester-I (Autu	mn)									
1.	MA-001	Mathematics-I	BSC	4	3	1	0	3	0	20-35	0	20-30	40-50	0	
2.	CY-101	Introduction to Chemical Science	PCC	2	2	0	0	0	0	20-35	0	20-30	40-50	0	
3.	CY-103	Computer Programming	ESC	4	3	0	2	3	0	10-25	25	15-25	30-40	0	
4.	PH-007	Modern Physics	BSC	4	3	0	2	3	0	10-25	25	15-25	30-40	0	
5.	HSN-002	Introduction to Psychology	HSSC	2	1	1	0	2	0	20-35	0	20-30	40-50	0	
6.	CEN-105	Introduction to Environmental Studies	GSC	3	3	0	0	3	0	20-35	0	20-30	40-50	0	
7.	HSN-001	Communication Skills	HSSC	2	1	0	2	2	0	20-35	0	20-30	40-50	0	
		Total		21											
		•									•				
			S	emester-II	(Spri	ing)									
1.	MA-004	Numerical Methods	BSC	4	3	1	0	3	0	20-35	0	20-30	40-50	0	
2.	PH-008	Electromagnetic theory	BSC	4	3	1	0	3	0	20-35	0	20-30	40-50	0	
3.	CY-102	Physical Chemistry-I	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	0	
4.	CY-104	Organic and Inorganic Chemistry	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	0	
5.	CY-106	Basic Analytical Chemistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0	
6.	CHN-102	Energy Engineering	ESC	4	3	1	0	3	0	20-35	0	20-30	40-50	0	
		Total		23											

Program Code:	XX	BS-MS (Chemical Sciences)
Department:	CY	Chemistry
Year:	II	-

		Teaching Scheme			(Conta	ct	Exam.			Relati	ve Weigł	nt (%)	
					Ho	ours/V	Veek	Dur	ation					
S. No.	Sub Code	Courses Title	Sub. Area	Credits	L	Т	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			S	emester-II	I (Au	tumn))	1						
1.	BT-201	Genetics and Developmental Biology	ESC	4	3	0	2	3	0	10-25	25	15-25	30-40	0
2.	CY-201	Chemical Thermodynamics	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
3.	CY-203	Main Group and Cluster Chemistry	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
4.	CY-205	Organic Chemistry-I	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
5.	MA-209	Ordinary and Partial Differential Equations	BSC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
6.	HSS-ELE	HSS Elective Course	HSSMEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
		Total		23										
					TI (O	• ``								
			1.	Semester-I	V (Sp	ring)						• • • •	40.50	
1.	CY-202	Coordination Chemistry and Organometallics	PCC	4	3	I	0	3	0	20-35	0	20-30	40-50	0
2.	CY-204	Organic Chemistry-II	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
3.	CY-206	Chemical Kinetics	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-208	Polymer Chemistry	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
5.	CY-212	Laboratory-I	PCC	6	0	0	12	0	4	0	25-35	20-30	0	40-50
6.	CY-ELE1	Program Elective-1	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
		Total		24										

Program Code:	XX	BS-MS (Chemical Sciences)
Department:	CY	Chemistry
Year:	III	

		Teaching Scheme				Conta	act	Exam.			Relat	ive Weig	ht (%)	
					Н	ours/V	Veek	Du	iration					
S. No.	Sub Code	Courses Title	Sub. Area	Credits	L	Τ	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			S	emester-V	' (Aut	umn)								
1.	CY-301	Quantum Chemistry and Chemical Bonding	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
2.	CY-303	Advanced Coordination Chemistry	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
3.	CY-305	Organic Chemistry-III	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-311	Organic Chemistry Laboratory	PCC	4	0	0	8	0	4	0	25-35	20-30	0	40-50
5.	OEC-1	Open Elective Course-1	OEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CY-ELE2	Program Elective-2	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
		Total		21										
	.		S	emester-V	/I (Sp	ring)			-		,			
1.	CY-302	Group Theory and Spectroscopy	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
2.	CY-304	Solid State Chemistry and Applications	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CY-306	Organic Chemistry-IV	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-312	Inorganic Chemistry Laboratory	PCC	4	0	0	8	0	4	0	25-35	20-30	0	40-50
5.	CY-316	Art of Scientific/ Technical Writing	PCC	2	2	0	0	2	0	20-35	0	20-30	40-50	0
6.	CY-398	Educational Tour	PCC	0	0	0	0	0	0	0	0	0	0	0
7.	BM-ELE	Management Studies Elective Course	HSSMEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
8.	MSC-1	Minor Specialization Course-I	MSC	3/4	3	0/1	0	3	0	20-35	0	20-30	40-50	0
		Total		19-23										

Program Code:	XX	BS-MS (Chemical Sciences)
Department:	CY	Chemistry
Year:	IV	

		Teaching Scheme	e				Conta	nct	E	xam.		Relat	tive Weig	ght (%)	
						H	ours/V	Veek	Du	ration					
S. No.	Sub Code	Courses Title		Sub. Area	Credits	L	Т	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
				S	Semester-V	/II (A	utumi	n)							•
1.	CY-521	Advanced Analytical M	[ethods	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CY-523	Organic Chemistry-V		PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CY-525	Advanced Molecular Spectroscopy		PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-531	Physical Chemistry Lab	ooratory	PCC	4	0	0	8	0	4	0	25-35	20-30	0	40-50
5	CY-ELE3	Program Elective-3		PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	MSC-2	Minor Specialization C	ourse-II	MSC	3/4	3	0/1	0	0	0	20-35	0	20-30	40-50	0
7.	MSC-3	Minor Specialization C	ourse-III	MSC	3/4	3	0/1	0	0	0	20-35	0	20-30	40-50	0
			Total		16-24										
	-			5	Semester-V	VIII (S	Spring	g)	-	-	-				
1.	CY-522	Materials Chemistry		PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CY-524	Frontier Inorganic Cher	nistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CY-526	Organic Chemistry-VI		PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CY-ELE4	Program Elective-4	Project*	PEC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
6.	CY-ELE5	Program Elective-5	CY-500	PEC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
7.	MSC-4	Minor Specialization C	ourse-IV	MSC	3/4	3	0/1	0	3	0	20-35	0	20-30	40-50	0
7.	MSC-5	Minor Specialization C	ourse-V	MSC	3/4	3	0/1	0	3	0	20-35	0	20-30	40-50	0
		Total			17-25										

Note: Students wishing to have BS Degree in Chemical Sciences they must inform to Dean (Academic Affairs) about their option before completing 7th semester and they may exit the program at the end of 4th year. *Compulsory for BS Degree students

-22-

Program Code:XXBS-MS (Chemical Sciences)Department:CYChemistryYear:V

		Teaching Scheme				Conta	ct	E	xam.		Rela	tive Weig	ht (%)	
					Η	ours/V	Week	Du	iration					
S. No.	Sub Code	Courses Title	Sub. Area	Credits	L	Τ	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			Se	mester-IX	K (Aı	ıtumn	l)							
1.CY-600AThesis Stage ITHE4							8	0	0	0	0	0	100	0
2.	CY-ELE6	Program Elective-6	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CY-ELE7	Program Elective-7	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-ELE8	Program Elective-8	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CY-699	Seminar	PCC	2	0	0	0	0	0	0	0	0	100	0
		Total		15										
									•					
			S	Semester-X	K (Sj	oring)								
1.	CY-600B	Thesis Stage II	THE	12	0	0	24	0	0	0	0	0	100	0
		Total		12										

		Teaching Scheme				Conta	ict	F	Exam.		Rela	tive Weig	ght (%)	
					Н	ours/V	Week	Dı	iration					
S. No.	Sub Code	Courses Title	Sub. Area	Credits	L	T	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CY-210	Bioinorganic and Biomimetic Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CY-309	Chemistry of Industrial Processes	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CY-512	Nuclear and Radiochemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CY-514	Heterocyclic Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CY-518	Structure, Bonding and Properties of Solids	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CY-606	Total Synthesis	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
7.	CY-607	Electroanalytical Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
8.	CY-608	Chemical Biology	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
9.	CY-609	Inorganic Biochemistry and Reaction Mechanism	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
10.	CY-610	Molecular Modeling and Simulations	PEC	3	2	0	2/2	2	0	15-30	20	15-25	30-40	0
11.	CY-612	Carbon Nanomaterials and their Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
12.	CY-613	Frontiers in Inorganic Biochemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
13.	CY-614	Asymmetric Synthesis	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
14.	CY-615	Crystal and Molecular Structure	PEC	3	2	0	2/2	2	0	15-30	20	15-25	30-40	0
15.	CY-617	Supramolecular Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
16.	CY-619	Modern Organic Synthetic Methods	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
17.	CY-621	Organic Structure Determination	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
18.	CY-623	Organic Semiconductors	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
19.	CY-625	Proteins and Polypeptides	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
20.	CY-627	Advanced Surface and Colloidal Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
21.	CY-633	Nanoscale Materials: Properties and Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0

List of Program Elective Courses

22.	CY-635	Advanced Magnetic Resonance	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
		Spectroscopy												
23.	CY-638	Reactivity, Structure Determination,	PEC	3	2	0	2	3	0	20-35	0	20-30	40-50	0
		Devices and Electronic Structure of												
		Solids												
24.	CY-703	Advanced Material Characterization	PEC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
		Techniques												
25.	CY-902	Advanced Inorganic Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
26.	CY-903	Advanced Organic Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
27.	CY-904	Advanced Physical Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
28.	CY-905	Spectroscopic Methods of	PEC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
		Structural Elucidation												

Credits	for	BS-MS	Programs
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CURRICULAR COMPONENTS	Credits
(a) Institute Core Courses	
(i) Humanities and Social Sciences (HSSC)	04
(ii) Basic Sciences (BSC)	16-20
(iii) Engineering Science (ESC)	08-16
(iv) General Sciences (GSC)	03
Total	31-43
(b) Program Core Courses (PCC)	
i. Class Contact Core courses	92-102
ii. Introduction to (Discipline) Engineering/Sciences	02
iii. Technical Communication	02
iv. Project/Thesis	12-16
v. Seminar	0-2
vi. Educational Industrial Tour	S/U
Total	108-124
(c) Humanities, Social Sciences and Management Elective Courses (HSSME	C)
i. Humanities and Social Sciences	03
ii. Management Studies	03
Total	06
(d) Open Elective Course (OEC)	03-06
(e) Programme Elective Courses (PEC)	24-32
(f) Minor Specialisation Courses (MSC)/Departmental Honour Courses	18-20
(DHC)	
(g) Co-curricular Activities (CCA)	
i. Discipline (To be awarded after Final Year)	02
ii. NCC/NSO/NSS (First Year)*	-
Total	02
Grand Total	156-166
(For those who exit after <mark>BS program</mark>)	
Grand Total	174-186
(For those who opt for degree with minor specialisation or honours with	
BS program)	
Grand Total	186-196
(For those who opt BS-IVIS program)	204 240
Grand Total	204-216
(For those who opt for degree with minor specialisation or honours with	
BS-IVIS program)	

* The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

Appendix - D Item No. Senate / 89.4

Credits for BS-MS	(Physics)	Program
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CURRICULAR COMPONENTS	Credits
(a) Institute Core Courses	
(i) Humanities and Social Sciences (HSSC)	04
(ii) Basic Sciences (BSC)	16
(iii) Engineering Science (ESC)	08
(iv) General Sciences (GSC)	03
Total	31
(b) Program Core Courses (PCC)	
i. Class Contact Core courses	94
ii. Introduction to (Discipline) Engineering/Sciences	02
iii. Technical Communication	02
iv. Project/Thesis	16
v. Seminar	2
vi. Educational Industrial Tour	-
Total	116
(c) Humanities, Social Sciences and Management Elective Courses (HSSME	C)
i. Humanities and Social Sciences	03
ii. Management Studies	03
Total	06
(d) Open Elective Course (OEC)	03
(e) Programme Elective Courses (PEC)	30-33
(f) Minor Specialisation Courses (MSC)/Departmental Honour Courses	18-20
(g) Co-curricular Activities (CCA)	
i Discipling (To be awarded after Final Year)	02
$\frac{1}{1000} = \frac{1}{1000} = 1$	02
	02
	161-164
(For those who evit after <mark>BS program</mark>)	101 104
(For those who exit after b5 program)	179_18/
(For those who opt for degree with minor specialisation or honours with	175-104
(i of those who option degree with finite specialisation of honours with BS program)	
Grand Total	188-191
(For those who opt <mark>BS-MS program</mark>)	-
Grand Total	
(For those who opt for degree with minor specialisation or honours with	
BS-MS program)	206-211

* The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

BS-MS in Physics Physics X H _ Program Code: Department: Year:

	ЬКЕ		0		0	0	0	0				0	0	0	0	50	0		
ıt (%)	313		40-50	40-50	40-50	40-50	40-50	40-50				40-50	40-50	40-50	40-50	0	40-50		
ive Weigh	ATE		20-30	20-30	20-30	20-30	20-30	20-30				20-30	20-30	20-30	20-30	0	20-30		
Relati	SAG		ı	25	ı	0	0	0				0	0	0	0	50	25		
	SWD		20-35	15-25	20-35	25-35	25-35	20-35				20-35	20-35	20-35	20-35	0	15-25		
am ation rs.)	Practical		0	0	0	0	0	0				0	0	0	0	4	2		
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it eek	٩	-	0	2	0	0	0	0	0	2		0	0	0	0	9	2		∞
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	Subject Area	A	BSC	ESC	BSC	HSSC	HSSC	PCC	GSC		0	BSC	PCC	PCC	PCC	PCC	BSC		
Teaching Scheme	Course Title		Mathematics - 1	Computer Programming	Physical Chemistry	Communication Skills	Introduction to Psychology	Introduction to Physical Science	Introduction to Environmental Studies	TOTAL		Mathematical Methods	Physics 1 (Mechanics and Relativity)	Physics 2 (Electro Magnetic Theory)	Basic Analog Electronics	Physics Lab 1 (Basic experiments)	General Organic and Inorganic	Chemistry	TOTAL
	Subject Code		MA-001	PH-103	CYN-001	HSS-10X	HSS-10Y	PH-101	CEN-105			MA-002	PH-xxx	PH-xxx	PHN-xxx	PH-xxx	CY-104		
	.oN .S		1.	2.	З.	4.	5.	6.	7.			1.	2.	З.	4.	5.	6.		

BS-MS in Physics Physics X H = Program Code: Department: Year:

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ıt (%)	313		0	40-50	40-50		40-50	0	40-50				40-50	40-50	40-50	40-50	40-50	0	50	
ve Weigh	MTE		0	20-30	20-30		20-30	0	20-30				20-30	20-30	20-30	20-30	20-30	0	50	
Relati	SЯq		50	0	0		0	50	0				0	0	0	0	0	50	0	
	SWD		0	20-35	20-35		20-35	0	20-35				20-35	20-35	20-35	20-35	20-35	0	0	
am ition rs.)	Practical		4	0	0		0	7	0				0	0	2	0	0	9	0	
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t eek	Ч		4	0	0		0	9	0		10		0	0	0	0	0	9	0	9
Contac urs/W	F	ter	0	1	1		0	0	1		3	er	0	0	1	0	0	0	1	2
Н		Semes	2	2	e		3	0	2		12	emest	£	£	3	£	£	0	1	16
	Stib 97C	itumn	4	£	4		<mark>8</mark>	£	£		20	pring S	£	£	4	£	£	£	2	21
	Subject Area	AL	ESC	PCC	PCC		PCC	PCC	HSS	MEC		S	PCC	РСС	PCC	PCC	PCC	РСС	PCC	
Teaching Scheme	Course Title		Mechanical Engineering Drawing	Quantum Physics	Thermal Physics and Statistical	Mechanics	Digital Electronics	Physics Lab 2 (Thermal & Electronics)	HSS Elective Course		TOTAL		Elements of condensed matter Physics	Mathematical Physics I	Applied Optics	Nuclear Physics and its applications	Spectroscopy & Laser Physics	Physics Lab 3 (Optics + Atomic Physics)	Technical Communication	TOTAL
	Subject Code		MIN-108	PH-xxx	PH-xxx		PH-xxx	PH-xxx	HSS-ELE				PH-xxx	PH-xxx	PH-xxx	PH-xxx	PH-xxx	PH-xxx	PH-xxx	
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BS-MS in Physics Physics ×₩≡ Program Code: Department: Year:

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ht (%)	313		40-50	40-50	40-50	40-50	ı	40-50			40-50	40-50	40-50	40-50	40-50		40-50	40-50	
ive Weig	MTE		20-30	20-30	20-30	20-30	-	20-30			20-30	20-30	20-30	20-30	20-30		20-30	20-30	
Relat	SAG		ı	-	I	-	20	-			-	-	I	I	I	50	-	I	
	SWD		20-35	20-35	20-35	20-35	-	20-35			20-35	20-35	20-35	20-35	20-35		20-35	20-35	
am ition 's.)	Practical		ı	-	ı	-	£	-			0	0	0	0	0	8	-	-	
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	Subject Area	Autun	PCC 4	PCC 4	PCC 2	PCC 4	PCC	OEC		Spri	PCC	PCC	PCC	PCC	PCC	PCC	HSSMEC	MSC 3	
Teaching Scheme	Course Title Subject Area	Autur	Quantum Mechanics - I PCC 4	Mathematical Physics 2 PCC 2	Classical Electrodynamics PCC ²	Classical Mechanics	Physics Lab 4 PCC	OEC DEC	Total	Spri	Condensed Matter Physics PCC	Statistical Mechanics PCC	Quantum Mechanics - II PCC	Atomic and Molecular Physics PCC	Nuclear and Particle Physics PCC	Physics Lab 5 PCC	Management Elective HSSMEC	Minor Specialization Course- I MSC 3	Total
Teaching Scheme	Subject Code Area Area	Autur	PH-xxx Quantum Mechanics - I PCC 4	PH-xxx Mathematical Physics 2 PCC 2	PH-xxx Classical Electrodynamics PCC ²	PH-xxx Classical Mechanics PCC 4	PH-xxx Physics Lab 4 PCC	OEC OEC OEC	Total	Spri	PH-xxx Condensed Matter Physics PCC	PH-xxx Statistical Mechanics PCC	PH-xxx Quantum Mechanics - II PCC	PH-xxx Atomic and Molecular Physics PCC	PH-xxx Nuclear and Particle Physics PCC	PH-xxx Physics Lab 5 PCC	HSSMEC Management Elective HSSMEC	MSC-1 Minor Specialization Course-1 MSC 3	Total

BS-MS in Physics Physics X H ≥ Program Code: Department: Year:

		Teaching Scheme			Hou	Contact urs/We	ek	Exal Durat (Hrs	m ion		Relat	ive Weigh	nt (%)	
.oN .S	Subject Code	Course Title	5ubject Area	Credits	_	F	٩	Τheory	Practical	SWD	SЯq	MTE	3T3	ЬВЕ
			Au	tumn S	semest	ter			-	-				
.	PH-xxx	Semiconductor Devices and Applications	PCC	4	m	1		m	0	20-35		20-30	40-50	ı
2.	PH-xxx	Plasma and space physics	PCC	4	3	<mark>1</mark>	0	m	0	20-35	·	20-30	40-50	ı
с.	PH-xxx	Programme Elective – I	PEC	N	m	0	0	m	0	20-35	1	20-30	40-50	0
4.	PH-xxx	Programme Elective – II	PEC	ŝ	3	0	0	ŝ	0	20-35	ı	20-30	40-50	ı
5.	PH-xxx	Project [*] stage - 1 (optional)	PEC	3	3	0	0	3	0	20-35	·	20-30	40-50	ı
6.	MSC-2	Minor Specialization Course- II	MSC	3/4	3	0/1	0	ŝ	ı	20-35	·	20-30	40-50	ı
7.	MSC-3	Minor Specialization Course- III	MSC	3/4	3	0/1	0	3	ı	20-35	·	20-30	40-50	ı
		Total		14/										
				22										
			S	oring So	emeste	er								
1.	PH-xxx	Programme Elective - III	PEC	m	ε	0	ı	m	0	20-35	·	20-30	40-50	ı
2.	PH-xxx	Programme Elective - IV	PEC	с	3	0	ı	ε	0	20-35	ı	20-30	40-50	ı
ю.	PH-xxx	Programme Elective - V	PEC	m	с	0	ı	m	0	20-35	ī	20-30	40-50	ı
4.	PH-xxx	Programme Elective - VI	PEC	с	с	0	ı	с	0	20-35	ı	20-30	40-50	ı
5.	PH-xxx	Programme Elective - VII	PEC	m	с	0		m	0	20-35	ı	20-30	40-50	
9.	MSC-4	Minor Specialization Course-IV	MSC	3/4	m	0/1	0	m	ı	20-35	ı	20-30	40-50	ı
7.	MSC-4	Minor Specialization Course-V	MSC	3/4	3	0/1	0	3	ı	20-35	·	20-30	40-50	ı
		Total		15/ 23										
*Proj	act only for 8 a	and above CGPA.]

BS-MS in Physics Physics × H > Program Code: Department: Year:

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	РЯЕ		ı	0	-	-	-			0	
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	Subject Area	AL	PCC	PCC	PEC	PEC	PEC		S	PCC	
Teaching Scheme	oject Course Title		kx Seminar	xx Thesis stage - 1	xxx Programme Elective – VIII	xxx Programme Elective – IX	xxx Programme Elective – X	Total		xxx Thesis stage - 2	Total
	Sub Co		PH-xx	PH-xx	<-NH4	-NHA	<-NH4			<-NH4	
	.oN .S		ij.	2.	ъ.	4.	4.			1.	

Item No. 89.5 To consider the proposal of Department of Hydro and Renewable Energy to rename the existing M.Tech. program on 'Alternate Hydro Energy System' as "Renewable and Hydro Energy" and to revise its structure.

The erstwhile Alternate Hydro Energy Centre (AHEC) has been converted to a Department named Hydro and Renewable Energy vide 57th meeting of BoG (Item No. 57.5), dated Mar 06, 2019. The department has been offering the Masters Program on "Alternate Hydro Energy System". However, in view of the change in the status and the name of the academic entity as well as to update the program deliverables, the Department proposed to change the (a) Name of the Masters Programme, (b) Structure of the Programme.

The IAPC, in its 113th meeting held on 24.11.2021, considered the proposal and recommended to rename the Programme as "M. Tech. (Renewable and Hydro Energy)". The IAPC also recommended the structure with modifications.

The modified course structure is placed at (Appendix-A).

The above is submitted for the consideration and approval of the Senate.
DEPARTMENT OF HYDRO AND RENEWABLE ENERGY INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

M.Tech. (Renewable and Hydro Energy) Program Code: 12 HRE Department of Hydro and Renewable Energy Department: Ι

		Teaching Scheme			Ho	Conta ours/V	ct Veek	Exam Duration		Relative Weight (9			(%)	
S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
	•	S	Semester	- I (Aut	umn)		•							
1.	AHN-510	Hydropower Planning and Management (New)	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	AHN-513	Renewable Energy Resources Development Technology (Existing)	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
3.		Program Elective-I	PEC	4	-	-	-	-	-	-	-	-	-	-
4.		Program Elective-II	PEC	4	-	-	-	-	-	-	-	-	-	-
5.		Program Elective-III	PEC	4	-	-	-	-	-	-	-	-	-	-
		Total		20										
			Semester	-II (Sp	ring)									
1.	AHN-583	Grid Integration of Renewable Energy (New)	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
2.	AHN-584	Finance, Policy and Regulations for Renewable Energy (New)	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	AHN-700	Seminar	SEM	2	-	-	-	-	-	-	-	-	100	-
4.		Program Elective-IV			-	-	-	-	-	-	-	-	-	-
5.	5. Program Elective-V			4	-	-	-	-	-	-	-	-	-	-
			18											

Appendix - A Item No. Senate / 89.5

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code:12M.Tech. (Renewable and Hydro Energy)Department:HREDepartment of Hydro and Renewable EnergyYear:II

			Contact Hours/Week			Exam Duration		Relative Weight (%)						
S. No.	Subject Code	Credits	L	Т	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE		
		S	Semester	- I (Aut	umn)									
1.	AHN-701A	Thesis Stage-I (to be continued next semester)	DIS	12	-	-	-	-	-	-	-	-	100	-
		Total		12										
Note	e: Students ca	an take 1 or 2 audit courses as advised by th	ie superv	visor, if	requi	red.						•		
		,	Semester	r-II (Sp	ring)		-			-	-		-	
1.	AHN-701B	Thesis Stage-II (continued from III semester)	DIS	18	-	-	-	-	-	-	-	-	100	-
		Total		18										

Su	mmary			
Semester	1	2	3	4
Semester-wise Total Credits	20	18	12	18
Total Credits		68	3	

Program Elective Courses M.Tech. (Renewable and Hydro Energy)

		-	Teaching Scheme	-		C Hou	Conta 1rs/W	ct Yeek	Exam Duration		Rel	ative	Weight	. (%)	
	S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	Р	Theory	Practical	CWS	PRS	MTE	ETE	PRE
	1.	AHN-514	Hydro Electric Equipment (Existing PCC)	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
	2.	AHN-515	Design of Hydropower Structures (New)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	3.	AHN-516	Hydro mechanical Equipment (Existing PCC)	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
	4.	AHN-517A	Modelling, Simulation & Computer Applications (Existing)	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
	5.	AHN-518	Environmental Planning and Management (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	6.	AHN-522	Wind Energy Application Technology (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
ώ	7.	AHN-526	Instrumentation for Hydro Power Plants (Existing)	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
9	8.	AHN-528	Rural Electrical Energy System Planning and Design (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	9.	AHN-532	Remote Sensing and GIS for Renewable Energy Planning (New)	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
	10.	AHN-534	Construction Planning and Management (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	11.	AHN-536	Biomass Production and Utilisation (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	12.	AHN-540	Solar Photo-Voltaic Design and Application (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	13.	AHN-542	Energy Conservation and Management (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	14.	AHN-580	Climate Change and water Resources (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	15.	AHN-581	Energy-water-food nexus (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	16.	AHN-582	Electric Vehicular Technology (Existing)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	17.	AHN-585	Energy Storage Systems (New)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
	18.	AHN-586	Hydrogen Economy (New)	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

Item No. 89.6 To consider the proposal of credit transfer for Master students from partner institutes similar to UG regulation.

The Institute, under the Clause 35 of UG Regulations, allows transfer of credits earned by the students from reputed institutions known for high academic standards in India and abroad, which have an MOU with the Institute concerning this aspect.

Dean, International Relations submitted a proposal to create a similar provision for PG students. It is argued that such provision shall help improving collaborative work between the partner Institutes.

The IAPC, in its 111th meeting held on 22.09.2021, considered the proposal and recommended Credit Transfer for Masters students with minor modification (Appendix-A).

The above is submitted for the consideration and approval of the Senate.

Appendix - A Item No. Senate / 89.6

<u>Transfer of Course Credits from other institutes for award of degree for</u> Master Students

(1)	Transfer of credits earned by the students from reputed institutions known for high
	academic standards in India and abroad, which have an MOU with the Institute
	concerning this aspect, be permitted.
(2)	The students of IIT Roorkee, who have been nominated/ recommended by the
	Chairman, DAPC/ CAPC, and approved by Dean, Academic Affairs for pursuing study in
	such other institutions, will only be eligible for such transfer of credits.
(3)	The subject wise study programme for each student and equivalence for transfer of
	credits based on the syllabi of the course of the host Institution to the Institute will be
	recommended by the Chairman, DAPC on case to case basis, and be approved by the
	Dean, Academic Affairs.
(4)	The credits earned in other institute will be transferred for award of degree.
(5)	The maximum permissible limit for transfer of credits will be 24.
(6)	The subjects and grades earned will be indicated in the consolidate grade
	sheet/transcripts with the remark that the grades have been awarded by the host
	institution.
(7)	Credits earned and grades will not be considered towards of SGPA/ CGPA.
(8)	Grades earned in host institutions will not be considered for any award/ prize at the
	Institute.

Item No. 89.7 To consider the proposal of Department of Design to revise the structures of M. Des. (Industrial Design) and MIM (Masters in Innovation Management) programs.

The program structures for M. Des. (Industrial Design) and MIM were approved by the Senate in its 86th meeting held on 09.02.2021. Subsequently, the department developed the detailed syllabi of the programmes. A few minor changes were observed while accommodating the newly developed syllabi in the structures according to the course components.

The IAPC, in its 113th meeting held on 24.11.2021, considered and recommended the modified structures of the said programs.

The revised structures are placed as (Appendix-A).

The above is submitted for the consideration and approval of the Senate.

M. Des. (Industrial Design)

Teaching Scheme

I Year: Autumn Semester

				Contact Hrs Per Week			Exa Dura	ım tion		Relat	ive Weig	htage %		
S. No.	Course Code	Course Title	Subject Area	Credits	L	T	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
1	IDN-501**	Introduction to Design and Prototyping	РСС	Audit	15	5	10	02	-	35	35	-	30	-
2	IDN-503	Design Thinking	PCC	3	1	0	4	2	0	10-25	25	15-25	-	<mark>30-40</mark>
3	IDN-505	Elements and Principles of Visual Design	РСС	3	2	1	0	2	0	20-35	-	20-30	40-50	-
4	IDN-507	Human Factor Design	PCC	3	1	2	0	2	0	20-35	-	20-30	40-50	-
5	IDN-509	Materials and Manufacturing	РСС	3	1	1	2	2	0	10-25	25	15-25	-	<mark>30-40</mark>
6	IMN-503	Effective Communication	PCC	2	1	1	0	0	2	20-35	20-30	-	-	40-50
7	IDN-513	Ideation Project	PCC	4	1	0	6	-	-	-	100	-	-	-
8		Program Elective I	PEC	3/4	-	-	-	-	-	-	-	-	-	-
			Sub Total	21/22		1		1	1	1		1	11	
** Th	is is a founda	tion course which will be runn	ing for 7-10 day	s to give o	rientat	ion of	Desig	n cours	se. It v	will be hel	ld before a	actual star	rt of the se	emester

teaching.

IYear:	Spring	Semester
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	Teaching Scheme						rs Per	Exa	m	Relative Weightage%						
						Week	K	Dura	tion							
S. No.	Course Code	Course Title	Subject Area	Credits	L	Т	Р	Т	Р	CWS	PRS	MTE	ETE	PRE		
1	IDN-502	Design Methodology	PCC	3	2	0	2	2	0	10-25	25	15-25	<mark>30-40</mark>	-		
2	IDN-504	Form Design	PCC	3	1	0	4	0	4	20-35	20-30	-	-	40-50		
3	IDN-506	Design for Sustainability	PCC	3	2	1	0	2	0	20-35	-	20-30	40-50	-		
4	IDN-508	Creation Project	PCC	5	-	-	10	-	-	-	100	-	-	-		
5	IDN-510	Design Seminar	PCC	2	-	-	4	-	-	-	100	-	-	-		
6		Program Elective II	PEC	3/4	-	-	-	-	-	-	-	-	-	-		
7		Program Elective III	PEC	3	-	-	-	-	-	-	-	-	-	-		
		•	Sub Total	22/23												

IIYear: Autumn Semester

				Contact Hrs Per Week			Exa Durat	m tion	Relative Weightage%						
S. No.	Course Code	Course Title	Subject Area	Credit	L	T	Р	Т	Р	CWS	PRS	MTE	ETE	PRE	
1	IDN-702	Internship (Industrial Training/ Project/ Interaction)	SEM	4	-	-	-	-	-	-	-	-	100ss	-	
2		Program Elective IV	PEC	3/4	-	-	-	-	-	-	-	-	-	-	
3		Program Elective V*	PEC	3	-	-	-	-	-	-	-	-	-	-	
4	IDN-701A	Design Project (Phase-I)	DIS	5	-	-	-	-	-	-	-	-	100	-	
			Sub Total	15/16											

\$\$ Evaluation scheme: (Industry: 40 + Institute: 60) Internship will be completed during summer break.

*May be completed through online mode (for example, NPTEL).

<u>II Year:</u> Spring Semester

		Contact Hrs Per Week			Exam Duration		Relative Weightage %							
S. No.	Course Code	Course Title	Subject Area	Credit	L	Т	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
1	IDN-701 B	Design Project (Phase – II)	DIS	12	-	-	-	-	-	-	-	-	100	-
			Sub Total	12										
			Total	70/73										

Basket 1 Engineering Group

		Teaching Scheme	Subject Area Credits			Contact Hrs Per Week			Exam Duration		Relati	ve Weigh	tage%	
S. No.	Course Code	Course Title	Subject Area	Credits	L	T	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
	First Seme	ster												
1	IDN-521	Sensors, Actuators and IOT	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	IDN-522	Computer Aided Design	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
3	IDN-523	Rapid Prototyping	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
4	IDN-546	Product Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	EEN-524	Intelligent Sensors and Instrumentation	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
	Second Ser	nester												
1	ECN-578	Digital Systems Design	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	IDN-525	CAE in Product Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	IDN-526	Reverse Engineering	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
	Third Sem	ester												
1	IDN-527	Artificial Intelligence and Data Science	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	IDN-547	Manufacturing Guidelines for Product Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	AID-505	Machine Learning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Basket 2 Management Group

		Teaching Scheme			Cont	act H Weel	rs Per «	Exa	ım		Relati	ve Weigh	tage%	
								Dura	tion					
S. No.	Course Code	Course Title	Subject Area	Credits	L	Т	Р	Т	Р	CWS	PRS	MTE	ЕТЕ	PRE
	First Sem	ester												
1	IDN-528	Product Planning and Marketing	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
	Second Se	emester												
1	IMN-505	Business Valuation	PEC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
2	IDN-530	Business and Service Innovation	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	IMN-506	Intellectual Property Management	PEC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
4	IMN-510	Product Innovation Management	PEC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
	Third Sen	nester												
1	IDN-531	Legal Standards/IPR	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	IDN-532	Systems Thinking	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-

		Teaching Scheme			Cont	act H Weel	frs Per k	Exa Dura	am Ition		Relati	ve Weigh	tage%	
S. No.	Course Code	Course Title	Subject Area	Credits	L	T	P	Т	P	CWS	PRS	MTE	ЕТЕ	PRE
	First Sen	nester												
1	IDN-533	User Experience Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
	Second S	emester												
1	IDN-534	Interaction Design	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	IDN-536	Service Design	PEC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
3	IDN-537	Research into Design	PEC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
4	IDN-538	Bio Inspired Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	IDN-548	Inter-Disciplinary Design	PEC	3	2	0	2/2	2	0	15-30	20	15-25	30-40	-
6	IDN-549	Design for Social Inclusion	PEC	3	2	0	2/2	2	0	15-30	20	15-25	30-40	-
	Third Se	mester												
1	IDN-535	Mobility Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	IDN-539	Computer Game Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	IDN-540	Design for Society	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	IDN-541	Graphic Design	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
5	IDN-542	Product Detailing	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	IDN-543	Contemporary Visual Design	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	IDN-544	Representation Techniques for Animation	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
8	IDN-545	Visual Narrative	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-

Basket 3 Design Group

Basket 4 On-line mode: NPTEL

A list of approved NPTEL courses by DAPC will be provided to students.

Course duration: 20hrs

The courses will be PEC without laboratory work

MIM (Masters in Innovation Management)

Teaching Scheme

<u>I Year:</u> Autumn Semester

		Teaching Scheme			Co	ntact	t Hrs	Exar	n	Relative Weightage%				
					Р	er W	eek	Durati	ion					
S.	Course	Course Title	Subject	Credits	L	Т	Р	Т	P	CWS	PRS	MTE	ETE	PRE
No.	Code		Area											
1	IDN-503	Design Thinking	PCC	3	1	0	4	2	0	10-25	25	15-25	-	30-40
2	IMN-503	Effective Communication	PCC	2	1	1	0	0	2	20-35	20-30	-	-	40-50
3	IMN-505	Business Valuation	PCC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
4	IMN-507	Innovative Entrepreneurship Strategies	PCC	3	2	0	2	2	0	10-25	<mark>25</mark>	15-25	<mark>30-40</mark>	-
5	IMN-509	Legal Aspects of Business	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
6	IMN-511	Business Decision Making	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	IMN-513	Contemporary Management Practices	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
		Sub Tot	al	18										

I <u>Year:</u> Spring Semester

		Teaching Scheme			Co	ntact	Hrs	Exa	m	Relative Weightage%				
					Р	er Wo	eek	Dura	tion					
S.	Course	Course Title	Subject	Credits	L	Т	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
No.	Code		Area											
1	IMN-502	Technology Management	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	IMN-504	Contemporary Strategic Management	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	IMN-506	Intellectual Property Management	PCC	3	2	1	0	2	0	20-35	-	20-30	40-50	-
4	IMN-508	Process Innovation Management	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
5	IMN-510	Product Innovation Management	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
6	IMN-512	Innovative Services and Business Models	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	IMN-514	Financing and Marketing of Innovation	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Sub To	otal	18										

II Year: Autumn Semester

		Teaching Scheme			Contact Hrs Per			Exam		Relative Weightage%				
					V	Week		Dura	tion					
S.	Course	Course Title	Subject	Credits	L	Т	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
No.	Code		Area											
1	IMN-601	Summer Training	SEM	3	-	-	-	-	-	-	-	-	100	-
2	IMN-602	Project	RP	2	-	-	-	-	-	-	-	-	100	-
3		Elective I	PEC	3	-	-	-	-	-	-	-	-	-	-
4		Elective II	PEC	3	-	-	-	-	-	-	-	-	-	-
5		Elective III	PEC	3	-	-	-	-	-	-	-	-	-	-
6		Elective IV	PEC	3	-	-	-	-	-	-	-	-	-	-
7		Elective V	PEC	3	-	-	-	-	-	-	-	-	-	-
		Sub Tota	l	20										

4 N <u>II Year:</u> Spring Semester

		Teaching Scheme			Contact Hrs Per Week			Exam Duration		Relative Weightage%				
S. No.	Course Code	Course Title	Subject Area	Credits	L	Т	Р	Т	Р	CWS	PRS	MTE	ETE	PRE
1	IMN-603	Project (Continued from Sem III)	RP	18	-	-	-	-	-	-	-	-	100	-
		Sub Tota	1	18										
		Grand Total		74										

List of Elective Courses for MIM (Masters in Innovation Management):

S. No.	Course	Subject Name	Credit	L	Т	Р	Exam	Dur.	Relative Weightage (%)							
	Code						(Hrs)									
							Т	Р	CWS	PRS	MTE	ETE	PRE			
1	IMN-521	IP Portfolio Management	3	2	1	0	2	0	20-35	-	20-30	40-50	-			
2	IMN-522	Intellectual Value and Corporate Value Creation	3	2	1	0	2	0	20-35	-	20-30	40-50	-			
3	IMN-523	Licensing and Commercialization of IP	3	2	1	0	2	0	20-35	-	20-30	40-50	-			
4	IMN-524	Diffusion of Innovations in Social networks	3	2	1	0	2	0	20-35	-	20-30	40-50	-			
5	IMN-525	Design for Extreme Affordability	3	2	1	0	2	0	20-35	-	20-30	40-50	-			

* All the elective subjects for M.Des Course are also available for the students of MIM as PECs.

Item No. 89.8 To consider the proposal to create second list in the admission to Ph. D. programme at the time of selection.

The Institute admits students into the Ph.D. Programmes in both the semesters of an academic session through a rigorous selection process. It is observed that many candidates do not join the programmes in either semester. In such cases, some seats apparently fall vacant as there is no mechanism to offer these seats presently. It poses difficulty in some activities where involvement of research students are planned.

In view of the above, many departments proposed to create a provision for preparing a second list of selected candidates so that subsequent offers can be made in case of non-joining of offered candidates. It was discussed in the 49th IRC meeting held on 15.09.2021 vide Item No. 49.2.4. Later, based on the recommendations received from the departments/centres, it was placed in 50th IRC meeting on 29.10.2021 under Item No. 50.2.1.

The IRC recommended preparation of a second list of selected candidates for Ph.D. admission with the following conditions:

- 1. Second-list of candidates will be provided category wise for each specialization, if any, by the Department/Centre to Academic Affairs Office (AAO) along with the first-list of selected candidates for Ph.D. admission.
- 2. Number of candidates in the second-list should not be more than 50% of the total number of selected candidates in each category.

The above is submitted for the consideration and approval of the Senate.

Item No. 89.9 To consider the Minimum Educational Qualification (MEQ) for admission in Ph. D. programme in Water Resources Development and Management Department.

The Department of Water Resources Development and Management has revisited their MEQ for admission into their Ph.D. programme in order to improve the quality of the admitted students.

The IRC, in its 51st meeting held on 10.11.2021, recommended the MEQ proposed by the Department as presented in the following Table to be implemented w.e.f. Autumn Semester 2022-23.

Existing MEQ	Proposed MEQ
(i) B.E. /B. Tech. /M.E.	B.E. /B. Tech. /M.E.
/M.Tech. in Civil,	/M.Tech. in Civil,
Environment/Electrical,	Environment / Electrical,
Mechanical / Agricultural	Mechanical /Agricultural/
or equivalent degree.	Computer Engineering or
(ii) M.Sc. Degree in	equivalent degree.
Agricultural/ <i>Biological</i> /	
Environmental / Natural /	M.Sc. Degree in
Social Sciences /	Agricultural/ Computer
Environmental Planning	Science / Environmental /
or equivalent consistent	Natural / Environmental
with research areas of the	Planning or equivalent
department.	consistent with research
	areas of the Department
	along with mathematics
	at bachelor's level.

The above is submitted for the consideration and approval of the Senate.

Item No.89.10 To report the approvals accorded by the Chairman, Senate

- (a) Institution of new scholarships/awards/prizes.
- 1) **AK Goel Green Energy Prize and Gold Medal:** Mr. Ashwani Kumar Goel, an alumnus of 1970 batch, has created a corpus to support one (01) cash prize of Rs. 1 Lac along with a Gold Medal and citation per year. This award will be awarded to a graduating student of UG/PG (including Ph.D.) programmes for significant contribution towards green/renewable energy sector. The award will be given on the following basis:
- Innovative idea in hydro/green/renewable energy sector,
- Reduction of carbon emission,
- Possibility of scalability,
- Possibility of wider deployment in industry,
- Encouraging sustainable energy development in the long run.

Eligibility: All graduating students of UG/PG (including Ph.D.) programmes.

Selection Process: The selection process will be based on inviting the applications from the students at individual level. These applications will be shortlisted by a committee, proposed by Chairperson, SCSP and approved by Chairman, Senate. The shortlisted candidates will be asked to make a presentation in front of the committee constituted. The final recommendation of the committee will be sent to the Senate for the approval.

Hari Krishna Mittal Leadership Award for Enhancing 2) Entrepreneurship Culture at IIT Roorkee: Mr. Sanjeev Mittal, an alumnus of 1984 batch of B.E. (Electronics & Communication Engineering), Mrs. Seema Garg, an alumnus of 1988 batch of B.E. (Computer Science & Engineering) and Mr. Rajeev Krishna, an alumnus of 1989 batch of B.E. (Electronics & Communication Engineering), have created a corpus to support one (01) award of Rs. 30,000/- per year. This award will be given to a deserving student of UG/PG (including Ph.D.) significant contribution programmes for towards enhancing the entrepreneurship culture at IIT Roorkee.

Eligibility: All students of UG/PG (including Ph.D.) programmes.

Selection Process: The selection process will be based on inviting the applications from the students at individual level. These applications will be shortlisted by a committee, proposed by Chairperson, SCSP and approved by Chairman, Senate. The shortlisted candidates will be asked to make a presentation in front of the committee constituted. The final recommendation of the committee will be sent to the Senate for the approval.

- S.K. Kumar Gold Medal: Mr. Abhas Kumar, 3) an alumnus of 1984 batch of B.E. (Mechanical Engineering), has established a corpus to create one (01) Gold medal for 10 years. This medal will be awarded as the S.K. Kumar Department Gold Medal to the graduating student of M.Tech. programmes of Department of Water Resources Development and Management with the highest CGPA.
- 4) **Ar. Rishi Tiwari Memorial Scholarship:** Alumni of 2020 batch of B.Arch. programme have created a corpus to support one (01) scholarship of Rs. 10,000/- per year. This scholarship will be given to a student obtaining the highest SGPA in the Professional Training Semester of B.Arch. programme. In case of a tie, the student with the highest CGPA will get this award.
- 5) New MCM Scholarships:
- i. Brigadier Harish Chandra Memorial MCM Scholarship: Smt. Mamta Malhotra has created a corpus to support one (01) MCM scholarship of Rs. 10,000/- per year. This scholarship will be given to a deserving student of final year of B.Tech. programme of Department of Civil Engineering. The awardee will be selected as per the prevailing procedure adopted by SCSP to award MCM scholarships of the Institute. This scholarship will replace the existing "Brigadier Harish Chandra Memorial Award".
- **ii.** Arvind Kumar Jain MCM Scholarship: Mr. Arvind Kumar Jain, an alumnus of 1971 batch of B.E.

(Electrical Engineering), has created a corpus to support one (01) MCM scholarship of Rs. 10,000/- per year. This scholarship will be given to a deserving student of B.Tech. programme of any year and any department. The awardee will be selected as per the prevailing procedure adopted by SCSP to award MCM scholarships of the Institute.

- iii. Electrical Branch 1971 Batch MCM Scholarship: Mr. Arvind Kumar Jain, Mr. Chandra Mohan Trikha and Mr. P.S. Mohan, alumni of 1971 batch of B.E. (Electrical Engineering), have created a corpus to support one (01) MCM scholarship of Rs. 10,000/- per year. This scholarship will be given to a deserving student of B.Tech. programme of Department of Electrical Engineering. The awardee will be selected as per the prevailing procedure adopted by SCSP to award MCM scholarships of the Institute.
- iv. Metallurgy Branch 1971 Batch MCM Scholarship: Mr. Ambrish Bhargava and Mr. Pramod Gothi, alumni of 1971 batch of B.E. (Metallurgy Engineering), have created a corpus to support one (01) MCM scholarship of Rs. 10,000/- per year. This scholarship will be given to a deserving student of B.Tech. programme of Department of Metallurgical and Materials Engineering. The awardee will be selected as per the prevailing procedure adopted by SCSP to award MCM scholarships of the Institute.

(b) Recommendations of 49^{th} , 50^{th} and 51^{st} meeting of IRC.

- The non-compliance of admission requirements by the provisionally admitted P.G. and Ph. D. Students 2021. (Item No.: 49.2.1, 49th IRC dt: 15.09.2021)
- (2) The seat matrix for Ph. D. admission in Departments /Centres in Spring Semester 2021-2022. (Item No.: 49.2.2, 49th IRC dt: 15.09.2021)
- (3) The proposed Minimum Educational Qualification (MEQ) for admission in Ph. D. programme in the following Departments/Centres:

1. Department of Biosciences and Bioengineering:

- 2. Department of Chemical Engineering:
- 3. Department of Earth Sciences:

(Item No.: 49.2.3, 49th IRC dt: 15.09.2021)

- (4) The recommendation of Centre for Artificial Intelligence and Data Science (CAIDS) to start the Ph. D. programme w.e.f. Spring Semester 2021-2022. (Item No.: 49.2.5, 49th IRC dt: 15.09.2021)
- (5) The request of several Ph. D. students (through their SRC recommendations) for approval of their course registration after the Senate approved date i.e. 09/08/2021. (49th IRC dt: 15.09.2021 and 50th IRC dt: 29.10.2021) Items No.: 49.2.6 and 50.2.4 respectively.
- (6) The recommendations received from the various Departments/ Centres to create second list in the admission to Ph. D. programme at the time of selection. (Item No.: 50.2.1, 50th IRC dt: 29.10.2021)
- (7) The mercy appeal of Ms. Meenal Gupta (20916013), Ex-Ph. D. student, Department of Humanities and Social Sciences for reinstatement of academic registration. (Item No.: 50.2.3, 50th IRC dt: 29.10.2021)
- (8) The modifications in the seat matrix approved in the 49th IRC meeting. (Item No.: 50.3.1, 50th IRC dt: 29.10.2021)
- (9) The conduct of Ph. D. viva-voce examination for three students, which are pending for more than a year. (Item No.: 50.3.2, 50th IRC dt: 29.10.2021)
- (10) The mercy appeals of P.G. and Ph. D. students, whose academic registration have been cancelled due to nonsubmission of remaining mandatory documents, required for admission in P.G. and Ph. D. programme in Autumn semester 2021-2022. (Item No.: 51.2.1, 51st IRC dt: 10.11.2021)

(11) The IRC in its 51st meeting held on November 10, 2021 recommended the proposal for **MoU** between IIT Roorkee and Chang Gung University, Taiwan for a Dual Doctoral Degree Programme.

(c) Recommendation of IAPC

- Requests of students regarding addition/change of course(s) after the last date: (Item No.: 110.2.1, 110th IAPC dt: 28.08.2021)
- 2. Shifting of ESN-526: Field Training for M.Sc. (Applied Geology) to Spring Sem 2021-22 of Department of Earth Sciences. (Item No.: 110.2.5, 110th IAPC dt: 28.08.2021)
- 2nd mercy appeal of Mr. Pratik Pralhadrao Panzade (Enr. No. 20510013) M.Arch. (AR), I Yr for name restoration. (Item No.: 110.3.2, 110th IAPC dt: 28.08.2021)
- 4. Criteria for tie breaking while preparing merit list in M.Sc. BT admission:

1st Criterion -

- a) Percentage/ CGPA obtained in the qualifying examination. A higher percentage/CGPA obtained in the qualifying examination would be given preference.
- b) In case of tie with a result awaited candidate, preference would be given to the candidate with the result completed in the qualifying examination.

2nd Criterion -

Date of birth. Preference to a person with earlier date of birth will be given. (Item No.: 111.2.1, 111th IAPC dt: 22.09.2021)

5. Merging of existing courses of Department of Humanities and Social Sciences on Communication Skills (HSN-001A and HSN-001B) as HSN-001: Communication Skills for B.Tech. 1st year. (Item No.: 111.2.4, 111th IAPC dt: 22.09.2021)

- Shifting of ECN-597: Microelectronics Lab-2 and ECN-598: Simulation Lab-2 of Deptt. of E&CE from Spring Sem 2020-21 to Autumn Semester 2021-22. (Item No.: 111.2.6, 111th IAPC dt: 22.09.2021)
- Shifting of BMN-601: Business Simulation from Capstone of Deptt. of Management Studies from Term 5 to Term 7. (Item No.: 111.2.8 (1), 111th IAPC dt: 22.09.2021)
- 8. UG seat matrix for session 2021-22. (Item No.: 111.3.1, 111th IAPC dt: 22.09.2021)
- 9. Requests of students regarding name restoration. (Item No.: 112.2.1, 112th IAPC dt: 27.10.2021)
- Conversion of 'BT-603: Critical Analysis of Classical Papers' of Deptt. of Biosciences & Bioengineering as a 'Seminar' course for M.Sc. BT program. (Item No.: 112.2.3, 112th IAPC dt: 27.10.2021)
- 11. Mode of conducting ETE of Autumn Semester 2021-22 for all students (excluding UG I Yr). (Item No.: 112.2.4, 112th IAPC dt: 27.10.2021)
- Request of Md. Sameer Ansari (En. No. 20544001), M. Tech. (Industrial Metallurgy), II Year of Deptt. of Metallurgical and Materials Engineering to delete an extra PEC (MTN-517: High Temperature Materials) of Autumn Sem 2020-21. (Item No.: 112.2.5, 112th IAPC dt: 27.10.2021)
- 13. Academic calendars for UG I Yr (2021-22) & Spring 2021-22 for all other than MBA, MSc (BT) and UG Year-I. (Notification dated 30.10.2021)
- Academic calendars for MBA Term 3, 4, 7 & 8 and M.Sc. BT I Yr Spring Sem 2021-22. (Notification dated 26.11.2021)

The above is reported to the Senate.

भारतीय प्रौद्योगिकी संस्थान रूड़की रूड़की — 247 667 (भारत) INDIAN INSTITUTE OF TECHNOLOGY ROORKEE ROORKEE - 247 667 (INDIA)



सीनेट की नवासीवीं बैठक हेतु अनुपूरक कार्य सूची

SUPPLEMENTARY AGENDA FOR THE 89th MEETING OF THE SENATE

बैठक सं0	:	नवासीवीं
MEETING NO.	:	89 th
स्थान VENUE	:	सीनेट हॉल, भा0प्रौ0सं0रूड़की Senate Hall, IIT Boorkee
	•	Senate nan, m Köörkee
दिनांक	:	09 दिसम्बर 2021
DATE	:	09 th December 2021
समय	:	04.00 बजे अपरान्ह
TIME	:	04.00 P.M.

भारतीय प्रौद्योगिकी संस्थान रूड़की INDIAN INSTITUTE OF TECHNOLOGY ROORKEE रूड़की 247 667 ROORKEE – 247 667



अनुपूरक कार्यसूची / SUPPLEMENTARY AGENDA

मुद्दा सं0 /	विवरण / Particulars	पृष्ठ /
Item No.		Page(s)
89.11	भारतीय प्रौद्योगिकी संस्थान रूड़की में पीएचडी कार्यक्रम में प्रवेश के लिए	52-53
	महिला उम्मीदवारों के लिए एक विशेष योजना, शकुतला (प्रतिभा के तहत	
	ज्ञान के उम्मीदवारों के लिए योजना) फैलोशिप के प्रस्ताव पर विचार करना।	
	To consider the proposal of SAKUNTALA (Scheme for	
	Aspirants of Knowledge Under TAlent Advancement)	
	Fellowship, a special scheme for female candidates for	
	admission in Ph. D. programme at IIT Roorkee.	
89.12	संस्थान भर के सभी संबंधित विभागों के लिए एमएससी से पीएचडी	54-56
	स्वीचओवर कार्यक्रम के लिए गठित समिति की संशोधित रिपोर्ट पर विचार	
	करना ।	
	To consider the revised report of the committee	
	constituted for Switchover Programme from M.Sc. to	
	Ph.D. for all the concerned Departments across the	
	Institute.	
89.13	इच्छुक परारनातक आर पाएचडा का आाडट पाठयक्रम क रूप म एक मुक्त	57-59
	वकाल्पक पाठयक्रम प्रदान करन के प्रस्ताव पर विचार करना।	
	To consider the proposal to offer an Open Elective	
	Course to interested Masters and Ph.D. students as an	
	AUDIT Course.	
89.14	वचुअल एकडामक सटर अथात "सटर फार फाटानिक्स एड क्वाटम	60-66
	कम्युनिकेशन टेक्नोलॉजी (CPQCT) की स्थापना के प्रस्ताव पर विचार	
	करना ।	
	To consider the proposal regarding establishment of a	
	virtual academic centre namely "Centre for Photonics	
	and Quantum Communication Technology" (CPQCT).	

89.15	अनुप्रयुक्त विज्ञान (एपलाइड सांइस) एवम् अभियांन्त्रिकी विभाग के	67-75
	निम्नलिखित प्रस्तावों पर विचार करना।	
	1. अनुप्रयुक्त विज्ञान एवम् अभियान्त्रिकी विभाग का नाम बदलकर	
	अनुप्रयुक्त गणित और वैज्ञानिक कंप्यूटिंग विभाग करना।	
	2. ''अनप्रयक्त गणित और वैज्ञानिक कप्यटिंग'' में एम.टेक. कार्यक्रम शरू	
	करने के साथ इसके पाठयकम संरचना और प्रवेश प्रक्रिया पर विचार	
	करना।	
	To consider the following proposals of Department of	
	Applied Science and Engineering:	
	1. To rename the Department of Applied Science and	
	Engineering as Department of Applied Mathematics and	
	Scientific Computing.	
	2. To introduce a M.Tech. Program in 'Applied	
	Mathematics and Scientific Computing' along with its	
00.16	course structure and admission procedure.	76.01
89.16	संत्र 2022–23 स एसएससा गाणत का संशाधित संरचना लागू किय जान पर	76-81
	To consider the revised structure of M So. Methometics	
	to be implemented from session 2022-23	
89 17	डिजाइन विभाग के एमआईएम कार्यक्रम में प्रवेश के लिए पात्रता मानदंड में	82
05.11	संशोधन पर विचार करना।	02
	To consider the revision in the eligibility criteria for	
	admission to MIM programme of the Department of	
	Design.	
89.18	जल संसाधन विकास एवं प्रबंधन विभाग द्वारा "पीने के पानी और स्वच्छता"	83-90
	पर एम.टेक कार्यक्रम शुरू करने के साथ इसकी प्रस्तावित संरचना और प्रवेश	
	प्रक्रिया के प्रस्ताव पर विचार करना।	
	To consider the proposal of Department of Water	
	Resource Development and Management to introduce	
	M. Tech. programme on "Drinking Water and Sanitation"	
	process	
89 19	्रीक्षणिक वर्ष 2022–2023 में यजी कार्यकर्मों के लिए संशोधित सीट मैटिक्स	91-92
05.15	पर विचार करना।	J1 J4
	To consider the revised seat matrix for UG programs in	
	the academic year 2022-2023.	
89.20	अध्यक्ष, सीनेट द्वारा दी गई मंजूरी को रिपोर्ट करना।	93
	To report the approvals accorded by the Chairman,	
	Senate	C . 1
अन्य मुदद	अध्यक्ष का अनुमात स / Under any other item with the permission	n of the
	Chair.	

Item No. 89.11 To consider the proposal of SAKUNTALA (Scheme for Aspirants of Knowledge Under TAlent Advancement) Fellowship, a special scheme for female candidates for admission in Ph. D. programme at IIT Roorkee.

It has been observed that the admission of female students in the Ph. D. programme is comparatively lower than the male students. The details of gender wise break ups of the existing Ph.D. students in the institute are given below:

Stream	Male	Female	Ratio (%)
Engineering	1237	436	35
Non-engineering	615	401	65

Male-female student ratio is often an important input for many government/non-government agencies for formulating policies. This is an important input for various institutional ranking systems as well. In this regard, a special scheme for Ph. D. admission for female candidates under full-time category is proposed. The IRC, in its 52nd meeting held on Dec.01, 2021, recommended the proposal with the following details:

MEQ:

Any female candidate having B.Tech./B.E./B.Arch./ B.Des. degree from National Institute of Technology (NIT) with CGPA \geq 9.0 in the 10-point scale will be eligible for **direct admission** to Ph.D. programme in the relevant disciplines. The requirement of GATE/CEED/National Level examination will be waived-off for such candidates.

Seats:

Seats in the above scheme will be over and above the sanctioned intake.

Fellowship:

At par with the Institute Assistantship.

Name:

The name of the above scheme is proposed as **"SAKUNTALA** (Scheme for Aspirants of Knowledge Under TALent Advancement) Fellowship" and the students enrolled under the scheme will be known as SAKUNTALA Fellows.

The IRC, in its 52nd meeting held on November 30, recommended the following:

- candidate 1. MEQ: Any female having B.Tech./B.E./B.Arch./B.Des. Indian degree from Institute of Technology (IIT) / National Institute of Technology (NIT) with CGPA \geq 9.0 in the 10-point scale will be eligible for admission to Ph.D. programme in the relevant disciplines. The requirement of GATE/CEED/National Level examination will be waivedoff for such candidates.
- **2. Selection:** The concerned department/centre will assess (SOP/Interaction regarding research area) the candidature of the applicants and send the recommendations to the AAO without written test and/or interview.
- **3. Seats:** Seats in the above scheme will be over and above the targeted/ sanctioned intake.
- **4. Fellowship:** At par with the Institute Assistantship. In addition to this, a contingency amount of Rupees One Lakh per annum (up to five years) will be given to the Fellows.

The above is submitted for the consideration and approval of the Senate.

Item No. 89.12 To consider the revised report of the committee constituted for Switchover Programme from M.Sc. to Ph.D. for all the concerned Departments across the Institute.

Presently, IIT Roorkee has provision only for its IDD/IMT/MURP/M.Arch./ M.Tech. students to switchover to Ph.D. programme. This provision is offered to the students with CGPA 8.5 and above after completing first two semesters of Masters programme or after completing all theory courses of IDD/IMT. (Senate Item No.78.11, Clause R.1.0 c). However, such provision does not exist for our M.Sc. students.

It is stated that the Department of Physics recommended switchover of its five students from M.Sc. to Ph.D. programme. Following the deliberations, the Chairman-IAPC constituted a committee (IAPC Item No. 88.3.1, dated 30/31.7.2020) comprising of the following members to submit a report:

– Chairman
– Member
– Member
– Member

The Report of the Committee was considered in the IAPC meetings (95th and 112th) held on 9.12.2020 and on 27.10.2021, respectively. The IAPC recommended that if a student opts to exit after 4th semester, the student should complete all the requirements for M.Sc. degree (including project etc.) for award of M.Sc. Degree.

Further, the IAPC referred the proposal to IRC as most of the clauses are related to Ph.D.

The 50th IRC, in its meeting held on 30.11.2021, considered the revised report of the Committee (**Appendix** – **A**) and recommended it with the following suggestions:

1. IITR can give fellowship to the selected candidate without valid GATE/NET w.e.f. the date of switchover from M.Sc. to the Ph.D. programme.

2. If for any reason, at the end of fourth semester, and thereafter, a student does not want to continue in the switchover programme, the Institute can award him/her regular M.Sc. degree subject to he/she earns the total credit requirements for the M.Sc. degree.

The above is submitted for the consideration of the Senate.

Appendix - A Item No. Senate / 89.12

After receiving the comments from IAPC members (Prof. Tanuja Srivastava, Mathematics, and Prof. C. N. Ramchandran, Associate Dean, Academic Affairs), a meeting related to Switchover program from M.Sc. to Ph.D. was held via Webex on August 24, 2021. The following guidelines for the switchover are suggested:

- 1. The students at the end of M.Sc. third semester will apply against an advertisement from the Institute for the switchover from M.Sc. to Ph.D. program.
- 2. The CGPA of the applicant should be 8.5 or above at the end of third semester.
- 3. IIT Roorkee can give fellowship to the selected candidate without valid GATE/NET w.e.f. the date of switchover from M. Sc. to the Ph. D. programme.
- 4. Selection of candidates for the switchover program shall be through extended DRC where all faculty members can participate. The mode of selection of the candidates may be decided by the DRC. A candidate who is applying under this program may give consent of his/her supervisor(s) at the time of selection process. A Ph.D. supervisor shall be allotted to him/her and SRC must be formed which decides about the courses that need to be completed.
- 5. The selected candidate should take Pre-Ph.D. courses in the fourth semester of the M.Sc. program in order to meet the credit requirements for Ph.D. program. The minimum credit requirements for the candidates admitted under this program shall be less than the normal candidates joining Ph.D. program in the Institute under regular admission process. The suggested minimum credit requirement for the candidate is 8 (in addition to the mandatory seminar (2 credits)). However, the SRC may recommend additional credit requirements for the student based on the research area and background of the student.
- 6. The minimum CGPA at the end of fourth semester shall be 8.5. If it is less than the minimum CGPA, the student has to take extra courses as suggested by the SRC to maintain the CGPA.
- 7. After completion of four semesters, the candidate can appear for the comprehensive exam if he/she fulfills the credit requirements and if declared successful in the comprehensive examination can present his/her research proposal for the completion of candidacy.
- 8. After the completion of candidacy, the candidates admitted under the switch over program will be treated on par with the candidates who were admitted under regular admission process with respect to Ph.D. regulations of the institute.
- 9. If for any reason, at the end of fourth semester and thereafter, a student does not want to continue in the switchover programme, the Institute can award him/her regular M.Sc. degree subject to he/she earns the total credit requirements for the M.Sc. degree.

Item No. 89.13 To consider the proposal to offer an Open Elective Course to interested Masters and Ph.D. students as an AUDIT Course.

In the last few years, students have shown interest in India's contribution to Mathematics, Science, and other relevant topics by organizing various workshops, seminars and other activities at the Institute. A number of faculty members across the departments have also expressed their enthusiasm and contributed to design a course titled – **'Introduction to Sanskrit Based Knowledge Systems'.** This course would provide an overview of Sanskrit based Indian knowledge systems in domains such as mathematics, science, management, humanities, and social sciences. This course is also in line with the greater objectives of New Education Policy to promote diverse subjects specially related to Indian contribution to different knowledge systems.

The IAPC, in its 113th meeting held on 24.11.2021, approved the course for the UG students as an Open Elective Course (OEC). The course will be offered by the Department of Humanities and Social Sciences. The syllabus of the course is placed as (**Appendix-A**).

In addition, considering the type and contents of the course, the IAPC recommended that the course be made open to interested Masters and Ph.D. students also as an AUDIT Course.

The above is submitted for the consideration and approval of the Senate.

Appendix - A Item No. Senate / 89.13

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Humanities and Social Sciences

- 1. Subject Code: IHS-325
 Course Title: Introduction to Sanskrit based Knowledge Systems
- 2. Contact Hours: **L:** 3 **T:** 0 **P:** 0 3. Examination Duration (Hrs.): **Theory:** 3 Practical: 0 Relative Weightage: CWS: 20-35 **PRS:** 0 **MTE:** 20-30 ETE: 40-50 4. **PRE:** 0 Credits: 3 6. Semester: Both 5. 7. Subject Area: OEC
- 8. Pre-requisite: NA
- **9. Objective:** The course aims to familiarize students with Sanskrit based knowledge systems and their role in advancement of science and technology.

10. Details of the Course

S.No.	Contents	Contact
		hours
1.	Overview: Classification of Indian texts; various specializations and leading	2
	figures; sources of Indian knowledge system. Introduction to Basic Sanskrit &	
	conversation.	
2.	Basic Sciences: Introduction of astronomy in India, Overview of Surya Siddhanta,	14
	Parasharatantra, Tantrasangraha and the recent developments based on Sanskrit	
	based texts; Indian Mathematics an overview, Development of calculus in India,	
	Trigonometry and spherical geometry, Magic squares; An introduction to biology,	
	anatomy, ayurveda as discovered and practiced in India from ancient to modern	
	times.	
3.	Architecture: Introduction of Practice of Traditional Architecture and Planning	6
	(Vaastushastra), Topics covered in Vaastushastra as per ancient treatises in	
	Vaastushastra, Prescriptions for residential Vaastushastra, City planning as per	
	vaastushastra.	
4.	Management and Governance: Leadership and Motivation, Planning and	6
	Organizing, Financial Management, Concept of Manager in Indian Knowledge	
	System.	
5.	Philosophy and Psychology: Rasa Siddhanta (Theory of Emotions), Natyashastra,	8
	Introduction to six Indian philosophical systems (Shad Darshans), Indic perspective	
	on philosophical foundations of modern world. Pāņini's contribution to linguistics.	
6.	Human Development: Introduction to Ashtanga Yoga for human development,	6
	Fundamentals of Bhagavad Geeta teachings for proper human living.	
	Total	42
11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of
		Publication / Reprint
1.	Yoga System of Patanjali, J. H. Woods, Bharatiya Kala Prakashan	2009
2.	Indian Philosophy – Vol I and II, S. Radhakrishnan, Oxford	2009
	University Press.	
3.	Mayamatam - Indian Treatise on Housing, Architecture and	2007
	Iconography (2 volumes), Bruno Daegens, Indira Gandhi National	
	Centre for Arts.	
4.	Natyasastra: Sanskrit Text With Transliteration, M. Ghosh,	2020
	Chaukhamba Surbharati Prakashan.	
5.	Vedanta and Management: Relevance of Vedantic Concepts in	2002
	Modern Management Practices, N. V. Dave, Deep & Deep.	
6.	Tantrasangraha with Detailed Mathematical Explanatory Notes, K.	2011
	Ramasubramanian, M. S. Sriram, Hindustan Book Agency.	

Item No. 89.14 To consider the proposal regarding establishment of a virtual academic centre namely "Centre for Photonics and Quantum Communication Technology" (CPQCT).

The IAPC in its 114th meeting considered a proposal to establish a virtual academic centre namely – "Centre for Photonics and Quantum Communication Technology" (CPQCT) with joint efforts of faculty members working in the Departments of Physics and Electronics and Communication Engineering. It is stated that the Photonics and Quantum Communication Technology has been identified as one of the focused domains under the National Mission on Quantum Technologies and Applications in India. Establishment of the proposed centre will be beneficial on multiple aspects including facilitating development of new academic programs in the area and boosting interdisciplinary research using complementary expertise. Further details are provided in the (**Appendix-A**).

The IAPC, in its 114th meeting held on 01.12.2021, recommended the proposal to establish a virtual academic centre.

The above is submitted for the consideration and approval of the Senate.

A proposal for the formation of "Centre for Photonics & Quantum Communication Technology - CPQCT"

Background

Photonics and Quantum Technology have emerged as very important technologies with enormous opportunities in research and development. Quantum technology encompasses quantum communication, quantum computing and quantum sensors, where photonics is a natural and major contributor. Quantum communication has come a long way from experimental demonstration of quantum cryptography for secure telecommunication over 1 km long optical fibers in 1993 in Geneva to world's first integrated quantum communication network combining 700 optical fibers and 2 ground-to-satellite links covering a total distance of 4600 km in China in 2021. In March 2021, Indian Space Research Organization (ISRO) has successfully demonstrated free-space quantum communication through an optical wireless communication link. The demonstration has included live video conferencing using quantum-key-encrypted signals. This is a major milestone achievement for unconditionally secured satellite data communication using quantum technologies. The idea of quantum computing gained impetus in 1980s. Afterwards, one of the major breakthroughs was the discovery of Shor's algorithm in 1993 where it was demonstrated that the prime factorization problem can be solved in polynomial time complexity with a quantum computer. That sparked a plethora of research in quantum algorithms. In 1999, David P. DiVincenzo proposed a criterion that a physical system need to follow in order to be a successful candidate for realizing qubits. After IBM's release of first commercial quantum computer in 2019, research on development of quantum computer has become a race among various countries and corporations. On quantum sensing front, its applications could become commercially or militarily ready within the next few years. Some of the primary applications for quantum sensing include position, navigation, and timing and possibly intelligence, surveillance, and reconnaissance.

National Status

Owing to importance and interdisciplinary nature of these technologies, government has taken an initiative in this direction and has allocated Rs. 8000 Cr under the National Mission on Quantum Technologies and Applications, where four domains of quantum technology have been identified as (i) Quantum Communication, (ii) Quantum Simulation, (iii) Quantum Computation and (iv) Quantum sensing and metrology (<u>https://www.psa.gov.in/technology-frontiers/quantum-technologies/346</u>). The applications of these technologies are quite diversified which include high speed secure telecommunication using photonic and mobile networks, high speed computation, superfast simulations of very

complex systems, and sensors for civil and defense applications. As per the concept note by TIFAC on national Mission on Quantum Technology & Applications the identified national gap areas are (i) lack of resources at undergraduate and graduate level, (ii) need for increased university level adoption, and (iii) need for building technical infrastructure to advance quantum technologies. In India there are already some dedicated centres for carrying out research, development and academics in quantum allied fields in several academic Institutes and Universities, which include RRI Bangalore, IIT Madras, IISc Bangalore, IIT Bombay, TIFR Mumbai, and IISER Pune. It is high time and immediate need for IIT Roorkee to catch up with these Institutes and start focused research and academic programs in such an important area. Creation of the proposed centre is one such step in this direction.

Existing expertise and resources

At IIT Roorkee several faculty members having complementary expertise are contributing to the area of Photonics and Quantum Technology. There has already been a collaboration among some faculty members from different departments having complementary expertise. This collaboration has been in the form of joint doctoral guidance and collaborative externally and internally funded research projects. SMILE project on high end infrastructure for simultaneous/complementary measurements of RF and Photonic devices brought together several faculty members from Physics, Electronics & Communication, and Computer Science & Engineering Departments. Some of the externally funded collaborative projects are:

(a) Indo-Russian project on optical fibers for high power lasers that included Prof. Vipul Rastogi as a PI, Professor Nagendra P. Pathak and Prof. Rajesh Kumar as Co-PIs.

(b) Multilateral BRICS projects called ERSPIC (Energy –efficient reconfigurable silicon photonic integrated devices and circuits for optical interconnects) is being carried out by Professor Rajesh Kumar as a PI, and Prof. Vipul Rastogi as a Co-PI.

(c) GIAN course on "High Speed Optical Transmitters for Optical Interconnects" was organized in October 2018 by Professor Rajesh Kumar, as a host faculty and Prof. Vipul Rastogi as a co-host faculty.

(d) Prof. Ajay Wasan and his group has been working in the area of quantum optics. His group is working on achieving Rydberg atoms using these trapped neutral Rb atoms. The quantum states of these trapped Rydberg atoms will be manipulated for the realization of CNOT gates which is an initial stage towards achieving a scalable Quantum Computer. The DST has sanctioned a grant of Rs. 7.13 crore to achieve quantum gates under their QuEST program. Prof. Wasan is also involved in teaching Quantum Computing course to our BTech students for the last ten years.

(e) Microsoft has been helping IITR by providing their quantum computing experts for the last four years. These experts demonstrate their QuantumKatas programming exercises aimed at teaching the elements of quantum computing and Q# programming at the same time. They cover mainly the quantum algorithms that are covered in the regular class lectures.

(f) A recently sanctioned REVAMPERS project (from DST) lead by Professor Sachin K. Srivastava, Department of Physics in collaboration with CSE Department along with doctors from ILBS Delhi has opened new avenues in the area of Medical Photonics supported with advanced computational techniques. This is also indicative of the importance of establishment of the proposed center, as it has potential for tremendous futuristic research ideas aligned with the priorities of the Govt. of India and hence, funding opportunities.

(g) Existing collaborative activities/projects with DRDO-IRDE (Vipul Rastogi & Akhilesh K. Mishra) and DRDO-INMAS (Sachin K. Srivastava) will provide opportunities to develop these small projects to joint mega-projects through team effort from the proposed centre for futuristic defense technologies.

(h) Prof. N. P. Pathak has a project on affordable sub millimeter-wave/THz components using 3D printed dielectric integrated guides by ISRO.

(i) International collaboration with University of Calgary under SPARC scheme looks upon measurement and implementation aspects of optical communication systems and their role in 5G/6G communication. Prof. Fadhel Ghannouchi (University of Calgary) and Prof. Meenakshi Rawat (IITR) discussed the limitations and feasible solutions in lecture series organized in Dec. 2019. Prof. Rajesh Kumar has provided device level insight on the optical communications and interconnects.

(j) Prof. Vishvendra S. Poonia and Prof. Akhilesh K. Mishra have recently started working together on device realization for quantum random number generation.

Many faculties involved in this proposal across the Departments have been making joint efforts in terms of supervising the students at various levels and has not been made official. They have close research interactions and already have plans to make their collaboration stronger and official.

Need for establishing the centre

In view of national gaps identified by TIFAC concept note and rapid coming up of dedicated centres in this field in various academic institutes, there is an immediate need for establishing the proposed centre at IIT Roorkee.

Establishment of the proposed centre (i) will provide a platform for the faculty members with complementary expertise to work together on focused problems requiring interdisciplinary expertise, (ii) will facilitate creation of resources in terms of equipment and manpower required to advance research and development in the field, (iii) will facilitate funding in this very important and emerging area, and (iv) will facilitate development of new academic programs to create skilled manpower in this area. In addition, it will remove difficulties faced in recruiting faculty in this specialized area as the core Departments often face restrictions in recruiting a faculty if his expertise is not in the core discipline or the degrees earned are not from the core Department.

Vision

The centre envisions that IITR emerges and remains a major player in the research and development of photonics and quantum technology by carrying out frontier research with specific objectives including, but not limited to, development of components, devices and systems for quantum communication, quantum sensors, and algorithms and tools for quantum computing and simulations. The centre also aims at creating skilled manpower required for implementation and advancement of these technologies in industry and academia in India, which would be carried out by running relevant academic programs.

Mission

<u>Phase-I</u>

In Phase-I, we plan to carry out the following

(a) Collaborative research by (i) pooling existing resources, (ii) establishment of financial resources by securing funding from government agencies and private companies such as Microsoft, IBM, and HPE etc., (iii) establishment of human resources by faculty recruitment and (joint)doctoral thesis guidance

(b) formulation of MTech program in Photonics & Quantum Communication and creation of resources to run the programs.

(c) Offering elective courses from the centre to UG and PG students. Some of these courses may be Photonic Information Processing, Quantum Electronics, Advanced Photonics for Communication, Quantum Sensors and Quantum Computing.

<u>Phase-II</u>

In Phase-II, in addition to continuing collaborative research, continued efforts towards sponsored research, securing funding, and doctoral research, MTech program in Photonics & Quantum Communication would be opened for admissions.

Brief description of MTech program to be offered

MTech (Photonics & Quantum Communication)

This flagship program of the centre would aim to produce skilled human resource capable of fulfilling county's industrial demands in the domain of emerging technology of quantum communication and allied technologies on quantum information processing, photonics devices and circuits and quantum sensing. One of the prominent features of this program includes the dynamism in terms of the courses to be included at a faster pace due to the unprecedented pace at which Quantum 2.0 will proceed globally. The skillsets imparted will be unique and would help in progressing in forefront research in quantum communication and allied technologies. The program will have courses such as digital signal processing, photonic fabrication and characterization techniques, quantum electronics, quantum photonics, quantum information processing, quantum communication, quantum sources and detectors, terahertz devices and sensors.

List of contributing faculty members

Following is the list of faculty members who are willing to join hands for the formation of the centre. We expect many more to join once the centre is formed.

- 1. Arumugam, P (Physics)
- 2. Dasgupta, Avirup (Electronics & Communication)
- 3. Jaiswal, Anshul (Electronics & Communication)
- 4. Kaushik, Brijesh Kumar (Electronics & Communication)
- 5. Kumar, Rajesh (Physics)
- 6. Mishra, Akhilesh Kumar (Physics)
- 7. Mitra, Anirban (Physics)
- 8. Pathak, Nagendra Prasad (Electronics & Communication)
- 9. Poonia, Vishvendra Singh (Electronics & Communication)
- 10. Pramanik, Tanmoy (Electronics & Communication)

- 11. Rastogi, Vipul (Physics)
- 12. Rawat, Meenakshi (Electronics & Communication)
- 13. Roy, Sourajit (Electronics & Communication)
- 14. Roy, Sudip (Computer Science and Engineering)
- 15. Srivastava, Sachin Kumar (Physics)
- 16. Tiwari, Anjani Kumar (Physics)
- 17. Wasan, Ajay (Physics)

Conclusion

Fast advancements in the field of Photonics and Quantum Communication Technology, government's initiatives in this direction and rapid embracement of these technologies by sister academic institutes by establishment of dedicated centres, there is a need for IIT Roorkee to make focussed efforts in this direction. To take a step in this direction we propose to create the Centre for Photonics & Quantum Communication Technology at IIT Roorkee. In view of urgent need to make directional efforts towards carrying out focussed research, development, and creation of skilled manpower in this field, the centre may function in virtual mode to begin with.

- Item No. 89.15 To consider the following proposals of Department of Applied Science and Engineering:
 - 1. To rename the Department of Applied Science and Engineering as Department of Applied Mathematics and Scientific Computing.

2. To introduce a M.Tech. Program in 'Applied Mathematics and Scientific Computing' along with its course structure and admission procedure.

The Department of Applied Science and Engineering (DASE) was formed in the year 2012 at Saharanpur mainly to support the other departments – the Department of Pulp and Paper Technology and the Department of Polymer and Process Engineering at the campus. Presently, the Department is offering doctoral degree program only. The Department has faculty members with expertise in Applied Mathematics and Computing and, therefore, has potential to contribute more to the Institute.

A committee was constituted by the Director on Aug 04, 2021 for the academic restructuring of the Department. The report of the committee w.r.t. the above proposals is placed as (**Appendix-A**).

The committee, after due deliberations, suggested that an academic degree program be offered by the Department. Renaming of the existing name Department was also suggested as the present name is too generic in nature.

The IAPC, in its 114th meeting held on 01.12.2021, considered the proposals of the Department of Applied Science and Engineering and recommended as under:

- 1. The Department of Applied Science and Engineering be renamed as 'Department of Applied Mathematics and Scientific Computing'.
- 2. The IAPC recommended the proposal to introduce M.Tech. Program in 'Applied Mathematics and Scientific Computing'.

- 3. Modified structure of the M.Tech. Program 'Applied Mathematics and Scientific Computing' as placed at (**Appendix –B**).
- 4. Admission process for the M.Tech. Program 'Applied Mathematics and Scientific Computing' as placed at (**Appendix- C**).

The above is submitted for the consideration and approval of the Senate.

Report on the academic restructuring of Department of Applied Science and Engineering, Saharanpur Campus of IIT Roorkee

The following committee was constituted by the Director on August 4, 2021 for the academic restructuring of the Department of Applied Science and Engineering at the Saharanpur Campus of IIT Roorkee:

Deputy Director	Chairperson
Dean, SRE Campus	Member
Dean, SRIC	Member
Head, PPE	Member
Prof. Dharam Dutt, PT	Member
Prof. Saniav Palsule, PPE	Member
Prof. SC Sharma, PT	Member
Prof. VC Srivastava, CH	Member
Prof Kaushik Ghosh, CY	Member
Prof. R Balasubramanian, CSE	Member
Prof GD Verma, PHY	Member
Prof Rajan Arora, ASE	Member
Prof Javdev ASE	Member
Prof. Millie Pant, ASE	Member
Prof. Y.S. Negi, PPE	Member

Terms of Reference:

(a) Propose academic programs to be run by the department of ASE.

(b) Accordingly, propose an appropriate name for ASE.

Report:

The first meeting of the committee was held on August 6, 2021. The members discussed the status of the Department of Applied Science and Engineering (DASE), formed in the year 2012 and serving as a '*service department*' for the Department of Pulp and Paper Technology and the Department of Polymer and Process Engineering, the other two departments of the campus. Presently, the only degree program being offered by DASE is PhD. More importantly, no faculty has been hired in DASE since its inception in 2012, hindering the growth of the department.

Deliberating on the terms of reference, it was suggested that there should be an academic degree program, besides PhD, offered by DASE according to the competence of its faculty members. Further, it was observed by the members that the present name of the department is too generic in nature which is not able to echo its vision and mission properly.

At present all the three faculty members of DASE have expertise in the areas of mathematics including computational and applied mathematics and it was felt that this aspect should be reflected in the name of the department showcasing a focused approach that is able to generate interest not only among the prospective students but is also able to attract competent faculties towards the program. Thereby promoting the growth and development of the primary stakeholders viz. students and teachers and the Institute as a whole.

It was also debated that the structure of the new course should be such that it is able to generate sufficient employment opportunities for the prospective students.

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The committee made the following recommendations:

- 1. The Department of Applied Science & Engineering be renamed as Department of Applied Mathematics & Scientific Computing.
- 2. The name to start the new M.Tech. Program shall be Applied Mathematics & Scientific Computing.

A sub-committee was constructed on November 14, 2021 to develop a course structure and to formulate some eligibility criteria on the basis of the recommendations made by the core

sub-

Prof. Millie Pant Prof. Balasubramanyam Prof. Jaydev Prof. Kusumdeep Prof. Rajan Arora Prof. RK Pandey Prof. Sanjeev Kumar Prof. SK Gupta Coordinator Member Member Member Member Member Member Member committee. The committee consisted of the following members:

The sub-committee placed the proposal before the core-committee on November 19, 2021 and it was suggested that:

(A) There will be 7 core courses (PCC), including seminar and 5 elective courses. The list of core courses finalized by the members is as follows:

- 1) Stochastic processes
- 2) Computational Differential Equations
- 3) Numeric Linear Algebra (PCC)
- 4) Data Structures and Algorithms
- 5) Programming Lab
- 6) Optimization Techniques
- 7) Seminar

Out of the seven PCCs, 5 will be running in the first semester and 2 will be running in the second semester. The electives will be segregated into three baskets viz. computational mathematics, decision making and operations research, data science and artificial intelligence. The student will have to take at least one course from each basket.

- (B) The eligibility criteria for admission in the program shall be:
- B. Tech./ BE in CS, Electrical, Electronics, Information Technology, Mechanical, Industrial, Chemical, Engineering Physics or equivalent
- 2) 4 years BS program in Mathematics, Mathematics and Computing, Statistics, Physics or equivalent
- 3) MSc in Mathematics, Statistics, Physics, Operations Research, MCA

Employment opportunities:

The proposed course structure is an integration of areas like Computational and Industrial Mathematics, Statistics, Data Science and Artificial Intelligence in a collaborative manner. The placement opportunities for the graduates of this course are likely to be in the following areas:

- a. Higher studies
- b. Scientific labs
- c. Data driven industries

The proposed course structure is attached as Annexure 1.



Detailed Syllabi can be prepared if the Institute decides to go ahead with the proposed M.Tech. program.

Recommendations and concluding remarks

- 1. M.Tech. degree program by the name M.Tech. in Applied Mathematics & Scientific Computing may be initiated.
- 2. The Department of Applied Science & Engineering may be renamed as Department of Applied Mathematics & Scientific Computing.
- 3. The eligibility criteria for admission in the program shall be:
 - a. B.Tech./ BE in CS, Electrical, Electronics, Information Technology, Mechanical, Industrial, Chemical, Engineering Physics or equivalent
 - b. 4 years BS program in Mathematics, Mathematics and Computing, Statistics, Physics or equivalent
 - c. MSc in Mathematics, Statistics, Physics, Operations Research, MCA

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30.11. 20 Chairperson

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Appendix-B

DEPARTMENT OF APPLIED MATHEMATICS AND SCIENTIFIC COMPUTING INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code:

XXX M.Tech. (Applied Mathematics and Scientific Computing) AMS Department of Applied Mathematics and Scientific Computing I

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Teaching Scheme	Course Title		Stochastic Processes	Numerical Linear Algebra	Data Structures and Algorithms	Programming Lab	Program Elective-I	Program Elective-II	Total		Applied Optimization Techniques	Seminar	Program Elective-III	Program Elective-IV	Program Elective-V	Total
	Subject Code		AMS-501	AMS-503	AMS-505	AMS-507					AMS-502	AMS-700				
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Appendix - B 89.15 4 I

DEPARTMENT OF APPLIED MATHEMATICS AND SCIENTIFIC COMPUTING INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code: Department: Year:

XXX M.Tech. (Applied Mathematics and Scientific Computing) AMS Department of Applied Mathematics and Scientific Computing II

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Semester	1	7	3	4
Semester-wise Total Credits	20/22	15/18	12	18
Total Credits		65-7	0,	

Department of Applied Mathematics and Scientific Computing INDIAN INSTITUTE OF TECHNOLOGY ROORKEE List of Program Electives

	Elective Basket – 1		Elective Basket – 2	,	Elective Basket – 3 (Data analysis an	d Machine
	(Computational Methods)		(Decision making and operations	s research)	Learning)	
S. No.	. Title	Code	Title	Code	Title	Code
1.	Advanced Computational Fluid Dynamics	AMSXXX	Advanced Operations Research	AMSXXX	Machine Learning Methods	AMSXXX
5	Dynamical Systems	AMSXXX	Evolutionary Algorithms for Optimization	AMSXXX	Data Analysis and Visualization Techniques	AMSXXX
Э.	Approximation Theory	AMSXXX	Logistics and Supply Chain Management	AMSXXX	Industrial Applications of ML and AI	AMSXXX
4.	Integral equations and calculus of variations	AMSXXX	Computational Decision Making	AMSXXX	Industrial Internet of Things	AMSXXX
5.	Advanced Transform Techniques	AMSXXX	Quality Management	AMSXXX	Deep Learning *	AID-552
6.	Discrete Mathematical Structures	AMSXXX	Queuing Theory and Applications	AMSXXX	Digital Image Processing *	AID-553
7.	Finite Element Method	AMSXXX	Soft Computing Methods	AMSXXX	Computer Vision *	AID-565
8.	Stochastic Methods in Industry	AMSXXX	Fuzzy Systems with Applications	AMSXXX	Time Series Analysis	AMSXXX
9.	Statistical Inference	AMSXXX	Applied Game theory	AMSXXX	Combinatorial Mathematics	AMSXXX
10.		AMSXXX	Multi Criteria and Multi Objective Optimization	AMSXXX	Ethics in Data Science and explainable AI	AMSXXX

*Will be offered if running in an online mode by the concerned department

-74-

Appendix- C

<u>Proposed Admission Process for M. Tech (Applied Mathematics</u> <u>and Scientific Computing) Program</u>

1. **Intake**- The intake of the proposed program is as under: -

Presently applied mathematics and scientific computing is not a part of GATE disciplines, but since it is a multidisciplinary program, candidates with valid GATE score in the following disciplines may be considered:

Discipline	Code	Proposed seats
Mathematics	MA	5
Computer Science and Information Technology	CS	5
Other GATE disciplines		5

2. <u>Eligible GATE disciplines for admission</u>

Discipline	Code
Mathematics	MA
Computer Science and Information Technology	CS
Statistics	ST
Production and Industrial Engineering	PI
Electronics and Communication Engineering	EC
Chemical Engineering	СН
Mechanical Engineering	ME
Electrical Engineering	EE
Physics	PH
Engineering Sciences	XE

3. **MEQ-** The proposed Minimum Education Qualifications are as under: -

(i) B.Tech./ BE in CS, Electrical, Electronics, Information Technology, Mechanical, Production and Industrial, Chemical, Engineering Physics or equivalent

(ii) 4 years BS program in Mathematics, Mathematics and Computing, Statistics, Physics or equivalent

(iii) MSc in Mathematics, Applied Mathematics, Statistics, Operations Research, Physics, MCA or equivalent

Item No. 89.16 To consider the revised structure of M.Sc. Mathematics to be implemented from session 2022-23.

The IAPC, in its 113th meeting held on 24.11.2021, considered the revision in the structure of the existing M.Sc. Mathematics program. The structure modification was necessitated to align the structure with the changes due to introduction of the BS-MS curriculum. The changes include – shifting of courses, changes in course codes and updating the list of electives. The IAPC suggested few modifications in the structure and further deliberations.

The IAPC, in its 114th meeting held on 01.12.2021, considered the revised structure and recommended it as placed at (**Appendix-A**).

The above is submitted for the consideration and approval of the Senate.

Proposed Revised Structure (To be implemented from academic session 2022-2023) DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

613 M.Sc. (Mathematics) MA Mathematics Program Code : Department :

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Appendix - A Item No. Senate / 89.16

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Proposed Revised Structure (To be implemented from academic session 2022-2023) DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

613 M.Sc. (Mathematics) MA Mathematics Program Code : Department :

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Total Credits	78	(PEC: 20, PCC	C: 58 (including 8	3 credits for Projec	t and 2 credits for Tech. Comm.)

Proposed Revised Structure (To be implemented from academic session 2022-2023) DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE	osed Revised Structure (10 De Implemented Irom academic Session 2022-202
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DEPARTMENT OF MATHEMATICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE Proposed Revised Structure (To be implemented from academic session 2022-2023)

Item No. 89.17 To consider the revision in the eligibility criteria for admission to MIM programme of the Department of Design.

The MIM program is primarily aimed to train mid-level working executives. However, application strata for the program indicate that there are interested candidates who have good academic credentials, but do not have working experience.

In view of the above, the Department of Design has proposed the REVISED eligibility criteria as follows:

Existing eligibility criteria	Revised eligibility criteria
Any candidate who has completed graduate degree in any discipline with post-degree	Any candidate who has completed graduate degree in any discipline with either post- degree experience of 5 years in a
experience of 5 years with a valid CAT/GMAT/ GATE score.	company of repute/ government sector/recognized NGO/ education sector OR a valid CAT/GMAT/ GATE/GRE score.

The IAPC, in its 114th meeting held on 01.12.2021, recommended the proposal.

The above is submitted for the consideration and approval of the Senate.

Item No. 89.18 To consider the proposal of Department of Water Resource Development and Management to introduce M.Tech. programme on "Drinking Water and Sanitation" along with its proposed structure and admission process.

The Department of Water Resource Development and Management offers Postgraduate Degree programs in Water Resources Development (for Civil, Electrical, and Mechanical Engineers) and in Irrigation Water Management (for Civil, Agricultural Engineers, and Agricultural Scientists). The Department has been hosting in-service engineers from Afro-Asian countries through cooperation and support from MEA, Govt. of India under ITEC program for Masters and Ph.D. programs for more than a decade. It has been identified that drinking water and sanitation are the major challenges in the water sector being faced by most of these countries. Accordingly, the Department has proposed a new M.Tech. course (2-year duration) on 'Drinking Water and Sanitation' to disseminate knowledge and to create a research ecosystem in the area.

The IAPC, in its 113th and 114th meetings held on 24.11.2021 and 01.12.2021, respectively, considered the proposal of the Department (**Appendix-A**) along with its structure and admission process.

The IAPC recommended the following:

- 1. The IAPC in principle recommended the proposal to introduce M.Tech. programme on "Drinking Water and Sanitation". However, the IAPC recommended that the proposal of P.G. Diploma programme be considered later as per the comprehensive Exit Policy of the institute according to Senate's decision vide Item No. 87.10 as and when formalized.
- 2. Intake to be 20 for the initial year, which includes 10 seats through GATE and 10 seats under sponsored category.
- 3. The revised structure as placed at (Appendix-B).

The above is submitted for the consideration and approval of the Senate.

Minutes of the Departmental Faculty Committee (DFC) meeting held on 08.11.2021 at 4.00 PM in the committee room of the department.

Following members were present:

1. 2.	Prof. Chelliah. T.R. Prof. Chandhiran Idhava	Member Member
3.	Prof. Khare Deepak	Member
4.	Prof. Kansal, M.L.	Member
5.	Prof. Kasiviswanathan	Member
6.	Prof. Mishra. SK	Member
7.	Prof. Mohanty Prakash Mohit	Member
8.	Prof. Pandey, Ashish	Chairman
9.	Prof. Yadav Basant	Member Secretary

1. Confirmation of the minutes of the last meeting held on 02.11.2021 at 4:00 PM in the committee room.

No comments were received on the minutes, hence the minutes of the meeting were confirmed.

2. To discuss the proposal for organizing the offline training of WRD officials of Rajasthan.

DFC discussed the proposal and agreed that the training programs should be taken up at the department level with the involvement of all the faculty members. Courses were allocated after the taking consent of the faculty members (Annexure I). HoD requested all the faculty members to submit the detailed syllabus conetent by November 12, 2021. HoD agreed to finalize the budget proposal.

3. To discuss the email of DORA on initiation of a student award at the Department on CGPA basis in the name of the donor Alumni

DFC discussed the email of DORA. DFC agreed that there is no such already existing award in the WRDM department in which any student obtains the highest CGPA in their final exam and is awarded.

 To discuss the orientation program for new faculty members scheduled to be held on tomorrow.

Head, WRDM apprised the faculty members about the scheduled orientation program on 9th November 2021 in the Senate Hall, J.T. Building, and requested the concerned faculties to attend the event.

5. To discuss the draft reply of Prof. Goel related to the proposal of the International Centre on Dam (ICD).

DFC discussed the proposal/reply, and the following were suggested:

- a) The Centre of Excellence for Dams must emphasize research themes related to dam safety and rehabilitation. As such, "reservoir sedimentation and management" is already under focus in the Department of Water Resources Devevelopment & Management /Department of Hydrology/ Department of Hydro and Renewable Energy/Civil Engineering Department. Under such lines, it is felt that the proposed center should primarily focus on core areas of dam safety and rehabilitation.
- b) The proposed Centre of Excellence for Dams may operate for a limited duration (5 to 10 years) and address specific purposes. Also, the center is expected not to overshadow the existing departments.
- c) Creating a "Virtual center for excellence for dams" may be more appropriate and solve the purpose.
- d) The dam is one of the major storages/hydraulic structures, which has been a crucial focus of R&D in Water Resources Development. It is hopeful that while creating such a center, the interest of the Department of Water Resources Development & Management will be protected.
- 6. To discuss the consideration of the newly introduced course on "Drinking Water and Sanitation" in next IAPC meeting. Head, WRDM apprised the faculty members about the updated course content of the newly introduced course on "Drinking Water and Sanitation". DFC agreed to submit the course in the next IAPC meeting.
- 7. Any other items with the permission of Chair.
- a. Distribution of marks at the stage-I thesis evaluation of M.Tech second years students.

DFC discussed the institute guidelines and agreed to the following distribution:

Report	20
Presentation	20
Viva-voice	10
*Supervisors	50
Total	100

*The supervisor marks will include the marks on the report, presentation, viva-voice, personal interaction.

The meeting ended with a vote of thank the Chair.

(Basant Yadav) Member Secretary, DFC

DEPARTMENT OF WATER RESOURCES DEVELOPMENT AND MANAGEMENT INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

No: WR/DFC/103 Copy to:

All members of DFC, WRDM.

Date: 10.11.2021

Member Secretary, DFC

M.Tech/PG-Diploma Programme

on

'Drinking Water & Sanitation'

Preamble

Since its inception in 1955, the Department of Water Resources Development & Management (DWRDM), IIT Roorkee, has played a pioneering role in actively imparting knowledge and practical training to the students and in-service personnel from multiple engineering backgrounds. Its unique and distinct feature is to bring together the experience and knowledge in the water sector for the service of society at large. The department helps in first-hand understanding and appreciation of various water related regional, national and international problems. Through its international academic and training programs, it fosters a feeling of brotherhood amongst the engineers of various countries from the Afro-Asian regions.

The department offers Postgraduate Degree programs in both Water Resources Development (for Civil, Electrical, and Mechanical Engineers) and Irrigation Water Management (for Civil, Agricultural Engineers, and Agricultural Scientists). For the last several decades, DWRDM has been hosting in-service engineers from Afro-Asian countries through cooperation and support from MEA, Govt. of India under ITEC program for Master and Ph.D. degrees. DWRDM also hosted the GATE-qualified students and sponsored candidates from various Central and State Government organizations of India. The candidates earned Master's & Ph.D. degrees in the field of practical application. It has been an exhilarating experience while interacting with the International and National students to share advanced knowledge with them. So far, the department has trained more than 2850 serving engineers from 52 countries. It offers education and training programs in all aspects of Water Resources Development and Irrigation Water Management to inservice engineers and professionals as well as young water resources professionals. Even during the unprecedented hardships realized during COVID-19, the department successfully organized online teaching, research, and other academic-related activities.

Safe drinking-water, sanitation, and hygiene (WASH) are crucial to public health and its wellbeing. Safe WASH is not only a prerequisite to health but also contributes to its livelihoods. The unplanned disposal of wastewater and untreated excreta contaminates the groundwater and surface water sources which is further used for drinking-water, irrigation, bathing, and household purposes. Chemical contamination such as arsenic and fluoride may be either due to geogenic origin or problems like that of nitrate which may be due to various anthropogenic activities pose a long-lasting health issue. Most of the countries in the world, particularly the Afro-Asian countries, have launched WASH program. Safely managed drinking-water and sanitation such as regulated piped water and well-connected and well-designed sewer system are need of the hour. Water & wastewater treatment can significantly reduce the deaths due to water borne diseases and will dramatically improve the public health. Government of India has emphasized a lot for developing infrastructure related to Drinking Water and Sanitation for its Urban & Rural settings and managing the same to improve the status of public health in the country. To achieve this objective, there will be a need for capacity building in this sector. At present, only a few masters level programmes are available which are directly related to WASH.

It is with this background, the Department of WRD&M proposes a M.Tech/PG-Diploma Programme on 'Drinking Water & Sanitation' which would broadly addresses to the issues of Drinking water sustainability, water security, water conservation, reuse and recycle, water treatment, storage and distribution, wastewater collection, treatment and disposal, impact of risks & uncertainties like climate change on water sustainability and water availability at consumer-end. The issues like supply and demand-based management and use of latest techniques like RS&GIS, Drone Technology, water treatment techniques like that of De-salinization, coastal and underground reservoirs, circular economy in water sector etc. will be the part of curriculum. The course will cover all the 4 realms like society, governance, economics, and technology and will be in line with the UN Sustainable Development Goal- 6 "Clean water and sanitation".

Based on the feedback and interaction with the students and industry, DWRDM has identified drinking water and sanitation as one of the major challenges in the water sector being faced by most of the Afro-Asian Countries, including India. Accordingly, DWRDM has proposed a new M. Tech course (2 years' duration) on Drinking Water and Sanitation to disseminate knowledge and conduct research in this important area. The COVID pandemic has further emphasized implementing sustainable sanitation programmes and techniques in urban and rural areas to avoid and mitigate the impact of virus infection in the area. I believe it is the first of its kind course being offered by DWRDM, IIT Roorkee in India. The course structure is designed to cover broad aspects and emerging concerns related to Drinking Water and Sanitation, including Technological & Governance issues.

We want to inform you that we circulated the draft course content to around 70 organizations working in the water sector and received their feedback. We are happy to inform you that the proposed course has received an overwhelming response and positive feedback from 12 organizations. Many organizations have expressed the need for such a course to plan and manage drinking water and sanitation services effectively. We would also like to mention that on September 21, 2021, an interaction meeting with Shri Pankaj Kumar, Secretary, Department of Drinking Water and Sanitation, Ministry of Jal Shakti and faculty members of the Department of WRDM, IIT Roorke was held at New Delhi. The suggestions provided by the Secretary has been already incorporated by the Department. The attached revised structure has been prepared after incorporating several suggestions from various stakeholders including those of Secretary, JJM.

I believe this will help DWRDM, IIT Roorkee to develop trained human resources and conduct research in the vital subject area of drinking water and sanitation to cater to the nation's needs, which would promote sustainable development goals of the society.

DEPARTMENT OF WATER RESOURCES DEVELOPMENT AND MANAGEMENT INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code: XXX M.Tech. (Drinking Water and Sanitation)

WR Department of Water Resources Development and Management I

Department: Year:

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Teaching Scheme	Course Title	Ň	Water Resources Planning and Management	Drinking Water and Sanitation Sustainability	Water Sanitation, Hygiene and Infrastructural Management	Rural and Urban Water Supply	Program Elective-I	Total		Mini Project on Drinking Water and Sanitation	Seminar	Program Elective-II	Program Elective-III	Program Elective-IV	Program Elective-V	Total
-	Subject Code		WRN-503	WRN-507	WRN-509	WRN-516				WRN-506	WRN-700					
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Appendix - B Item No. Senate / 89.18

DEPARTMENT OF APPLIED MATHEMATICS AND SCIENTIFIC COMPUTING INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code: Department: Year:

Department of Water Resources Development and Management XXX M.Tech. (Drinking Water and Sanitation) WR Department of Water Resources Developm II

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	Subject Code		WRN-701A		: Students c		WRN-701B	
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Semester	1	2	3	4
Semester-wise Total Credits	20	20	12	18
Total Credits		70		

Program Elective Courses for M.Tech. (Drinking Water and Sanitation)

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Teaching Scheme	Course Title	System Design Techniques	Renewable Energy System Technology	Water Quality Monitoring and Modeling	Groundwater Development and Management	Watershed Development and Management	Remote Sensing and GIS Applications in Water Systems	Drinking-Water for Low-Income Societies	Wastewater and Fecal Sludge Management	Resilience, Shocks and Emergencies	Management and Operation of Water Utilities	Water Works Engineering	Flow Hydraulics and Urban Drainage	Water in Circular Economy	Sustainable Water Resources
	Subject Code	WRN-501	WRN-580	WRN-581	WRN-586	WRN-587	WRN-588	WRN-589	WRN-590	WRN-591	WRN-592	WRN-593	WRN-594	WRN-595	WRN-596
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Item No. 89.19 To consider the revised seat matrix for UG programs in the academic year 2022-2023.

The Mehta Family School of Data Science and Artificial Intelligence has been established at IIT Roorkee vide the BOG Resolution No. BG/37/2021. The School offers two Masters programs and PhD programs on Data Science and Artificial Intelligence w.e.f. the academic year 2021 – 2022. The School will offer UG program on DS&AI mainly to create young professionals and Data Scientist. The School is in the process of developing its UG curriculum.

It is proposed that the School will admit 40 students in its UG programme w.e.f. the academic year 2022 – 2023. The seats required may be drawn by readjusting the intakes of the existing programmes. Currently, the Institute admits 1353 students into its 18 different UG programmes.

In view of the above, the UG Seat Matrix for the academic year 2022-2023 is proposed as follows:

S. No.	Discipline	Intake 2020	Intake 2021	Proposed (2022)
1	B.Tech. (Biosc. & Bioengg.)	46	46	46
2	B.Tech. (Chemical)	120	127	110 (- 17)
3	B.Tech. (Civil)	194	194	183 (- 11)
4	B.Tech. (CSE)	109	109	109
5	B.Tech. (Electrical Engg.)	165	165	165
6	B.Tech. (E & CE)	109	109	109
7	B.Tech. (Engg. Physics)	40	50	50
8	B.Tech. (Mechanical Engg.)	150	150	150
9	B.Tech. (Met.& Mat. Engg.)	112	92	80 (- 12)
10	B.Tech. (PSE)	40	00	00
11	B.Tech. (Prod.& Ind.Engg.)	58	58	58
12	B.Arch.	37	37	37
13	Int. M.Tech. (GT)	38	38	38
14	Int. M.Tech. (GPT)	41	41	41
15	IMS/BSMS Mathematics	42	42	42

16	IMS/BSMS Chemistry	25	35	35
17	IMS/BSMS Physics	27	27	27
18	IMS/BSMS Economics	0	33	33
19	B.Tech. (DS & AI)	00	00	+ 40
	Grand Total	1353	1353	1353

The above is submitted for the consideration and approval of the Senate.

Item No. 89.20 To report the approvals accorded by the Chairman, Senate.

(a) Recommendations of IRC.

- 1. The IRC in its 52nd meeting held on 30.11.2021 recommended the proposal for MoUs between IIT Roorkee and the following Institutes:
 - a. ARIES (Aryabhatta Research Institute of Observational Sciences), Nainital, Uttarakhand.
 - b. HBNI (Homi Bhabha National Institute), Mumbai.
- 2. The IInd request of Mr. Vikas Surana (20909031), Ph.D. student, Department of Chemistry for allowing course addition after the Senate approved date i.e. 09.08.2021

(b) Recommendations of IAPC

- 1. Requests of students regarding dropping of course after the last date and year withdrawal (Item No.: 113.2.7, 113th IAPC dt: 24.11.2021)
- 2. Requests of students regarding academic registration and course drop/ change after the last date (Item No.: 114.2.3, 114th IAPC dt: 01.12.2021)
- 3. Request of B.Tech. (final year) students regarding minor specialization in CSE. (Item No.: 114.2.4, 114th IAPC dt: 01.12.2021)
- 4. Senate Committee to create a comprehensive 'Exit Policy' for the academic programs. (Item No.: 87.10, 87th Senate dt: 28.07.2021)

Item No.89.21 To consider the proposal of rewording the Centre of Nanotechnology as Centre for Nanotechnology.

Head, Centre of Nanotechnology has proposed a note dated 22.11.2021, for rewording the name of the 'Centre of Nanotechnology' as 'Centre for Nanotechnology'. A concept note to establish a centre of Nanotechnology at IIT Roorkee was initially approved by the Board vide resolution no.BG/79/2005.

The CFC, Centre of Nanotechnology in its meeting dated 16.11.2021 has recommended the said proposal for this minor change.

The proposal to reword the Centre is placed before the Senate for consideration and to recommend the Board.