INDIAN INSTITUTE OF TECHNOLOGY KANPUR
POSTGRADUATE OFFICE

No. A(P)/IITK/course approval/
September 12, 2025

The Convener, DPGC
Departments of **DoMS/PHY/HSS/EE**
IIT Kanpur

I am directed to communicate the concurrence of the SPGC (2024-25) in its 11th meeting held on 06/08/2025 for the approval of new/modification PG course proposal. After detailed discussion the following courses were approved.

Course No	Title	Credits	Instructor	SPGC Decision
MBA793M	Policy Paradigm for Cutting Edge Technologies – Module 1	3-0-0-0-5	Dr. Suvendu Naskar	Approved
MBA794M	Policy Paradigm for Cutting Edge Technologies – Module 2	3-0-0-0-5	Dr. Suvendu Naskar	Approved
PHY692	Measurement Techniques	2-0-6-0-12	Dr. Aditya H. Kelkar	Approved
ENG766	Cinema and the Global South	3-0-0-0-9	Dr. Syed Feroz Hassan	Approved
EE606	Circuit design for frequency and phase synthesis	3-0-0-0-9	Dr. Chithra	Approved
EE607	Mixed-signal IC design	3-0-0-0-9	Dr. R. S. Ashwin Kumar	Approved
EE612	Analog circuits for signal processing	3-0-0-0-9	Dr. R. S. Ashwin Kumar	Approved

Deputy Registrar
Academic Affairs 12.09.25

CC: OARS (DOAA Office) For necessary action

MBA 793 M

Indian Institute of Technology, Kanpur

Department of Management Sciences

Proposal for a New Course

1. **Course No: XXXXXX**
2. **Course Title: Policy Paradigm for Cutting Edge Technologies – Module 1**
3. Units: 3-0-0-0 (5)
4. Duration of Course: Modular
5. Proposing Department: DoMS
6. Other Departments:
7. Proposing Instructor(s): Dr. Suvendu Naskar (DoMS), Dr. B.V.Phani (DoMS)
8. **Pre-requisite Courses:** None

Course Description:

The advent of cutting-edge technologies in various areas like, electric mobility/vehicles, artificial intelligence, new & renewable energy, 5G-6G, cyber security, advanced cell chemistries etc., with their disruptions and impact on a citizen's life, the role of scientists, researchers and policy makers becomes not only critical but also extremely difficult. This course would be providing a micro level perspective on current policy regime and exposure to various aspects of policy formulation. The disruptions caused by these technologies and the pace at which these changes take place coupled with the quick adoption of these technologies by the masses make them even more challenging. Disruptions caused by these on different parts of the eco system and how the policy is expected to handle it, what the policy ought to be and what it is, few examples will be taken up to discuss the issues in formulating a public policy. How a policy is made, handling the diversities of the country particularly arising out of the federal democratic set-up in India along with the global perspectives & implications of a policy. Stages in making a policy taking up examples from the actual policies framed by practitioners.

Expected Learning Outcomes:

At the end of this course the student is expected to be able to understand the disruptive aspects of most advanced and innovative technologies and appreciate the complexities involved in formulating policies in the areas of these technologies. How the nation/country prepares itself and copes up with their disruptive nature and faster rate of adoption and the economic and global implications of policies. How to build dynamism in policy making and how dynamic the policy regime should be. This is first part of two modular courses. Students can take this course without attending the second module.

Course Contents: (*preferably in the form of 5 to 10 broad titles*):

Sr. No.	Broad Title	Topics	No. of Lectures
1.	Introduction-	Overview of formulating public policy and its components. Policy vs Scheme, Output & Outcome based Monitoring Framework for schemes/budget.	3
2.	Stage of policy formulation	Complexities in policy formulation, handling diversities with examples from the policies related with Electric Vehicles, Advanced Cell Chemistry, Production Linked Incentive Schemes for various sectors, Energy Transition.	3
3.	Examples of policy making. Mid-way corrections / modifications in policies.	Framework for evaluation and monitoring of policies and schemes under Union budget (Analyzing Outputs and Outcomes). Discussion on monitoring framework for some recent policies.	3
4.	Cutting Edge Technologies	Advent/adoption of technologies and consequential disruptions. Pace of adoption of technologies and learning curve. Impact on the eco-system and reaction of different players in the ecosystem.	3
5.	Capstone/Projects	Students to pick one aspect of existing policy framework and study the impacts in light of emerging technology paradigm	2

9. Remarks:
   The course is on the practical aspects of policy making, for students who intend to have insights into the issues and complexities of policy making in view of changes that take place with changing technologies. Course is expected to provide insights of how policies are made from practitioner's and policy makers perspective and where they are failing. Also, it will take up a couple of examples of existing policies and what the policies should have been from a theoretical perspective. Students will read the reference material, study how policies are evaluated, discuss in the class the outcomes and outputs achieved by those policies.

10. Textbook:
    Power & Progress, Daron Acemoglu and Simon Johnson
    Any other text books needed for this course will be specified during the class.

11. Reference Material:

1. Outcome Budget 2019-20, 2020-21, 2022-23, 20223-24, Ministry of Finance, Government of India
2. Policy documents: PLI Schemes, Faster Adoption and Manufacturing of Electric Vehicles, Solar Policies of State Governments, Government's Initiatives on AI Policies.
3. OECD working papers on Public governance no. 31, Emerging technologies in Public Sector
4. Hinkley, Sara. 2022. Technology in the Public Sector and the Future of Government Work. Berkeley: UC Berkeley Labor Center

Dated: 21/6/25 Proposer: **Suvendu Naskar** Signature: Suvendu Naskar

Dated: 21/6/25 Proposer: **B.V.Phani** Signature: _____

Dated: _____ DPGC Convener: _____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated: _____

MBA 794 M

Indian Institute of Technology, Kanpur

Department of Management Sciences

Proposal for a New Course

1. Course No: **XXXXXX**
2. Course Title: **Policy Paradigm for Cutting Edge Technologies – Module 2**
3. Units: 3-0-0-0- (5)
4. Duration of Course: Modular
5. Proposing Department: DoMS
6. Other Departments: SEE
7. Proposing Instructor(s): Dr. Suvendu Naskar (DoMS), Dr. B.V.Phani (DoMS)
8. **Pre-requisite Courses: Policy Paradigm for Cutting Edge Technologies – Module 1**

Course Description:

The advent of cutting-edge technologies in various areas like, electric mobility/vehicles, artificial intelligence, new & renewable energy, 5G-6G, cyber security, advanced cell chemistries etc., with their disruptions and impact on a citizen's life, the role of scientists, researchers and policy makers becomes not only critical but also extremely difficult. This course would be providing a micro level perspective on current policy regime and exposure to various aspects of policy formulation. The disruptions caused by these technologies and the pace at which these changes take place coupled with the quick adoption of these technologies by the masses make them even more challenging. Disruptions caused by these on different parts of the eco system and how the policy is expected to handle it, what the policy ought to be and what it is, few examples will be taken up to discuss the issues in formulating a public policy. How a policy is made, handling the diversities of the country particularly arising out of the federal democratic set-up in India along with the global perspectives & implications of a policy. Stages in making a policy taking up examples from the actual policies framed by practitioners.

Expected Learning Outcomes:

At the end of this course the student is expected to be able to understand the disruptive aspects of most advanced and innovative technologies and appreciate the complexities involved in formulating policies in the areas of these technologies. How the nation/country prepares itself and copes up with their disruptive nature and faster rate of adoption and the economic and global implications of policies. How to build dynamism in policy making and how dynamic the policy regime should be. This is **second part** of two modular courses. Attending Module 1, will help student to actively engage in this course

Course Contents: (*preferably in the form of 5 to 10 broad titles*):

Sr. No.	Broad Title	Topics	No. of Lectures
1.	Introduction-	Revision of Public Policy formulation and associated complexities	2
2.	Cutting Edge Technologies	Revision of Cutting edge technologies	2
5.	Policies for Cutting Edge Technologies	Nuances of policy formulations for new technologies in view of their disruptive aspects and their adoption. How the state/nation prepares itself and facilitates these technologies for citizen and in the overall interest of the nation considering national complexities and global implications.	4
6.	Global perspective	Global perspectives and changes of public policy driven by technology based paradigm	2
	Policy Papers Presentations	Presentation and Discussion on policy papers prepared by groups.	4

9. Remarks:
   The course is on the practical aspects of policy making, for students who intend to have insights into the issues and complexities of policy making in view of changes that take place with changing technologies. Course is expected to provide insights of how policies are made from practitioner's and policy makers perspective and where they are failing. Also, it will take up a couple of examples of existing policies and what the policies should have been from a theoretical perspective. Students will read the reference material, study how policies are evaluated, discuss in the class the outcomes and outputs achieved by those policies.

10. Textbook:
    Power & Progress, Daron Acemoglu and Simon Johnson
    Any other text books needed for this course will be specified during the class.

11. Reference Material:
    1. Outcome Budget 2019-20, 2020-21, 2022-23, 20223-24, Ministry of Finance, Government of

India

2. Policy documents: PLI Schemes, Faster Adoption and Manufacturing of Electric Vehicles, Solar Policies of State Governments, Government's Initiatives on AI Policies.
3. OECD working papers on Public governance no. 31, Emerging technologies in Public Sector
4. Hinkley, Sara. 2022. Technology in the Public Sector and the Future of Government Work. Berkeley: UC Berkeley Labor Center

Dated: 21/6/25 Proposer: **Suvendu Naskar** Signature: Suvendu Naskar

Dated: 21/6/25 Proposer: **B.V.Phani** Signature: _____

Dated: _____ DPGC Convener: _____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated: _____

PGDesk

From: SPGC <spgc@iitk.ac.in>
Sent: 18 July 2025 06:33
To: dpgc_phy
Cc: Aditya Kelkar; P G Desk
Subject: Re: Fwd: Modified course proposal for PHY692

@PG desk: for next SPGC meeting.

Regards,

Sudhanshu Shekhar Singh
Chairperson, SPGC

On 2025-07-15 23:00, dpgc_phy wrote:

> Dear SPGC Chairman,
>
> Please add this course for formal approval in the next SPGC meeting if you deem fit. We have received no comments on it from acadstaff members.
>
> Regards,
> Sagar
>
> -------- Original Message --------
> Subject: Modified course proposal for PHY692
> Date: 2025-06-21 10:18
> From: dpgc_phy <dpgc_phy@iitk.ac.in>
> To: Acadstaff <acadstaff@lists.iitk.ac.in>
> Copy: Aditya Kelkar <akelkar@iitk.ac.in>
>
> Dear Colleagues,
>
> Please find proposal for a PG course here:
> https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-PHY692-Measurement Techniques.pdf.
>
> This is a regular course in the Physics department; mostly credit-distribution modification is being sought through this proposal. If you have any comments, then please send it to akelkar@iitk.ac.in (the course-proposer) with a copy to dpgc_phy@iitk.ac.in by 15 July 2025.
>
> Regards,
> Sagar
> DPGC (PHY) Convenor

Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course No: PHY692 3-0-6-0 (12)
2. Course Title: Measurement Techniques
3. Per Week Lectures: 2 (L), Tutorial: 0 (T), Laboratory: 6 (P), Additional Hours[0-2]: 0 (A),
   Credits (3*L+2*T+P+A): 12 Duration of Course: Full Semester
4. Proposing Department/IDP: Physics
   Other Departments/IDPs which may be interested in the proposed course:
   Other faculty members interested in teaching the proposed course: Krishnacharya, Chanchal Sow
5. Proposing Instructor(s): Aditya H. Kelkar, Venkata Jayasurya Yellapragada
6. Course Description:

A) Objectives: This course is to discuss basic concepts of experimental measurements, and the introduction of experimental and data analysis techniques used in various domains of experimental research. The course will comprise of lectures on selected topics as well as laboratory sessions and hands-on instrumentation.

B) Contents (*preferably in the form of 5 to 10 broad titles*):

S. No	Broad Title	Topics	No. of Lectures
1.	Theory of Error Analysis	Uncertainties in measurement, Probability distribution, Error analysis, Mean and expectation value, counting statistics, Least square fit.	4
2.	Data analysis and Numerical techniques	χ^2 fit, Linear correlation, Polynomial interpolation, numerical differentiation, integration, roots of non-linear equation	4
3.	Vacuum Technology	Kinetic theory of gases, Gas flow, Vacuum pumps, Vacuum gauges, leak testing, degassing	4
4.	Electronics and Instrumentation	Basics of diodes and transistors, analog circuits using opamp, digital electronics, interfacing with microcontroller (Arduino/esp32)	5
5.	Radiation Detection and measurement	Radiation sources, interaction of radiation with matter, Scintillator detectors, photomultiplier tubes, radiation spectroscopy	3
6.	Some specialized experiments	Thin film deposition, microscopy using SEM, AFM, X-ray diffraction, Rutherford backscattering, Autocorrelation	6

C) Laboratory experiments: Thin Film deposition*, Johnson noise/ Shot noise*, Lock-in amplifier*, 4-f imaging*, Interferometry, Gamma Ray spectroscopy, Resistivity measurement - Four probe technique, PID controller, Chaos – electronic circuits, Rutherford Backscattering using Tandetron Accelerator, Force measurement etc.

D) Pre-requisites, if any (*examples: a- PSO201A,or b- PSO201A or equivalent*): None

E) Short summary for including in the Courses of Study Booklet

This course is to discuss basic concepts of experimental measurements and introduction of experimental and data analysis techniques used in various domains of experimental research. The course will comprise of lectures on selected topics as well as laboratory sessions and hands-on instrumentation.

Lecture topics: Theory of Error Analysis, Data analysis and Numerical techniques, Vacuum Technology, Electronics and Instrumentation, Radiation Detection and Measurement, Some specialized experiments

Laboratory experiments: Thin Film deposition*, Johnson noise/ Shot noise*, Lock-in amplifier*, 4-f imaging*, Interferometry, Gamma Ray spectroscopy, Resistivity measurement - Four probe technique, PID controller, Chaos – electronic circuits, Rutherford Backscattering using Tandetron Accelerator, Force measurement etc.

7. Reference
   books:
   Data reduction and error analysis by Bevington and Robinson
   Vacuum Technology by Nagamitsu Yoshimura
   Radiation detection and measurement by G. F. Knoll
   Art of Electronics by Horowitz and Hill
8. Any other remarks:

Dated: 16/6/25_____Proposer: Aditya H. Kelkar _____

Dated:_____DUGC/DPGC Convener:_____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____

PGDesk

From: SPGC <spgc@iitk.ac.in>
Sent: 18 July 2025 07:50
To: Pgdesk
Cc: dpgc_hss@iitk.ac.in
Subject: Fwd: New PG course proposal in English_Cinema and the Global South
Attachments: Cinema and the Global South.docx

For next SPGC meeting.

Regards,

Sudhanshu Shekhar Singh
Chairperson, SPGC

-------- Original Message --------

Subject: New PG course proposal in English_Cinema and the Global South
Date:2025-07-18 06:43
From:dpgc_hss <dpgc_hss@iitk.ac.in>
To: Spgc <spgc@iitk.ac.in>
Copy: Feroz <feroz@iitk.ac.in>, Pgdesk <pgdesk@iitk.ac.in>

Dear Prof. Singh,

I am forwarding here a new PG course proposal by Prof. Hassan, which was circulated over acadstaff and revised accordingly. Kindly add this to the agenda for the next SPGC meeting.

The link to the course proposal:
https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-ENG7XX-Cinema-and-the-Global-South.pdf
The link to the institute repository:
https://www.iitk.ac.in/doaa/new-course-approval-repository

Best wishes,

Rajarshi

-------- Original Message --------

Subject: Re: [acadstaff] New PG course proposal in English_Cinema and the Global South
Date:2025-07-16 16:08

From:"Feroz Hassan" <feroz@iitk.ac.in>
To:"dpgc_hss" <dpgc_hss@iitk.ac.in>

Dear Rajarshi,

I am attaching the revised course proposal here. I had received one piece of feedback asking me to include the names of the filmmakers whose work will be covered in the course. I have now done so.

Could you please forward the revised proposal to the SPGC?

Thank you.

Best,
Feroz

On Wed, June 11, 2025 8:42 pm, dpgc_hss wrote:
> Dear all,
>
> Please find below the link to a new PG course proposal by Prof. Feroz Hassan
> in English. Kindly share your feedback on this proposal by Wednesday, July 2,
> to Prof. Hassan (feroz@iitk.ac.in), copied to DPGC, HSS.
>
> The link to the course proposal:
> https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-ENG7XX-Cinema-and-the-Global-South.pdf
> The link to the institute repository:
> https://www.iitk.ac.in/doaa/new-course-approval-repository
>
> With best wishes,
> Rajarshi
> acadstaff mailing list
> acadstaff@lists.iitk.ac.in
> https://lists.iitk.ac.in/mailman/listinfo/acadstaff

Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course no.: ENG7XX (PG course) 766

2. Course title: Cinema and the Global South 3-0-0-0(9)

3. Per-week Lectures: 3 (L), Tutorial: 0 (T), Laboratory: 0 (P), Additional hours: 0 (A)

Credits (3xL+2xT+P+A): 9 Duration of course: Full semester

4. Proposing department: HSS/English

Other departments/IDP which may be interested in the proposed course:

Other faculty members interested in teaching the proposed course:

5. Proposing instructor: Syed Feroz Hassan

6. Course description:

A) Scope

This course will look at the intersection of film history with discursive constructions of the "Third World" and subsequently of the "Global South" since the second half of the twentieth century. Rather than provide histories of multiple national cinemas from the Global South, the course will engage with films and critical debates from both the Global South and North that resonate with different understandings of the Third World/Global South.

The course will begin with a historical overview of Third-Worldist discourses to contextualize them in the movements of decolonialization, postcolonial solidarity movements such as the non-aligned movement, and the Cold War in the decades immediately after World War II. This overview will then extend to the emergence of the 'developmental' discourse of the Third World that coincides with the increasing role in geopolitics played by global financial agencies such as the World Bank and the International Monetary Fund starting in the 1970s. An overview of this history will end with a look at newer forums of Global South identity such as BRICS.

The historical overview in the initial part of the course will be followed first by an examination of the Soviet Union's role as a mediator of cultural exchange with and across postcolonial countries. The course will then turn to the primacy of guerilla/militant film movements in the western hemisphere's assessments of cinemas from the Third World. This part will be accompanied by a close examination of 'tricontinental' film discourses such as 'imperfect cinema', 'cinema of hunger, 'cinema of underdevelopment' and 'third cinema'. Films, non-fiction and fiction, narrative and non-narrative, from Latin America and Africa will feature prominently in this part of the course. A key strand of examination will be the tension between

'national' imperatives and 'tricontinental' solidarities in the debates during this period, as well as the mediating role played by First World intellectuals and institutions.

The final part of the course will look at the increasing prominence of the kind of personal narrative cinemas from the Global South on the film festival circuit that the earlier tricontinental discourses resisted. Apart from examining historical and structural reasons for this, the course will also attempt to use select films to identify shared stylistic, thematic and institutional patterns across parts of the Global South and to assess if they amount to any kind of discursive coherence.

B) Contents

S. No.	Broad Title	Topics	No. of hours
1.	From the 'Third World' to the 'Global South'	Histories of: 1. The non-aligned movement 2. Revolutionary third-worldism 3. Developmental third-worldism 4. The Brandt Line and the discourse of the Global South 5. Newer Global South forums	6
2.	Cinema in the Soviet sphere of cultural influence	Case studies: 1. The Tashkent film festival 2. The circulation of Indian cinema in the Soviet Union	6
3.	The 'third cinema' moment	1. Tricontinental film manifestoes 2. The role of ICAIC, post-revolutionary Cuba's film school 3. Senegal's FESPACO film festival 4. The mediating role of western intellectuals and institutions 5. Tensions between personal and political cinemas	18
4.	The Global South on the map of transnational cinema	1. The courting of the Global South by western film festivals 2. GATT negotiations and cinema as 'cultural exception' 3. Festivals as producers	10

S. No.	Broad Title	Topics	No. of hours
		4. Patterns across case studies of Global South films from this period	
Total			40

C) Pre-requisites, if any: None

D) Short summary for inclusion in the Courses of Study booklet

This course will look at the intersection of film history with discursive constructions of the "Third World" and subsequently of the "Global South" since the second half of the twentieth century. Rather than provide histories of multiple national cinemas from the Global South, the course will engage with films and critical debates from both the Global South and North that resonate with different understandings of the Third World/Global South.

7. Recommended books:

a) *The Darker Nations: A People's History of the Third World*, by Vijay Prashad (The New Press, 2007)

b) *The Global Cold War: Third World Interventions and the Making of Our Times* (Cambridge UP, 2007)

c) *The Cultural Cold War and the Global South: Sites of Contest and Communitas*, ed. Kerry Bystrom et al (Routledge, 2021)

d) *World Socialist Cinema: Alliances, Affinities, and Solidarities in the Global Cold War*, by Masha Salazkina (University of California Press, 2023)

e) *Leave Disco Dancer Alone: Indian Cinema and Soviet Movie-Going After Stalin*, by Sudha Rajagopalan (Yoda Press, 2008)

f) Selections from *Film Manifestos and Global Cinema Cultures: A Critical Anthology*, ed. Scott MacKenzie (UC Press, 2014)

g) Selections from *African Experiences of Cinema*, ed. Imruh Bakari and Mbye Cham (British Film Institute, 1996)

h) *Questions of Third Cinema*, ed. Jim Pines and Paul Willemen (British Film Institute, 1989)

i) Selections from *New Latin American Cinema, Vols. 1 & 2*, ed. Michael T. Martin (Wayne State University Press, 1997)

j) *Framework: The Journal of Cinema and Media*, Volume 62, Number 1, Spring 2021 (special issue on Third Cinema documents)

k) Selections from *The Film Festival Reader*, ed. Dina Iordanova (British Film Institute, 2013)

l) Kirsten Smith, "Questions of identity and global visibility: French funding in Latin American and Maghrebi cinema," in *Contemporary French Civilization*, vol. 49, no. 1, 41-66.

m) Joseph Pomp, "France as author of world cinema: International co-production and the Fonds Sud, 1984-2012", in *French Cultural Studies*, vol. 31, no. 2 (2020), 113.

Reference Books: --

8. Any other remarks: None

Dated: 11-05-2025 Proposer:

Dated: DUGC/DPGC Convenor:

The course is approved / not approved.

Chairman, SUGC/SPGC

Dated:

PGDesk

From: SPGC <spgc@iitk.ac.in>
Sent: 03 August 2025 20:23
To: Pgdesk
Cc: imon; Atul Singh Kushwaha
Subject: Re: Fwd: New Course Proposals - EE

Follow Up Flag: Follow up
Flag Status: Flagged

@Pgdesk: for next SPGC meeting.

Regards,

Sudhanshu Shekhar Singh
Chairperson, SPGC

On 2025-08-03 02:09, imon wrote:

> Dear Prof. Sudhanshu
>
> We have not received any feedback regarding the courses in the last three weeks.
>
> I request you to kindly do the needful.
>
> Best wishes
> Imon
>
> Begin forwarded message:
>
> **From:** dpgc_ee <dpgc_ee@iitk.ac.in>
> **Date:** 9 July 2025 at 2:16:59 PM IST
> **To:** faculty@lists.iitk.ac.in
> **Cc:** AshwinKumar Ramakrishnan Sivakumar <ashwinrs@iitk.ac.in>, Chithra fc ee <chithra@iitk.ac.in>, Imon Mondal <imon@iitk.ac.in>
> **Subject: New Course Proposals - EE**
>
> Dear Colleagues,
>
> The following new courses are being proposed by the department of Electrical Engineering. Kindly provide your feedback to dpgc_ee or to the course instructors (CC-ed in the email) before July 30, 2025.
>
> Circuit design for frequency and phase synthesis:
> https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-EE6XX-Circuit_design_for_frequency_and_phase_synthesis.pdf
>
> Mixed-signal IC design:

https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-EE6XX-Mixed_signal_IC_design.pdf

Analog circuits for signal processing:
https://www.iitk.ac.in/doaa/data/NewCourses/Courses-proposal-EE6XX-Analog_circuits_for_signal_processing.pdf

-Best wishes
Imon

Indian Institute of Technology,

Kanpur Proposal for a New Course

1. **Course No:** EE698G (Old Course No) 702 - 3-0-0-0(9)
2. **Course Title:** Circuit design for frequency and phase synthesis
3. **Per Week Lectures:** 3 (L), Tutorial: (T), Laboratory: ____(P), Additional Hours[0-2]: (A), Credits (3*L+2*T+P+A): 9 **Duration of Course:** Full Semester
4. **Proposing Department/IDP:** EE
5. **Proposing Instructor(s):** Chithra (chithra@iitk.ac.in)
   Other faculty members interested in teaching the proposed course:
   R. S. Ashwin Kumar (ashwinrs@iitk.ac.in), Imon Mondal (imon@iitk.ac.in)
6. **Course Description:**

Objectives: The following are the course objectives.

- Understand the necessity for clock and delay generation circuits
- Learn basics of time-to-digital converters
- Understand basics of phase noise and jitter
- Learn to analyze and design delay-locked loops
- Learn to analyze and design ring oscillators
- Learn to analyze and design phase-locked loops

Contents (*preferably in the form of 5 to 10 broad titles*):

S. No.	Broad Title	Topics	No. of Lectures (1.5 hours each)
1.	Delay lines	Implementation of delay-lines, variable delay lines, time-digital converters (TDC), flash TDC, PVT variations.	2
2.	Delay-locked loop	Phase detectors: multipliers, sample & hold, XOR, and latch-based phase detectors, phase frequency detector (PFD), Locking in a DLL, Locking non-idealities: False locking, harmonic locking, static phase offset, charge pump implementation, small signal phase domain model for the DLL	9
4.	Phase noise & jitter	Noise, power spectral density, thermal and flicker noise, jitter definitions, jitter characterization, relationship between phase noise & jitter, phase noise analysis of VCO,	6

		inverter, delay lines; jitter in delay lines vs. ring oscillators.	
5.	Oscillators	Review of start-up condition for oscillations, analyzing the startup condition in oscillators, Overdesigning the gain condition in Barkhausen criteria and its effects on oscillation, oscillation frequency of a ring oscillator: small-signal vs large signal analysis, LC tank, impedance transformation in LC tank, common source amplifier with LC tank load, building an oscillator with LC tank, cross-coupled oscillator, one-port view of oscillators, three-point oscillator, ring oscillator, tuning a ring oscillator.	6
6.	Phase-locked loop	Motivations for a feedback loop with oscillator, phase-locking vs frequency locking, building a phase-locked loop (PLL), stability analysis of PLL, charge-pump PLL, STF & NTFs in PLL, reference spurs.	3
		Total Lectures (1.5 hours each)	26

A) **Pre-requisites:** ESC201 (Introduction to electronics) & EE200 (Signals and Systems)

B) **Short summary for including in the Courses of Study Booklet:** Delay lines, variable delay lines, delay locked-loop, phase detectors, phase-frequency detector, locking in a DLL, locking non-idealities, phase noise & jitter, relationship between phase noise and jitter, oscillators, analyzing the startup condition in oscillators, LC oscillators, ring oscillators, one-port view of oscillators, three-point oscillator, tuning a ring oscillator, motivation for phase locked loop, frequency locking vs phase locking, charge-pump PLL.

7. **Recommended reference:** There is no single reference for this. It will be based on multiple journal articles that will be shared along with the relevant lectures.

Evaluation Policy: Mini-quizzes + Assignments – 25%, Midsem – 25%, Endsem – 25% Project – 25%

8. **Course strength last three times:**

Jan 2022: 16; Jan 2023: 12; Jan 2024: 23

Dated: 14/02/2025

Proposer: Chithra

Dated:

DUGC/DPGC Convener:

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____

Indian Institute of Technology,

Kanpur Proposal for a New Course

1. **Course No:** EE698I (Old Course No) 703
2. **Course Title:** Mixed-signal IC design (3-0-0-0-9)
3. **Per Week Lectures:** 3 (L), Tutorial: (T), Laboratory: ____(P), Additional Hours[0-2]: (A), Credits (3*L+2*T+P+A): 9 **Duration of Course:** Full Semester
4. **Proposing Department/IDP:** EE
5. **Proposing Instructor(s):** R. S. Ashwin Kumar (ashwinrs@iitk.ac.in)
   Other faculty members interested in teaching the proposed course:
   Imon Mondal (imon@iitk.ac.in), Chithra (chithra@iitk.ac.in)

6. **Course Description:**

Objectives: : At the end of the course, the students should be able to i) understand basics of sampling, quantization, estimating power spectrum, ii) Switched-capacitor circuits, settling, noise, iii) Design Nyquist rate analog-to-digital converters like Flash, SAR, Pipelined, and noise-shaping ADCs (like delta-sigma ADCs).

Contents (*preferably in the form of 5 to 10 broad titles*):

S. No.	Broad Title	Topics	No. of Lectures (1.5 hours each)
1.	Mathematical understanding & characterizing an ADC	Mathematical understanding of sampling, quantization, need for discrete Fourier transform (DFT), spectral leakage, windowing; Dynamic performance metrics: SQNR, SNDR, ENOB; Static performance metrics: DNL & INL	4
2.	Circuit implementation of sampling network	Implementation of switch, nMOS, pMOS, CMOS, gate-bootstrapped switch, linearity of switches; Non-idealities: noise, charge injection; Bottom-plate sampling, and evolution of switched-capacitor amplifier	3
3.	Switched-capacitor circuits: Analysis & tackling non-idealities	Understanding charge conservation, analyzing switched-capacitor circuits, basics of z-transform, deriving transfer functions, switched-capacitor integrators, amplifiers, correlated-double sampling, correlated level shifting, N-path filters.	5

4.	Circuit implementation of comparators,	Regenerative latches, StrongARM latch, basics of comparators.	2
5.	Flash ADC & techniques to improve flash ADC resolution	Flash ADC implementation, ways for reference subtraction, interpolation & folding (in both time & voltage domain) to improve the resolution of flash ADC	3
6.	SAR ADC	Basics of SAR ADC, asynchronous operation, redundancy to tackle incomplete DAC settling, split C-DAC to reduce capacitor area, digital calibration to tackle capacitor mismatches.	3
7.	Pipelined ADC	Multi-step & pipelined ADC, Redundancy, circuit implementation, noise & linearity, digital calibration examples	3
8.	Noise-shaping ADCs	Oversampling & noise-shaping, error-feedback structure, delta-sigma modulation, system-level and circuit design, noise-shaping SAR.	3
		Total Lectures (1.5 hours each)	26

A) **Pre-requisites:** Consent of the Instructor

B) **Short summary for including in the Courses of Study Booklet:** Sampling & quantization: mathematical understanding, characterizing ADCs: spectral analysis, signal to quantization noise ratio, effective no. bits, static non-linearity, sampling switch, switched-capacitor circuits, tackling non-idealities in switched-capacitor circuits, regenerative latches, flash ADC, voltage & time domain interpolation, successive approximation register (SAR) ADC, pipelined ADCs, noise-shaping ADCs.

7. **Recommended reference:** There is no single reference for this.
   It will be based on multiple journal articles that will be shared along with the relevant lectures.

Evaluation Policy: Mini-quizzes: 20%; Midsem: 25%; Endsem:30%; Design projects (two): 25% (This is the rough distribution; the exact distribution can change)

8. **Course strength last three times:**

   Jan 2022: 21; July 2023: 6; July 2024: 14

R. S. Ashwin Kumar

Dated: 14/02/2025

Proposer: R. S. Ashwin Kumar

Dated:

DUGC/DPGC Convener:

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____

Indian Institute of Technology,

Kanpur Proposal for a New Course

1. **Course No:** EE698W (Old Course No) 704
2. **Course Title:** Analog circuits for signal processing (3-0-0-0-9)
3. **Per Week Lectures:** 3 (L), Tutorial: (T), Laboratory: (P), Additional Hours[0-2]: (A), Credits (3*L+2*T+P+A): 9 **Duration of Course:** Full Semester
4. **Proposing Department/IDP:** EE
5. **Proposing Instructor(s):** R. S. Ashwin Kumar (ashwinrs@iitk.ac.in)
   Other faculty members interested in teaching the proposed course:
   Imon Mondal (imon@iitk.ac.in), Chithra (chithra@iitk.ac.in), Nagarjuna Nallam (nallam@iitk.ac.in)
6. **Course Description:**

Objectives: By the end of this course, the students will be able to understand and analyse linear periodically time-varying (LPTV) systems and circuits, get familiarized to circuit theorems pertaining to LPTV networks, periodic-steady-state simulations, noise in LPTV networks, and practically used LPTV circuits, like the N-path filters, N-path mixers, multi-phase dc-dc converters, N-path chopping, etc.,

Contents (*preferably in the form of 5 to 10 broad titles*):

S. No.	Broad Title	Topics	No. of Lectures (1.5 hours each)
1.	LPTV circuits used in voltage regulators	Bandgap reference, basics of linear regulator and switching regulators.	3
2.	Practically useful LPTV circuits using switches & capactiors	Chopping to eliminate flicker noise, variants of switched-RC filter.	3
3.	Basics of linear time invariant and periodically time varying systems	Impulse response for LTI and LPTV systems, Zadeh expansion of LPTV systems, modelling LPTV networks using mixers and LTI systems, notion of harmonic transfer functions (HTF), periodic steady state simulations	3
4.	N-path principle &	Reduce aliasing using N-path principle, N-path LPTV systems examples: multi-phase dc-dc converters, N-path chopping, time-	6

	practical examples	interleaved sampling & ADCs, N-path switched-RC filters, N-path mixers, mixer-first RF receiver.	
5.	Impedance and transfer function representation in LPTV networks	Impedance and admittance conversion matrix, harmonic transfer matrix definitions with practical examples, conversion matrix based analysis of LPTV networks	2
6.	Circuit theorems for LPTV networks	Tellegan's theorem and its extensions, Thevenin & Norton theorem for LPTV networks, reciprocity, inter-reciprocity, adjoint networks	3
7.	Inter-reciprocity in LPTV networks	Understanding inter-reciprocity using conversion matrices, inter-reciprocity relation in time domain, examples	3
8.	Noise in LTI & LPTV networks	Nyquist's noise theorem, Bode's noise theorem, noise in LPTV networks with sampled output, miscellaneous examples.	3
		Total Lectures (1.5 hours each)	26

A) **Pre-requisites:** Consent of the Instructors

B) **Short summary for including in the Courses of Study Booklet:** Linear periodically time varying (LPTV) networks, switched-RC filter, impulse response in LTI & LPTV networks, Zadeh expansion of LPTV networks, Harmonic transfer functions, N-path principle & examples: multi-phase converters, time-interleaved sampling, N-path switched RC filters, N-path mixers, mixer-first RF receiver, circuit theorems for LPTV networks, adjoint LPTV networks, inter-reciprocity in LPTV networks, noise in LTI & LPTV networks with sampled output.

7. **Recommended reference:** There is no single reference for this. It will be based on multiple journal articles that will be shared along with the relevant lectures.

8. **Evaluation Policy:** Assignments: 40%, Mid-sem: 30%, Endsem: 30%.

9. **Course strength last three times:**

   July 2019: 16; July 2020: 9; July 2022: 7

R. S. Ashwin Kumar

Dated: 14/02/2025

Proposer: R. S. Ashwin Kumar

Dated:

DUGC/DPGC Convener:

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____