College Code: 231

# R.D. ENGINEERING COLLEGE

Approved by AICTE New Delhi & Affiliated to Dr. APJ Abdul Kalam Technical University, Lucknow under the aegis of IQAC

Date: 01/02/2022

# DEPARTMENT OF CIVIL ENGINEERING

### NOTICE

Dear CE VI semester students,

We are excited to announce the commencement of special classes for the preparation of the Graduate Aptitude Test in Engineering (GATE). The GATE exam is a gateway to some of the most prestigious postgraduate programs and job opportunities in the field of engineering.

Class Details:

Commencement Date: 04 Feb 2022

Venue: C Block Room C 101

Why Join GATE Classes at R D Engineering College?

1. In-House Expert Faculty: Our experienced faculty members, who are well-versed with the GATE examination pattern, will guide you through the entire syllabus.

2. College Resources: Access to library resources, study materials, and state-of-the-art facilities to enhance your learning experience.

3. Peer Learning: Collaborative learning environment, providing you with the opportunity to study and discuss with your peers.

Sincerely,

Dr. Pankaj Kumar Singh

### Civil Engineering CE

# Section 1: Engineering Mathematics

Linear Algebra: Matrix algebra; Systems of linear equations; Eigen values and Eigen vectors.

Calculus: Functions of single variable; Limit, continuity and differentiability; Mean value theorems, local maxima and minima, Taylor series; Evaluation of definite and indefinite integrals, application of definite integral to obtain area and volume; Partial derivatives; Total derivative; Gradient, Divergence and Curl, Vector identities; Directional derivatives; Line, Surface and Volume integrals.

Ordinary Differential Equation (ODE): First order (linear and non-linear) equations; higher order linear equations with constant coefficients; Euler-Cauchy equations; initial and boundary value problems.

Partial Differential Equation (PDE): Fourier series; separation of variables; solutions of onedimensional diffusion equation; first and second order one-dimensional wave equation and twodimensional Laplace equation.

Probability and Statistics: Sampling theorems; Conditional probability; Descriptive statistics - Mean, median, mode and standard deviation; Random Variables - Discrete and Continuous, Poisson and Normal Distribution; Linear regression.

Numerical Methods: Error analysis. Numerical solutions of linear and non-linear algebraic equations; Newton's and Lagrange polynomials; numerical differentiation; Integration by trapezoidal and Simpson's rule. Single and multi-step methods for first order differential equations.

# Section 2: Structural Engineering

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Frictions and its applications; Centre of mass; Free Vibrations of undamped SDOF system.

Solid Mechanics. Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Construction Materials and Management: Construction Materials: Structural Steel - Composition, material properties and behaviour; Concrete - Constituents, mix design, short-term and long-term properties. Construction Management: Types of construction projects; Project planning and network analysis - PERT and CPM; Cost estimation.

Concrete Structures: Working stress and Limit state design concepts; Design of beams, slabs, columns, Bond and development length; Prestressed concrete beams ge Differing College Copyright © GATE 2022. Indian Institute of Technology Rharagpural, Ghaziabad

73 of 171



Steel Structures: Working stress and Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections - simple and eccentric, beam-column connections, plate girders and trusses; Concept of plastic analysis -beams and frames.

### Section 3: Geotechnical Engineering

Soil Mechanics: Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Seepage through soils – two - dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force; Principle of effective stress and quicksand condition; Compaction of soils; One- dimensional consolidation, time rate of consolidation; Shear Strength, Mohr's circle, effective and total shear strength parameters, Stress-Strain characteristics of clays and sand; Stress paths.

Foundation Engineering: Sub-surface investigations - Drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories - Rankine and Coulomb; Stability of slopes — Finite and infinite slopes, Bishop's method; Stress distribution in soils — Boussinesq's theory; Pressure bulbs, Shallow foundations — Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations — dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

### Section 4: Water Resources Engineering

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth; Concept of lift and drag.

Hydraulics: Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, reservoir capacity, flood estimation and routing, surface runoff models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's Law.

Irrigation: Types of irrigation systems and methods; Crop water requirements - Duty, delta, evapotranspiration; Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures.

Section 5: Environmental Engineering

Director College R.D. Engineering College Duhai, Ghaziabad

74 of 171

Water and Waste Water Quality and Treatment: Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water distribution system; Drinking water treatment.

Sewerage system design, quantity of domestic wastewater, primary and secondary treatment. Effluent discharge standards; Sludge disposal; Reuse of treated sewage for different applications.

Air Pollution: Types of pollutants, their sources and impacts, air pollution control, air quality standards, Air quality Index and limits.

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

### Section 6: Transportation Engineering

Transportation Infrastructure: Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignments.

Geometric design of railway Track - Speed and Cant.

Concept of airport runway length, calculations and corrections; taxiway and exit taxiway design.

Highway Pavements: Highway materials - desirable properties and tests; Desirable properties of bituminous paving mixes; Design factors for flexible and rigid pavements; Design of flexible and rigid pavement using IRC codes

Traffic Engineering: Traffic studies on flow and speed, peak hour factor, accident study, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Signal design by Webster's method; Types of intersections; Highway capacity.

### Section 7: Geomatics Engineering

Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves.

Photogrammetry and Remote Sensing - Scale, flying height; Basics of remote sensing and GIS.

Director R.D. Engineering College Duhai, Ghaziabad dineering Co



Dr Pankaj Kumar Singh is PhD in Civil Engineering and M.Tech in the Diversified Engg Stream, He also holds a MBA in Foreign Trade.

Dr Singh is Director Research in R D Engineering College, Ghaziabad.

He also serves as Guest Professor in several countries like Philippines, Qatar etc.

His research area of interest is Environmental Conservation & Sustainability, Biological Waste water treatment, Plant medicine, Crop recognition & monitoring, AI & Modelling and so on.

He wrote 5+ books and book chapter in diversified field.

His work is in the field of Patent and till now published more than 30+ national and International Patent and Granted 10+ National and International Patent along with Professors/Researcher of US, Canada, UK, Russia, Syria, Philippines etc as well as Published many Research Papers in reputed journals like MDPI(SCI), ESCI, ABDC Journal, Scopus, Springer, UGC -Care etc.

He also holds session Chair in many International Conferences in different countries like Las Vegas, New Jersey, Bali, Geneva, George Town (Australia).

After all these achievements, Dr Singh was awarded as \*Best Research Director in the field of Biological Waste water treatment & Plant Medicine\* and many more awards



SANJAY PALIWAL is a Renowned Professor in the Mechanical Department at R D Engineering College, Ghaziabad, INDIA.

He has done B.E. & M.Tech. and Published Several Research Papers and National and International Patent to his Credit. He has Attended Several National & International Conferences. He has 5 year Industry & 22 year Teaching Experience.



DATE: 4 22 2022

Sr. No.	Student Name	Roll No.	Signature
31. 140.	J. Carlotte and T. Carlotte an		<b>b</b> 1.
1	AHMAD HUSSAIN	1902310000001	Threed
2	AMANULLAH AHMED	1902310000002	Amapulbiel
3	ANCHAL	1902310000003	Snelvel
4	ANKIT	1902310000004	that
5	ARYAN TYAGI	1902310000005	Angen Jaggi
6	BOBY	1902310000006	Pody
7	DEEPANSHU VERMA	1902310000007	1708ent
8	HIMANSHU	1902310000008	Hemanery
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Increm Aumou
10	KM VANDANA	1902310000010	Vandance
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shahryen
12	MUKESH KUMAR	1902310000013	Mukesho
13	MUZAFFAR ALI	1902310000014	Muzeeffar
14	SACHIN KUMAR PUNDIR	1902310000016	Sachin James
15	SANGRAM SINGH	1902310000017	Sangreum Shingh
16	SHIVAM CHAUDHARY	1902310000018	Sholleum
17	SHUBHAM TYAGI	1902310000019	Shubham
18	AJAY YADAV	2002310009001	Agay Terden
19	AMISHA GUPTA	2002310009002	U Hosel
20	ANANT SHARMA	2002310009003	Ahant sham
21	ANCHALTIWARI	2002310009004	Hanchal Liver
22	NITISH BHARDWAJ	2002310009005	Mitish Bhande
23	UTKARSH PARASHAR	2002310009006	Vakarsh Pares

5



DATE: 11 02 2022

Sr. No.	Student Name	Roll No.	Signature
51.140.			
1 T	AHMAD HUSSAIN	1902310000001	Ahmad Mussem
2	AMANULLAH AHMED	1902310000002	Amanullan Ahm
3	ANCHAL	1902310000003	experience
4	ANKIT	1902310000004	Ancheel
5	ARYAN TYAGI	1902310000005	tothet
6	вову	1902310000006	Body
7	DEEPANSHU VERMA	1902310000007	1 Seepasthu
8	HIMANSHU	1902310000008	Himanshu
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Javam Ahmad
10	KM VANDANA	1902310000010	Lvandemer
11	MOHAMMAD SHAHRYAB	1902310000012	comb. Shoho
12	MUKESH KUMAR	1902310000013	MyKesh
13	MUZAFFAR ALI	1902310000014	emuraffar all
14	SACHIN KUMAR PUNDIR	1902310000016	Saenin
15	SANGRAM SINGH	1902310000017	Lang srom
16	SHIVAM CHAUDHARY	1902310000018	Shilivam
17	SHUBHAM TYAGI	1902310000019	Shub hom
18	AJAY YADAV	2002310009001	Ajery Gerden
19	AMISHA GUPTA	2002310009002	Amelsha,
20	ANANT SHARMA	2002310009003	Aman
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Nedish
23	UTKARSH PARASHAR	2002310009006	Vikarsh

8/



DATE: 18 02 2022

Sr. No.	Student Name	Roll No.	Signature
31. 140.			
1	AHMAD HUSSAIN	1902310000001	Thomas
2	AMANULLAH AHMED	1902310000002	Tot mensmelller
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	Ankot
5	ARYAN TYAGI	1902310000005	Longon
6	BOBY	1902310000006	Boby
7	DEEPANSHU VERMA	1902310000007	Deopersoner
8	HIMANSHU	1902310000008	Himanshus
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imcram thm
10	KM VANDANA	1902310000010	Vandema
11	MOHAMMAD SHAHRYAB	1902310000012	M. Mahryed
12	MUKESH KUMAR	1902310000013	Muldesn
13	MUZAFFAR ALI	1902310000014	Munerffano
14	SACHIN KUMAR PUNDIR	1902310000016	Sachin
15	SANGRAM SINGH	1902310000017	Sangerenn
16	SHIVAM CHAUDHARY	1902310000018	Shivam
17	SHUBHAM TYAGI	1902310000019	Shubham
18	AJAY YADAV	2002310009001	Ascen
19	AMISHA GUPTA	2002310009002	Amisha
20	ANANT SHARMA	2002310009003	Ahamt
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Notin
23	UTKARSH PARASHAR	2002310009006	Skarsh

£/



DATE: 20 02 2022

Sr. No.	Student Name	Roll No.	Signature
31.1131			
1	AHMAD HUSSAIN	1902310000001	At meid
2	AMANULLAH AHMED	1902310000002	Atmanullah
3	ANCHAL	1902310000003	Anenal
4	ANKIT	1902310000004	Anlast
5	ARYAN TYAGI	1902310000005	Airyen
6	BOBY	1902310000006	Body
7	DEEPANSHU VERMA	1902310000007	Deepourshus
8	HIMANSHU	1902310000008	thinewhou
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imeran Am
10	KM VANDANA	1902310000010	Vandaren
11	MOHAMMAD SHAHRYAB	1902310000012	AND. Shaney
12	MUKESH KUMAR	1902310000013	mulaesh
13	MUZAFFAR ALI	1902310000014	Muzaffar
14	SACHIN KUMAR PUNDIR	1902310000016	Sussin
15	SANGRAM SINGH	1902310000017	Sangereram
16	SHIVAM CHAUDHARY.	1902310000018	Shivern
17	SHUBHAM TYAGI	1902310000019	Thubhami
18	AJAY YADAV	2002310009001	1 gary
19	AMISHA GUPTA	2002310009002	Amis heres
20	ANANT SHARMA	2002310009003	Anant
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Hisin
23	UTKARSH PARASHAR	2002310009006	JKarsh

£1



DATE: 402 2022

Sr. No.	Student Name	Roll No.	Signature
31			1
1 1	AHMAD HUSSAIN	1902310000001	Thomas
2	AMANULLAH AHMED	1902310000002	- Amunulley
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	Ankit
5	ARYAN TYAGI	1902310000005	Hosent
6	вову	1902310000006	Boby
7	DEEPANSHU VERMA	1902310000007	Deepanshus
8	HIMANSHU	1902310000008	Thimansher
9	IMRAN AHMAD SHEERGOJRI	1902310000009	I merens
10	KM VANDANA	1902310000010	Van deugen
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shaherye
12	MUKESH KUMAR	1902310000013	Muldegn
13	MUZAFFAR ALI	1902310000014	Moreffer
14	SACHIN KUMAR PUNDIR	1902310000016	Southin
15	SANGRAM SINGH	1902310000017	Sangerom
16	SHIVAM CHAUDHARY	1902310000018	Shivem
17	SHUBHAM TYAGI	1902310000019	Shubhern
18	AJAY YADAV	2002310009001	Ajay
19	AMISHA GUPTA	2002310009002	Absent
20	ANANT SHARMA	2002310009003	Anant
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Mitien
23 .	UTKARSH PARASHAR	2002310009006	Vokanson

E/

DATE: 4 02 2013

Sr. No.	Student Name	Roll No.	Signature
1	AHMAD HUSSAIN	1902310000001	Thomas
2	AMANULLAH AHMED	1902310000002	-Aman rullan
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	Ankit
5	ARYAN TYAGI	1902310000005	HOSENT
6	ВОВУ	1902310000006	Bo duf
7	DEEPANSHU VERMA	1902310000007	Deeplanshu
8	HIMANSHU	1902310000008	thinnerry
9	IMRAN AHMAD SHEERGOJRI	1902310000009	5 mercun fither
10	KM VANDANA	1902310000010	Hosent
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shahry
12	MUKESH KUMAR	1902310000013	Mulaesh
13	MUZAFFAR ALI	1902310000014	Myzaffan
14	SACHIN KUMAR PUNDIR	1902310000016	Sachen
15	SANGRAM SINGH	1902310000017	Sangerem
16	SHIVAM CHAUDHARY	1902310000018	Shivam
17	SHUBHAM TYAGI	1902310000019	Shubherm
18	AJAY YADAV	2002310009001	Agery
19	AMISHA GUPTA	2002310009002	Anishen
20	ANANT SHARMA	2002310009003	Anant
21	ANCHALTIWARI	2002310009004	Anchel
22	NITISH BHARDWAJ	2002310009005	Nidien
23	UTKARSH PARASHAR	2002310009006	Valdashin



DATE: 11/02/2022

Sr. No.	Student Name	Roll No.	Signature
			, 9
1 T	AHMAD HUSSAIN	1902310000001	Showerd
2	AMANULLAH AHMED	1902310000002	- Amamulle
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	-About
5	ARYAN TYAGI	1902310000005	Doryem
6	вову	1902310000006	Budy
7	DEEPANSHU VERMA	1902310000007	7188 ent
8	HIMANSHU	1902310000008	Himanshur
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imaria
10	KM VANDANA	1902310000010	Vern dannel
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shahory
12	MUKESH KUMAR	1902310000013	Muldesh
13	MUZAFFAR ALI	1902310000014	Menaffera
14	SACHIN KUMAR PUNDIR	1902310000016	Suchin
15	SANGRAM SINGH	1902310000017	Langem
16	SHIVAM CHAUDHARY	1902310000018	Shivern
17	SHUBHAM TYAGI	1902310000019	Shybdacin
18	AJAY YADAV	2002310009001	1 of grand
19	AMISHA GUPTA	2002310009002	Amirhares
20	ANANT SHARMA	2002310009003	Anaht
21	ANCHALTIWARI	2002310009004	Anchael
22	NITISH BHARDWAJ	2002310009005	Nitish
23	UTKARSH PARASHAR	2002310009006	Hosent



DATE: 25 02 2022

Sr. No.	Student Name	Roll No.	Signature
31. 140.			
1	AHMAD HUSSAIN	1902310000001	Ahmerd
2	AMANULLAH AHMED	1902310000002	HOSENT
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	Antait
5	ARYAN TYAGI	1902310000005	Lingen
6	вову	1902310000006	Ba dy
7	DEEPANSHU VERMA	1902310000007	Deepanshu
8	HIMANSHU	1902310000008	Himanshu
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imarem
10	KM VANDANA	1902310000010	Vanderner
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Sharyah
12	MUKESH KUMAR	1902310000013	Absent
13	MUZAFFAR ALI	1902310000014	Muraffag
14	SACHIN KUMAR PUNDIR	1902310000016	Sachin
15	SANGRAM SINGH	1902310000017	Sangeram
16	SHIVAM CHAUDHARY	1902310000018	Shivann
17	SHUBHAM TYAGI	1902310000019	Shubhan
18	AJAY YADAV	2002310009001	/ topany
19	AMISHA GUPTA	2002310009002	TO85VF
20	ANANT SHARMA	2002310009003	Hount
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Nihish
23	UTKARSH PARASHAR	2002310009006	VHRayh

DATE: 104 2022

Sr. No.	Student Name	Roll No.	Signature
1	AHMAD HUSSAIN	1902310000001	Ahmerd
2	AMANULLAH AHMED	1902310000002	J Manulley
3	ANCHAL	1902310000003	Finchal
4	ANKIT	1902310000004	Pokid
5	ARYAN TYAGI	1902310000005	Hygan
6	вову	1902310000006	Body
7	DEEPANSHU VERMA	1902310000007	Deoparene
8	HIMANSHU	1902310000008	Himanshu
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Inchen
10	KM VANDANA	1902310000010	Hosent
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shaheny
12	MUKESH KUMAR	1902310000013	Mukesh
13	MUZAFFAR ALI	1902310000014	Mureeffor
14	SACHIN KUMAR PUNDIR	1902310000016	Sachin
15	SANGRAM SINGH	1902310000017	Sanguram
16	SHIVAM CHAUDHARY	1902310000018	Shivam
17	SHUBHAM TYAGI	1902310000019	Shubhem
18	AJAY YADAV	2002310009001	tous
19	AMISHA GUPTA	2002310009002	Amistra
20	ANANT SHARMA	2002310009003	Anant
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Ninen
23	UTKARSH PARASHAR	2002310009006	VtKarsh

Director College R.D. Engineering abad Duhai, Ghaziabad



DATE: 8/04/2023

Sr. No.	Student Name	Roll No.	Signature
<u> </u>			
1	AHMAD HUSSAIN	1902310000001	homand
2	AMANULLAH AHMED	1902310000002	mangallah
3	ANCHAL	1902310000003	Anchel
4	ANKIT	1902310000004	Hosent
5	ARYAN TYAGI	1902310000005	toyen
6	вову	1902310000006	Body
7	DEEPANSHU VERMA	1902310000007	Hosent
8	HIMANSHU	1902310000008	Himanshu
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imaran
10	KM VANDANA	1902310000010	Vandemer
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Shahr
12	MUKESH KUMAR	1902310000013	Mulsesh"
13	MUZAFFAR ALI	1902310000014	merceffen
14	SACHIN KUMAR PUNDIR	1902310000016	Suchen
15	SANGRAM SINGH	1902310000017	Langeren
16	SHIVAM CHAUDHARY	1902310000018	Shivam
17	SHUBHAM TYAGI	1902310000019	Sherdheim
18	AJAY YADAV	2002310009001	Jay
19	AMISHA GUPTA	2002310009002	Amilne
20	ANANT SHARMA	2002310009003	Anth
21	ANCHALTIWARI	2002310009004	Hohal
22	NITISH BHARDWAJ	2002310009005	128.641
23	UTKARSH PARASHAR	2002310009006	Moseph

Director College R.D. Engineering Ghaziabad



DATE: 22/04/2022

Sr. No.	Student Name	Roll No.	Signature
31. 140.			
1	AHMAD HUSSAIN	1902310000001	Lahmad
2	AMANULLAH AHMED	1902310000002	Amanullan
3	ANCHAL	1902310000003	Anchal
4	ANKIT	1902310000004	Ankit
5	ARYAN TYAGI	1902310000005	Aryen
6	ВОВУ	1902310000006	Bodel
7	DEEPANSHU VERMA	1902310000007	Deepashy
8	HIMANSHU	1902310000008	of lye menther
9	IMRAN AHMAD SHEERGOJRI	1902310000009	Horeta
10	KM VANDANA	1902310000010	Vandence
11	MOHAMMAD SHAHRYAB	1902310000012	MD. Sharyan
12	MUKESH KUMAR	1902310000013	Absent
13	MUZAFFAR ALI	1902310000014	Musicuffer
14	SACHIN KUMAR PUNDIR	1902310000016	Secuin
-15	SANGRAM SINGH	1902310000017	Sangam
16	SHIVAM CHAUDHARY	1902310000018	Shi'verm
17	SHUBHAM TYAGI	1902310000019	Speubern
18	AJAY YADAV	2002310009001	- to cry
19	AMISHA GUPTA	2002310009002	Mogent
20	ANANT SHARMA	2002310009003	Anant
721	ANCHALTIWARI	2002310009004	Anonel
22	NITISH BHARDWAJ	2002310009005	Nitish
23	UTKARSH PARASHAR	2002310009006	Ab sent



DATE: 29/04/2022

Sr. No.	Student Name	Roll No.	Signature
31. 140.			
1 1	AHMAD HUSSAIN	1902310000001	Thomas do
2	AMANULLAH AHMED	1902310000002	Amoueller
3	ANCHAL	1902310000003	Agchoel
4	ANKIT	1902310000004	ProKid
5	ARYAN TYAGI	1902310000005	Thoseh+
6	BOBY	1902310000006	Body
7	DEEPANSHU VERMA	1902310000007	Deeparshy
8	HIMANSHU	1902310000008	Himenshur
. 9	IMRAN AHMAD SHEERGOJRI	1902310000009	Imcrown
10	KM VANDANA	1902310000010	Van demer
11	MOHAMMAD SHAHRYAB	1902310000012	MD: Shah
12	MUKESH KUMAR	1902310000013	Myldesn
13	MUZAFFAR ALI	1902310000014	Muraffeer
14	SACHIN KUMAR PUNDIR	1902310000016	Sackin
15	SANGRAM SINGH	1902310000017	Sangeron
16	SHIVAM CHAUDHARY	1902310000018	Shiram
17	SHUBHAM TYAGI	1902310000019	Shubham
18	AJAY YADAV	2002310009001	Jay
19	AMISHA GUPTA	2002310009002	thosent
20	ANANT SHARMA	2002310009003	#Nont
21	ANCHALTIWARI	2002310009004	Anchal
22	NITISH BHARDWAJ	2002310009005	Ninen
23	UTKARSH PARASHAR	2002310009006	Absely



AICTE ID: 1-3548321

College Code: 231

# R.D. ENGINEERING COLLEGE

Approved by AICTE New Delhi & Affiliated to Dr. APJ Abdul Kalam Technical University, Lucknow under the aegis of IQAC

Date: 11/09/2021

# DEPARTMENT OF MECHANICAL ENGINEERING

### **NOTICE**

Dear ME Vth & VIIth semester students,

We are excited to announce the commencement of special classes for the preparation of the Graduate Aptitude Test in Engineering (GATE). The GATE exam is a gateway to some of the most prestigious postgraduate programs and job opportunities in the field of engineering.

Class Details:

Commencement Date: 18 Sep 2021 Venue: C Block Room No. C 205

Sincerely,

Prof. Sanjay Pak (HOD, ME

<u>CC:</u> Director

**IQAC** 

Dean Academics

Departmental Notice Board



SANJAY PALIWAL is a Renowned Professor in the Mechanical Department at R D Engineering College, Ghaziabad, INDIA.

He has done B.E. & M.Tech. and Published Several Research Papers and National and International Patent to his Credit. He has Attended Several National & International Conferences. He has 5 year Industry & 18 year Teaching Experience.

A Head Office

### ME Mechanical Engineering

### Section 1: Engineering Mathematics

Linear Algebra: Matrix algebra, systems of linear equations, eigenvalues and eigenvectors.

Calculus: Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems.

Differential Equations: First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; solutions of heat, wave and Laplace's equations.

Complex Variables: Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series.

Probability and Statistics: Definitions of probability, sampling theorems, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods for differential equations.

### Section 2: Applied Mechanics and Design

Engineering Mechanics: Free-body diagrams and equilibrium; friction and its applications including rolling friction, belt-pulley, brakes, clutches, screw jack, wedge, vehicles, etc.; trusses and frames; virtual work; kinematics and dynamics of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations; Lagrange's equation.

Mechanics of Materials: Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; concept of shear centre; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.

Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.

Machine Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.



### Section 3: Fluid Mechanics and Thermal Sciences

Fluid Mechanics: Fluid properties; fluid statics, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings; basics of compressible fluid flow.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts; thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan-Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis

Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behavior of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

Applications: Power Engineering: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. Turbomachinery: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines; steam and gas turbines.

### Section 4: Materials, Manufacturing and Industrial Engineering

Engineering Materials: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

Casting, Forming and Joining Processes: Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

Machining and Machine Tool Operations: Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, jigs and fixtures; abrasive machining processes; NC/CNC machines and CNC programming.

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly; concepts of coordinate-measuring machine (CMM).

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools; additive manufacturing.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning; lean manufacturing.

Inventory Control: Deterministic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

Heart Heart

R D Engineering College, Ghaziabad Department of Mechanical Engineering GATE CLASSES(2018-19)

46	45	4	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	22	19	18	17	16	15	14	13	12	=	10	9	8	7	6	20 1	Δ (ω	2	_	
1623140096	162314009	162314009	1623140091 SONAM	162314009	162314008	162314008	162314008	162314008	1623140083	1623140082	1623140081 SAHIL	162314007	162314007	162314007	162314007	162314006	162314005	1623140053	162314005	162314004	1623140048	162314004	1673140046	162314004	162314004	162314004	162314004	16231400	1623140036	16231400	1623140034 ASIF	16231400	16231400	16231400	16231400	1623140019 AMAN	16231400	16231400	16231400	16231400	16231400	16231400	16231400	
1623140096 TARUN CHOUDHARY	1623140093 SOURABH KUMAR	1623140092 SONU KUMAR	SONAM	1623140090 SHUBHAM GAUR	SHUBHAN	1623140087 SHIVANSH KUMAR	1623140086 SHIVAM SHARMA	1623140085 SHEKHAR KUMAR	3 SATYAM CHAURSIA	2 SAHIL CHIKARA	1 SAHIL	1623140079 RUPESH RAJ	1623140078 ROHIT KUMAR	1623140077 ROHAN SINGH	1623140073 RAHUL SINGH	1623140067 PANKAJ JANOTI	1623140055 KAVITA DIVEDI	KAJAL	1623140050 JAGDEEP SINGH	1623140049 IRSHANT GIRI	HIMANSH	1623140047 HEMANT KUMAR	GYANESH SHIVAM	1623140044 GOVIND SHARMA	1623140043 GAURAV SINGH	1623140042 GAURAV MUNDE	1623140040 DEEPANSHU TYAGI	1623140037 DEENANAND	36 BASANT JHA	1623140035 AVINASH KUMAR	34 ASIF	1623140033 ASHWANI KUMAR	32 ASHUTO	1623140030 ASHISH TOMAR	1623140021 ANIKET SHARMA	19 AMAN	1623140018 AKASH TYAGI	1623140017 AKASH SINGH	1623140013 AKASH	1623140011 ADITYA KUMAR	10 ABHISHE	1623140008 ABHISHEK SINGH	1623140007 ABHISHEK RAI	ľ
HOUDHARY	KUMAR	MAR		GAUR	1623140089 SHUBHAM BAGEDYAN	KUMAR	HARMA	KUMAR	CHAURSIA	IKARA		RAJ ,	MAR	INGH	NGH	ANOTI	IVEDI		SINGH	GIRI	HIMANSHU KUMAR SHARMA	KUMAR	MANIHAM	SHARMA	SINGH	MUNDE	SHU TYAGI	AND	JHA	KUMAR		II KUMAR	1623140032 ASHUTOSH TRIPATHI	TOMAR	SHARMA		YAGI	SINGH		KUMAR	1623140010 ABHISHEK KUMAR SHARMA	EK SINGH	EKRAI	ranic
Taxu	Lecumb	James	MONOR	Ab	Serv	45	A.	のちょき	É	J. FERNE	A.a.r	Zam	いない	1	P	S IN	AA	REST	Laddy	Ab	San R	200	(GACAMA)	Granza	46	Centres	8	Marriage .	0	A	OFFICE	2	9	O CACA	On the	Q.	AK M		2000	THE	1	SA.	24	10000
town	Some of	4	Sar.	Swork .	45	Ship land	pil	7 Street	Ø	Jack Sale	40	du	\$7.50 F	Charles and the same of the sa	X	Care	Camara		Loren	F-VFCF	Number of the second	1 months	Company	XX L	Spe way	Ceremon	<b>X</b>	R	0	S.	A COR		400	24	2 7 7	Brown Comment	200		1000	The same	1	SA.	17/10	10107-NOTO
21.2	Samo	Semi	6	10	2	5	9	5	Q	40	9	**	1220	75%	no la	1	Mundo	Faul	And the Coll	DV4	7	Company	aux	Considery of	gaust	140	P	200	3	2	DEST	10	Separa .	200	AVA		No. i.	1	TO SE	CHI	8	and:		01070867
N. P.	To a	drum	2	Oh.	250			A CONTROL	Ab	K and a second	0	D	1	1.	K	a l	The same	1	1	DX	No.	18 April 1	de	AB	gaun	annap	O	Druh	1	4	4.94	1	Signer		No.	Show	mi	Con Barre	12.00	1000	941	200	イン	010-10-2019
Br	Sermon ?	MATTE	· ·	2		N.	3	BANTA	A	Table of	4	*	D.		1	P	AN	10000	Children	No And A	T. C.	TO	County	Town !	#0	Chumbell 1	0	Bunder	N	1	1. C.	The same	3	Attack Y	No.		44		The state of the s	Supply	A	1	-	8107-01-61
D'ran	Troil of	Savina	0	72.	7	7	D	Canada	Constitution	N.C.	b	14	The contract of	de	The state of the s		To the second	100	C CARLO	Shu W	1	Cospins	Conar	Chamer	goure	Tuy val		De la contra del la contra del la contra del la contra de la contra del la contra de la contra de la contra del la contr	1	The same	45.00	200	WAY B	Starket !	and the	Mar	100	0	ST.T.	Sale .	Q	1		8102-01-02
ながら	1200	A. C.	6	9	and a co	AL	0	A	1	1	Pare	7	2	1	× 22.55	1200	100	0	Contract of	The	the 1	Carring	Cabre	Lawren	PONEW	AN	C	1	MA	100	2	7	61118	Anyk.+	Xerra .	a Kenn		- Wester	2	Sell se	Q	and.	-	27-10-2018
2 2		The state of	6		0	0	The state of	1	TWIN	4	2		0	N N		The second	760	torton	12 P. J. C.	L'all	01	Cuman	Ceropino o	Many!	On Suns		36	D. T. C.	The same	TX.	A STATE OF THE PARTY OF THE PAR	2	Service !	T D	· Par	0.40		TINE TO	244	dh	0	1	-60	03-11-2018
がく	X	2000	David Control		A LANGE		O MANA		STATE OF		2	17.73	TO I	X	1	ANN	3.00	The A	JAR ALL	D	Ro	anym	in and	A 0	100	1	Charles of the Control of the Contro		70	JAN .	1000	R	St. Just	Cartes 2	an o	Wesh		- LYNNARA	A CAN	MA	X			10-11-2018 1
1341 C	B	20	NAM Y	1	No.		BAAC	S COL	S. W.	1	0	7	0000	1	Can	DKUNG .	673	0		March.	1	A	80	Paralus .	O carro	- Charles	AR Shirt	90	346	1441	1	00	10	るなどん	×	the ho	1	A A	of the	S . MO	A P			7-11-2018 24
Janes J	V	V	Str. of	- A	A TOWN	39	1	2	3	7	3	Ser.	6	1	0	Waste.	D	2 congs		way hours	Hen K	*	# (ag		and a	1	KENRY I		March 1	77 1861	CAN'T	20 5	8 1100	2	D C	okan x	1	A SERVE	and &	S Max	5	-		11-2018 31
50	The same	1	1	1	3	Y	6	17	CALLEY I	1	3	The state of the s		1	1	0	CAR.	40	A SOLIN	nemicial	ton	Enny	Cubin	C-ton / Ju	Character	1	Down	70	3	18	2	R	2 Min	Ankley	An	Rich	1	7	Share and	ast.		*	4	8100-11-

AICTE ID: 1-3548321

College Code: 231

# R. D. ENGINEERING COLLEGE

Approved by AICTE New Delhi & Affiliated to Dr. APJ Abdul Kalam Technical University, Lucknow under the aegis of IQAC

# Department of Electronics and Communication Engineering

Date:09.09.2021

### **Notice**

### Dear ECE V semester students,

We are excited to announce the commencement of special classes for the preparation of the Graduate Aptitude Test in Engineering (GATE). The GATE exam is a gateway to some of the most prestigious postgraduate programs and job opportunities in the field of engineering.

**Classes Details:** 

Commencement Date: 17 Sep 2021 Venue: C Block Room No. C 201

Dr. Vishal Upmanu

(HOD-ECE)

CC to:

Coordinator, IQAC

Dean Academics

Departmental Notice Board

# R D Engineering College, Ghaziabad

# GATE CLASSES for B. Tech (ECE- V Sem) Session 2021-22 Attandance Sheet

	38	37	36	35	34	33	32	اد	30	29	28	27	26	25	24	23	22	21	20	19	81	17	16	15	14	5.	12	=	10	9	∞	7	6	5	4	w	2	_	SN	
	1902310310054	1902310310052	1902310310048	1902310310047	1902310310046	1902310310044	1902310310043	1902310310042	1902310310041	1902310310040	1902310310039	1902310310037	1902310310036	1902310310035	1902310310034	1902310310033	1902310310031	1902310310030	1902310310029	1902310310027	1902310310025	1902310310022	1902310310021	1902310310019	1902310310018	1902310310017	1902310310015	1902310310014	1902310310013	1902310310012	1902310310011	1902310310009	1902310310006	1902310310005	1902310310004	1902310310001	1902310400003	1823131084	Roll No.	
	SAGAR	SAGAR	PUNIT SAINI	PRIYANKA SINGH	PRADEEP SAGAR	PANKAJ SHARMA	NIKHIL KUMAR	NIKHIL SINGH	NEELAM DIWAKAR	NAVIT KUMAR	NANDITA DODWAL	MUKESH KORI	Moin Khan	MOHD SUHAIL	MOHD NASEEM ANSARI	MEHUL ARYA	MD ALTAMASH	MANSVI SAINI	KM ISHA SHARMA	KM HEMA	JANVI TYAGI	HEAMANT SINGH PATEL	HARUN	HARSH PORWAL	GAURI SHANKAR	GAURAV KUMAR	DEEPANSHU TYAGI	DEEPANSHU	DEEPANSHU	DEEPAK	AVINASH KUMAR	ANKITA	AKASH SINGH RATHI	AKASH KUMAR	AAKASH KUMAR	AAYUSH	AJAY KUMAR BHARTI	TANYA	Student's Name	
	12000	36	1	2002	(A)	F	N. EL	A	3	200	No.		\$	A	A	See	MD.	No.	3 kg	7	- Len	Howi	7	4	97	O Cue	dian	Din	B	A	Hum	A CONT	A	ak-	A	188	Ajay	A	17-09-2021	
	A	W.	2	1	Chadee		AM	2	A.	Som	H	Made	A.	many	A LA	1	A	H	200		H	Herr	1	HAL	A	(2)	A	Di	Diepro	- A	Aun	マス	Askath	A	Aakark	1	Aigy	1000	27-09-2021	Att
	180%	A,	2	C LLA	D Comme	1	CH	Now	2	N.W	200	W	H	JW.	1	1 765	W.	NAN-	H	planed.	H	You	A	San	N. S.	1	A	Du	Hespand	1	D	1	Askathi	CAB).	Askah	- A	A	100	07-10-2021	Attendance Sheet
	to the	*	L	100	081 4	1	2	H	T N	Vas	3		3	A	子母で	36	Too or	NA.V	1	12	Town to the same of the same o	H	E C	Z	Markey	9-1	duai	D'a	Deckery	A	Aun	1	Askath.	AK	Askash	7	Ayan	1 A.	14-10-2021	Sheet
	they the	4	H	ASS.	Ap	Alt	TO THE	100	1	H	101	N.V.	K	MIN	TAX.	The same of the sa	H	7000	100	Contr	- Asset	Hein	1	C H	min	( S	dings	2-	Licken		Asia	7	ASKATKI	H	Makash	Jan.	Ajan	No.	21-10-2021	
	A	4	4	727	04	7	120	Amaria	1	HX	Non	1	The state of the s	Mun	tr.	J H	700	4	1	S I	- Jan	Mar	· ·	N. CHI	H		atyan	A	Luban		Flyn		# S Kathi	AKL	Askash	R	Ajay	of the second	28-10-2021	
	1	4	Tr.	1	A	P AT	0	Mary	1	NAN	1	No.	1	2	II A A	T	3		XX	on or .	200	Har	7	More	Marian.	Clar	State	X	H	A.	Hunga	1	HSKathy	(FR)	Action	3	A	7	04-11-2022	Althoropy Man and Althoropy an
4	Jan Jan	0	P	200	CHAT.	7	A SON		-	Nav.	17	2000	TAT	2	1	200	7	2000		Chr		1	7	- March	Long	· Car	alle	<i>[1]</i>	Depan	H	Huine	**	T	(AK)	HOKOM		4794	1	10-11-2022	-
R.D. Eng Duhai		) A	7	13	CA		N. C.	T + 100	The County of th	Now!				num o	7	200	1		MA A	15	7	Men	1	the	VANS	H '	deliber	*	. Lockin		1	1	HSKath,	HR	DO JOSE	10	Hoy	1	17-11-2022	_
R.D. Engineering College Duhai, Ghaziabad	200	-	1	1	3	1	Sur Sur		1	1 Once	1				The state of the s		MON	and and	In a C		4		1	F		Car.	1	*	**	9	HULAN	127	HS Kath	ARCH.		7	Hyan	10-4	24-11-2022	
ollege				1)		1	*		1		)			/	/	,			15		1		J.								1	/								

The second of th	SHRISTI BHATNAGAR	2002310319008	57
The state of the s	SACHIN SINGH	2002310319007	56
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ROMIT GUPTA	2002310319006	55
We have the total the total the total total the total	RAVI KUMAR	2002310319005	54
two the training the training to the training	ANMOL RANA	2002310319003	53
The state of the s	ANJU GOSWAMI	2002310319002	52
The transfer of the transfer o	AKASH GOSWAMI	2002310319001	51
AND THE STATE OF T	VIVEK KUMAR	1902310310069	50
	VAIBHAV	1902310310067	49
I Com Com Com	KM TANU PANWAR	1902310310066	48
1	TANU GAUTAM	1902310310065	47
The state of the s	SUNIL KAUSHWAH	1902310310064	46
A CONTRACTOR OF STATE	SUMIT SINGH	1902310310063	45
	SHWETA SHARMA	1902310310061	44
	SHWETA	1902310310060	43
	SHUBHAM	1902310310059	42
Mario	SHIVAM	1902310310057	41
	SATENDRA KUMAR	1902310310056	40
	SARFUL HOQUE	1902310310055	39

Dr. Vishat Opmanu
Program Coordinator
R.

### **Electronics and Communications**

### Section 1: Engineering Mathematics

EC

Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems.

Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stoke's theorems.

Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula; Taylor's and Laurent's series, residue theorem.

Numerical Methods: Solution of nonlinear equations, single and multi-step methods for differential equations, convergence criteria.

Probability and Statistics: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability; Correlation and regression analysis.

## Section 2: Networks, Signals and Systems

Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks.

Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

### Section 3: Electronic Devices

Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

### Section 4: Analog Circuits

Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation, single-transistor and op-amp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation.

### Section 5: Digital Circuits

Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Semiconductor memories: ROM, SRAM, DRAM; 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.

### Section 6: Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

### Section 7: Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

### **Section 8: Electromagnetics**

Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers.

R.D. Engin Ghaziabad