St. Albert's College (Autonomous)

PHY1CMT0119 : PROPERTIES OF MATTER & ERROR ANALYSIS

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1 and 2) *(Module 2 and 3)*	B.Sc. Mathematics	2019-22	I	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	34 (Including assignments)
2	Assessment (CAE)	2
	Total	**36**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Explain the concept of elasticity in solid objects and the various types of stresses, strains and elastic moduli as well as the methods of their estimation
- Study of the physics behind surface tension and its various applications
- Understanding the mathematics behind hydrodynamics and the flow of liquids and gases.
- Learn about error analysis and its importance in physics. Study the various types of errors and how they are estimated in instruments and reported in literature.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Stress- strain- Hooke's law, Elastic moduli- Poisson's ratio	12-Jun-19	Lectures
twisting couple, determination of rigidity modulus- static and dynamic methods	19-Jun-19	Lectures
static torsion, torsion pendulum	26-Jun-19	Lectures
bending of beam, cantilever - uniform bending,	03-Jul-19	Lectures
non-uniform bending, I section girder.	10-Jul-19	Lectures
Tutorial	17-Jul-19	Lectures
MODULE II		
Molecular Theory of surface tension	10-Jun-19	Lectures
Surface energy	17-Jun-19	Lectures
Excess pressure in a liquid drop	24-Jun-19	Lectures

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Factors affecting surface tension - Applications	01-Jul-19	Lectures
Streamline and turbulent flow - critical velocity - Coefficient of viscosity	24-Jul-19	Lectures
Derivation of Poiseuille's equation - Stokes equation	07-Aug-19	Lectures
Determination of viscosity by Poiseuille's method	21-Aug-19	Lectures
Brownian motion – Viscosity of gases - Bernoulli's theorem.	04-Sep-19	Lectures
Tutorial	18-Sep-19	Lectures
MODULE III		
Basic ideas – Uncertainties of measurement	08-Jul-19	Lectures
Importance of estimating errors – dominant errors, random errors	22-Jul-19	Lectures
Systematic errors – rejection of spurious measurements	29-Jul-19	Lectures
Estimating and reporting errors – errors with reading scales	05-Aug-19	Lectures
Errors of digital instruments	19-Aug-19	Lectures
Number of significant digits	26-Aug-19	Lectures
Absolute and relative errors – standard deviation	02-Sep-19	Lectures
Propagation of errors – sum and differences	16-Sep-19	Lectures
Products and quotients	23-Sep-19	Lectures
Multiplying by constants - powers	30-Sep-19	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to entropy	Solution of numerical problems		Submit Hard copy

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Assignment -2`	Problems-thermal conductivity	Solution of numerical problems		Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. *Complementary Physics, Setupathy*

References:

1. *Elements of properties of matter, D S Mathur*
2. *Advanced course in Practical Physics by D Chattopadhyay*
3. *Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)*
4. *Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)*
5. *Modern Physics- G. Aruldas and P. Rajagopal (PHI Pub)*
6. *Physics- Resnick and Halliday*
7. *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, John R. Taylor - Univ. Science Books*

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St. Albert's College (Autonomous)

PHY1CMT0219: PROPERTIES OF MATTER AND THERMODYNAMICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1 and 3) (Module 2 and 4)	B.Sc. chemistry	2019-22	I	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	36 (Including assignments)
2	Assessment (CAE)	3
	Total	**37**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Illustrate the different examples of elasticity
- Explain the molecular theory of surface tension
- Categorize the factors affecting the surface tension
- Discuss the theories related to viscosity
- Classify different thermodynamic systems
- Explain the theories of thermodynamics

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Stress- strain- Hooke's law	12-Jun-19	
Elastic moduli	19-Jun-19	
Poisson's ratio	26-Jun-19	
Twisting couple	03-Jul-19	
Determination of rigidity modulus	10-Jul-19	
Static torsion- torsion pendulum	17-Jul-19	
Bending of beams	24-Jul-19	
Cantilever	07-Aug-19	
Uniform bending	21-Aug-19	
Non-uniform bending	04-Sep-19	
I section girder	18-Sep-19	

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MODULE II - Surface Tension		
Molecular Theory of surface tension	06-Jun-19	
Surface energy, excess pressure in a liquid drop	13-Jun-19	
Factors affecting surface tension	20-Jun-19	
Applications	27-Jun-19	
MODULE III		
Streamline and turbulent flow	25-Sep-19	
Critical velocity, Coefficient of viscosity	02-Oct-19	
Derivation of Poiseuille's equation, Stokes equation	09-Oct-19	
Determination of viscosity by Poiseuille's method	16-Oct-19	
Brownian motion – Viscosity of gases	23-Oct-19	
Bernoulli's theorem	30-Oct-19	
MODULE IV - Thermodynamics		
Thermodynamic Systems	04-Jul-19	
Thermodynamic Equillibrium	11-Jul-19	
Thermodynamic Processes – Isothermal process, adiabatic process	18-Jul-19	
Zeroth Law of Thermodynamics	25-Jul-19	
Heat Engine	01-Aug-19	
Carnot Engine	08-Aug-19	
Refrigeration	22-Aug-19	
Concept of Entropy	29-Aug-19	
Second Law of Thermodynamics	05-Sep-19	
Third Law of Thermodynamics, Maxwell's Thermodynamic relations	19-Sep-19	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to elasticity	Solution of numerical problems		Submit Hard copy
Assignment -2`	Problems-hydrodynamics	Solution of numerical problems		Submit Hard copy

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Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. Elements of properties of matter, D S Mathur- S Chand
2. Heat and Thermodynamics-Brijlal & Subrahmanyam (S.Chand))

References:

1. Mechanics - H.S.Hans and S.P.Puri. (Tata McGraw-Hill)
2. Properties of Matter - Brijlal and N. Subrahmanyam (S. Chand and Co.)
3. Mechanics - J.C. Upadhyaya (Ram Prasad and sons)
4. Heat and Thermodynamics – Mark W Zemanski (Tata McGraw-Hill)

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ST. ALBERT'S COLLEGE (AUTONOMOUS)

Department of Physics

St. Albert's College (Autonomous)

PHY1CRT0119: METHODOLOGY AND PERSPECTIVES OF PHYSICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
Dr. Louie Frobel P.G.	Sem I B.Sc Physics, 2019-22	louiefrobel@gmail.com

II. Duration of Course:

No	Activity	Duration
1	Contact hours	35
2	Assessment (CAE & ESE)	2
	Total	**37**

I. Course Objectives:

* Introduced with the pursuit of physics, its history and methodology.
* Illustrate different number systems and their significance in Physics
* Interpret the Importance of measurements and error analysis which is central to Physics
* Realize the role of vectors and coordinate systems in Physics
* Capable of estimation of errors for the simple experiments in Physics .

I. Course Delivery Plan

This course is designed to make students get understanding and perform numerical analysis and integration.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Development of physics in the last century	03/07/19	Lectures
Galileo, Newton, Einstein,	10/07/19	Lectures
J J Thomson, Curies, Rayleigh	17/07/19	Lectures
Max Plank, Heisenberg and Schrodinger	24/07/19	Lectures
Contributions of Indian physicists -C V Raman, H J Babha	07/08/19	Lectures

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J C Bose, S N Bose, M Saha,	21/08/19	Lectures
S Chandrasekhar, Vikram Sarabhai,	24/08/19	Lectures
MODULE II		
Decimal, hexadecimal and Binary.Conversions,	04/09/19	Lectures
Binary arithmetic addition,	18/09/19	Lectures
subtraction and multiplication.	25/09/19	Lectures
1's complement, 2's complement	02/10/19	Lectures
Signed binary arithmetic,	09/10/19	Lectures
BCD code, ASCII code,	16/10/19	Lectures
Significance of binary number system in digital electronics	23/10/19	Lectures
INTERNAL EXAM	30/10/19	EXAM
Applications of vectors in Physics.	01/07/19	Lectures
Differential and Integral vector calculus:	04/07/19	Lectures
physical significance of Gradient,	11/07/19	Lectures
physical significance of Divergence	18/07/19	Lectures
physical significance of CURL	22/07/19	Lectures
Line integral of vectors	25/07/19	Lectures
surface integral of vectors	01/08/19	Lectures
volume integral of vectors	05/08/19	Lectures
Cartesian Co-ordinate system,	08/08/19	Lectures
plane polar and spherical polar coordinates,	19/08/19	Lectures
cylindricalcoordinates	22/08/19	Lectures
MODULE III		
least count of instruments	29/08/19	Lectures
Instruments for measuring mass	02/09/19	Lectures
Instruments for measuring length	05/09/19	Lectures
spectrometer	19/09/19	Lectures
conversion of galvanometer to ammeter and voltmeter	26/09/19	Lectures
Fundamental units.	30/09/19	Lectures

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Precision and accuracy of measurements,	03/10/19	Lectures
Types of errors,	10/10/19	Lectures
Errors of computation	17/10/19	Lectures
Propagation of errors,	24/10/19	Lectures
Internal Exam	05/09/19	EXAM

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Hands on experiment with instruruments , identify variaous factors causing errors	3 Days	Experiment	4th Week

IV. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

V. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Digital electronics: Albert Paul Malvino
2. Digital logic and computer design – M. Morris Mano, PHI.
3. Text book: Advanced course in Practical Physics by D Chattopadhyay- Chapter-1
4. Practical Physics, G L Squires, Third edn. Cambridge University Press.

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HEAD OF THE DEPARTMENT OF PHYSICS
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St. Albert's College (Autonomous)

PHY2CMT0119 : MECHANICS AND ASTROPHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1 and 2) *(Module 2 and 3)*	B.Sc. Mathematics	2019-22	II	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	34 (Including assignments)
2	Assessment (CAE)	2
	Total	**36**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Explain the conservation laws and symmetries to solve mechanical problems.
- Mathematically analyse and demonstrate the wave motion and its properties.
- Summarize the basic parameters of stars like brightness, radiant flux, luminosity, magnitude, orbits, spectral classification. H-R diagram.
- Recall the basic ideas of gravity and illustrate the experiments related to gravity.
- Explain the phenomena of simple harmonic motion and the properties of systems executing such motions.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Velocity- acceleration- force – acceleration due to gravity	13-Nov-19	Lectures
compound pendulum (symmetric and asymmetric)	20-Nov-19	Lectures
radius of gyration – Kater's Pendulum	27-Nov-19	Lectures
centripetal acceleration and force - centrifugal force	04-Dec-19	Lectures
Angular velocity- angular momentum- torque	11-Dec-19	Lectures
conservation of angular momentum- angular acceleration-	18-Dec-19	Lectures

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moment of inertia- parallel and perpendicular axes theorems-	01-Jan-20	Lectures
moment of inertia of rod, ring, disc, cylinder and sphere- flywheel	08-Jan-20	Lectures
MODULE II		
Waves-classifications.	15-Jan-20	Lectures
progressive wave	22-Jan-20	Lectures
energy of progressive wave	29-Jan-20	
superposition of waves-	05-Feb-20	Lectures
theory of beats	12-Feb-20	
Doppler Effect	19-Feb-20	Lectures
Periodic and oscillatory motion- simple harmonic motion	11-Nov-19	Lectures
differential equation, expression for displacement, velocity and acceleration- graphical representation	18-Nov-19	Lectures
energy of a particle executing simple harmonic motion	25-Nov-19	Lectures
damped oscillation	02-Dec-19	Lectures
forced oscillation and resonance.	09-Dec-19	Lectures
MODULE III		
Temperature and color of a star	16-Dec-19	Lectures
elements present in a stellar atmosphere-	06-Jan-20	Lectures
mass of star	13-Jan-20	Lectures
life time of a star	20-Jan-20	Lectures
main sequence stars-HR diagram	27-Jan-20	Lectures
evolution of stars	03-Feb-20	Lectures
white dwarf-	10-Feb-20	Lectures
supernova explosion-	17-Feb-20	Lectures
neutron star-	24-Feb-20	Lectures
black hole-	02-Mar-20	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines

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Assignment -1	Problems related to entropy	Solution of numerical problems		Submit Hard copy
Assignment -2`	Problems-thermal conductivity	Solution of numerical problems		Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. Complementary Physics, Setupathy

References:

1. Elements of properties of matter, D S Mathur Mechanics- H.S.Hans and S.P.Puri. (TMH)
2. Mechanics, D S Mathur
3. Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad
4. A text book on oscillations waves and acoustics, M.Ghosh , D Bhattacharya
5. Introduction to Astrophysics-Baidyanath Basu.
6. Mechanics by D.S. Mathur and P.S. Hemne, S. Chand.
7. Waves, Mechanics & Oscillations- S B Puri

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St. Albert's College (Autonomous)

PHY2CMT0219: MECHANICS AND SUPERCONDUCTIVITY

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1 and 3) (Module 2 and 4)	B.Sc. chemistry	2019-22	II	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	36 (Including assignments)
2	Assessment (CAE)	3
	Total	**37**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Explain the conservation laws and symmetries to solve mechanical problems.
- Mathematically analyse and demonstrate the wave motion and its properties.
- Explain types of superconductivity and their applications.
- Explain the phenomena of simple harmonic motion and the properties of systems executing such motions.
- Recall the basic ideas of gravity and illustrate the experiments related to gravity.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Velocity- acceleration- force – acceleration due to gravity	13-Nov-19	
compound pendulum (symmetric and asymmetric)	20-Nov-19	
radius of gyration – Kater's Pendulum	27-Nov-19	
centripetal acceleration and force - centrifugal force	04-Dec-19	
Angular velocity- angular momentum-	11-Dec-19	
torque	18-Dec-19	
conservation of angular momentum-	01-Jan-20	

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angular acceleration-		
moment of inertia- parallel axes theorems	08-Jan-20	
perpendicular axes theorems	15-Jan-20	
moment of inertia of rod, ring, disc, cylinder and sphere-	22-Jan-20	
flywheel	29-Jan-20	
MODULE II		
Waves-classifications.	05-Feb-20	
progressive wave- energy of progressive wave	12-Feb-20	
superposition of waves-theory of beats	19-Feb-20	
Doppler Effect	26-Feb-20	
Periodic and oscillatory motion- simple harmonic motion	14-Nov-19	
differential equation, expression for displacement, velocity and acceleration- graphical representation	21-Nov-19	
energy of a particle executing simple harmonic motion	28-Nov-19	
damped oscillation	05-Dec-19	
forced oscillation and .	12-Dec-19	
resonance	19-Dec-19	
MODULE IV		
Super conducting phenomenon	09-Jan-20	
Occurrence	16-Jan-20	
BCS theory (qualitative)	23-Jan-20	
Meissner Effect-	30-Jan-20	
Type I superconductors	06-Feb-20	
Type II superconductors	13-Feb-20	
Josephson effects (qualitative)	20-Feb-20	
High temperature superconductors	27-Feb-20	
Applications of Superconductivity	05-Mar-20	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

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No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to elasticity	Solution of numerical problems		Submit Hard copy
Assignment -2	Problems-hydrodynamics	Solution of numerical problems		Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Books:

1. Elements of properties of matter, D S Mathur- S Chand
2. Mechanics- D S Mathur- S Chand
3. Solid State Physics- P K Palanisamy- Scitech

References:

1. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)
2. A text book on oscillations waves and acoustics, M.Ghosh , D Bhattacharya
3. Solid State Physics- R. K. Puri and V.K. Babbar (S. Chand and Co.)
4. Elementary Solid State Physics,Ali Omar
5. Modern Physics- Murugeshan- S Chand

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Department of Physics

St. Albert's College (Autonomous)

PHY1CRT0119: MECHANICS AND PROPERTIES OF MATTER

I. Course Instructor

Name	Sem, Programme& Batch	Email
	Sem II B.Sc Physics, 2019-22	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	32
2	Assessment (CAE & ESE)	3
	Total	**35**

III. Course Objectives:

* Capable to demonstate the wave motions mathemtically.
* Understanding in the principle of conservation and symmetries.
* Interpret the principles of elasticity through the study of Young's & rigidity modulus.
* Learn simple principles of fluid flow and the equations governing fluid dynamics.
* Understanding of basic principles of surface tension and its application in real life

IV. Course Delivery Plan

This course is designed to make students get understanding concepts of mechanicl motions and mechanical properties of materials

Topics	Session No & Date(s)	Methodology and Duration
Module I		
General wave equation , plane progressive harmonic wave	11/11/19	Lectures
energy density, intensity of a wave, superposition of waves	14/11/19	Lectures
beats, transverse waves in stretched strings, modes.	21/11/19	Lectures

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Periodic motion	28/11/19	Lectures
simple harmonic motion and harmonic oscillator	05/12/19	Lectures
energy of a harmonic oscillator,	12/12/19	Online
examples of harmonic oscillator – simple and compound pendulum.	19/12/19	Lectures
Theory of Damped harmonic oscillator	09/01/20	Lectures
heory of forced oscillator	11/01/20	Lectures
resonance, applications.	16/01/20	Lectures
Internal Exam		EXAM
Module II		
Angular velocity- angular acceleration-	23/01/20	Lectures
angular momentum- conservation	30/01/20	Lectures
Orque-moment of inertia	06/02/20	Lectures
Parallel and perpendicular axes theorems	13/02/20	Lectures
calculation of moment of inertia	20/02/20	Lectures
Theory of flywheel.	27/02/20	Lectures
Discussions and tutorials	27/01/20	Tutorial
Module III		
Basic ideas on elasticity, Young's modulus,	13/11/19	Lectures
bulk modulus, rigidity modulus,	20/11/19	Lectures
Poisson's ratio,	27/11/19	Lectures
relations connecting various elastic constants.	04/12/19	Lectures
Work done per unit volume in a strain	11/12/19	Lectures
Bending of beams, bending moment, flexural rigidity	18/12/19	Lectures
Young's modulus – uniform and non-uniform bending	01/01/20	Lectures
cantilever.I –section girders	08/01/20	Lectures
Determination of rigidity modulus using Static and Dynamic methods.	15/01/20	Lectures
Streamline and turbulent flows	22/01/20	Lectures
coefficient of Viscosity – Determination of viscosity by Poiseuille's method	29/01/20	Lectures

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Equation of continuity, energy possessed by a liquid,	05/02/20	Lectures
Bernoulli's theorem.	12/02/20	Lectures
Surface tension, surface energy,	19/02/20	Lectures
excess pressure in a liquid drop and bubble,	04/03/20	Lectures
Factors affecting surface tension, applications.	11/03/20	Lectures
Internal Exam	19/03/20	EXAM

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Hands on experiment with instruruments , identify concepts	3 Days	Experiment	4th Week and 6th week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. Mechanics by J.C. Upadhayaya, Ramprasad Pub.

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2. Mechanics -D.S.Mathur, S.Chand.
3. Advanced course in Practical Physics by D Chattopadhyay, Central Book
4. Properties of Matter and Acoustics by Murugeshan and K. Sivaprasath, S.Chand
5. Mechanics- Hans and Puri, TMH
6. Classical Mechanics by J.C. Upadhyaya, Himalaya Pub.
7. Classical Mechanics-Takwale and Puranik, TMH.
8. Classical mechanics- K.SankaraRao, PHI.
9. Properties of Matter by Mathur, S. Chand,
10. Mechanics by Somnath Datta, Pearson
11. Mechanics by H.D Young and R.A Freedman, Pearson.

Dr. NELSON RODRIGUES
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DEPT. OF PHYSICS * ST. ALBERTS COLLEGE, ERNAKULAM *

HEAD OF THE DEPARTMENT OF PHYSICS
ST. ALBERT'S COLLEGE, COCHIN-682 018

St. Albert's College (Autonomous)

PHY3CRT0119: OPTICS, LASER AND FIBER OPTICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Augustine Sumesh C (Module 3) (Module 1, 2 and 4)	B.Sc. PHYSICS	2019-22	III	sumeshcj@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	54 (Including assignments)
2	Assessment (CAE)	3
	Total	57
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

- Comprehend the fascinating area of interference
- Compare Fresnel's and Fraunhofer diffraction.
- Identify polarization by reflection, refraction and scattering.
- Classify different types of lasers, its principle and properties, application.
- Understand structure and principle of optic fibers

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Review of basic ideas of interference	10/6/2019	Lecture
Coherent waves-Optical path and phase change	11/6/2019	Lecture
superposition of waves	17/6/2019	Lecture
theory of interference-	18/6/2019	Lecture
intensity distribution	24/6/2019	Lecture
Young's double slit experiment, Coherence-Conditions for interference.	25/6/2019	Lecture
Thin films-plane parallel film	01/7/2019	Lecture
interference due to transmitted light	02/7/2019	Lecture
Haidinger fringes	08/7/2019	Lecture
interference in wedge shaped film	09/7/2019	Lecture
Newton's rings	22/7/2019	Lecture

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Michelson interferometer	23/7/2019	Lecture
applications	29/7/2019	Lecture
MODULE II		
Fresnel Diffraction	30/7/2019	Lecture
Huygens- Fresnel theory	05/8/2019	Lecture
Difference between zone plate and convex lens.	06/8/2019	Lecture
Comparison between interference and diffraction	19/8/2019	Lecture
diffraction pattern due to a straight edge,	20/8/2019	Lecture
single silt	26/8/2019	Lecture
double slit	27/8/2019	Lecture
theory of plane transmission grating	02/9/2019	Lecture
Dispersive power and resolving power of grating	03/9/2019	Lecture
Review of basic ideas of interference	16/9/2019	Lecture
Coherent waves-Optical path and phase change	17/9/2019	Lecture
superposition of waves	23/9/2019	Lecture
MODULE III		
Concept of polarization	07/6/2019	Lecture
plane of polarization	14/6/2019	Lecture
Types of polarized light	21/6/2019	Lecture
production of plane polarized light by reflection	28/6/2019	Lecture
refraction. Malu's law	05/7/2019	Lecture
Polarization by double refraction	12/7/2019	Lecture
calcite crystal	19/7/2019	Lecture
Anisotropic crystals-optic axis	26/7/2019	Lecture
Double refraction	02/8/2019	Lecture
Huygens explanation of double refraction	16/8/2019	Lecture
Retarders - Quarter wave plate and Half wave plate	30/8/2019	Lecture
Production and Detection of plane	06/9/2019	Lecture
elliptically and circularly polarized light	20/9/2019	Lecture
Optical Activity- specific rotation.	27/9/2019	Lecture
MODULE IV		
Absorption and emission of light	24/9/2019	Lecture
Absorption-spontaneous emission and stimulated emission	30/9/2019	Lecture
Einstein relations	01/10/2019	Lecture
Population inversion	04/10/2019	Lecture
Active medium-Pumping	09/10/2019	Lecture
different pumping methods	09/10/2019	Lecture
Resonators	11/10/2019	Lecture
plane mirror and confocal resonators	14/10/2019	Lecture
Metastable state	15/10/2019	Lecture

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Three level and Four level Laser systems	16/10/2019	Lecture
Ruby Laser, He-Ne laser	18/10/2019	Lecture
Semiconductor Laser	25/10/2019	Lecture
Laser beam Characteristics	28/10/2019	Lecture
coherence	29/10/2019	Lecture
Applications of Laser	30/10/2019	Lecture
Holography (qualitative study only).	25/10/2019	Lecture

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

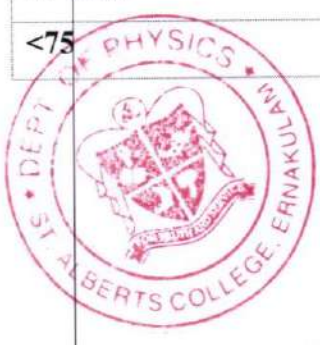
The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to polarisation	Solution of numerical problems	24/8/2019	Submit Hard copy
Assignment -2`	Problems-diffraction	Solution of numerical problems	20/10/2019	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**



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VIII. Required reading:

Text Book:

1. Optics by N.Subramanayam, Brijlal, M.N.Avadhanulu
2. *Semiconductor physics and optoelectronics- V.Rajendran, J.Hemaletha and M.S.M.Gibson*

References:

1.Optics, E Hecht and AR Ganesan, Pearson

2.Optics, 3rd edition, AjoyGhatak, TMH

3.Optical Electronics, AjoyGhatak and K Thyagarajan, Cambridge

4.Optics and Atomic Physics, D P Khandelwal, Himalaya Pub. House

5.Optics, S K Srivastava, CBS Pub. N Delhi

1.

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St. Albert's College (Autonomous)

PHY3CMT0219: MODERN PHYSICS AND MAGNETISM

I. Course Instructor

Name	Sem, Programme & Batch	Email
	SemesterIII, B.Sc 2019-20	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	51(Including assignments)
2	Assessment (CAE & ESE)	7
	Total	**58**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

III. Course Objectives:

- Explain the different atom models
- Compute the binding energy of nucleus
- Interprets the theory of radioactivity
- Explain the physical concepts of quantum mechanics
- Summarise the Schrödinger equation (time dependent and time independent) for a particle in a potential box.
- Explain the quantum theory of Raman Effect
- Explain the physics of semiconductors
- Evaluate the working of diodes and rectifiers
- Discuss about magnetism, different magnetic materials and its properties

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, field based assignments etc.

Topics	**Session No & Date(s)**	**Methodology and Duration**
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		

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Module I ***Modern Physics***		
Basic features of Bohr atom model-formula for energy-	06/06/2019 07/06/2019	Class exercises Lectures GD
vector atom model- various quantum numbers	10/06/2019	
-coupling schemes – LS & JJ	11/06/2019	
-Pauli's exclusion principle- magnetic moments of orbital electrons	12/06/2019	
Atomic nucleus-classification	17/06/2019	
-basic properties of nucleus-charge, mass, spin, magnetic moment	18/06/2019	
binding energy and packing fraction	19/06/2019	
-nuclear forces-salient features	24/06/2019	
Radioactivity- properties of alpha, beta and gamma-Soddy Fajan's displacement law,	25/06/2019	
law of radioactive disintegration-decay constant-half life and mean life-	26/06/2019	
radioactive equilibrium - measurement of radioactivity-radio carbon dating	01/07/2019	
Module II ***Quantum Mechanics***		
Inadequacies of classical physics-experimental evidences	02/07/2019 03/07/2019	
evidences for quantum theory-Planck's hypothesis-	08/07/2019	GD Lectures
foundation of quantum mechanics-wave function & probability density-	09/07/2019	
Schrödinger equation-time dependent	10/07/2019	
and time independent particle in a potential box	16/07/2019	

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Optical spectra- spectral terms, selection rules,	17/07/2019	
hyperfine structure; molecular spectra-rotational,	22/07/2019	
vibrational and electronic spectra;	23/07/2019	
Raman effect- experimental study, quantum theory;	24/07/2019 29/07/2019	
fluorescence and phosphorescence; comparison of Raman, fluorescence and IR spectra	30/07/2019	
; NMR	05/08/2019	
Module III ***Electronics***		
Current-voltage characteristics of a diode-forward and reverse bias-	06/08/2019	GD, Lectures
breakdown mechanism of p-n junction diode-Zener diode and its characteristics-.	07/08/2019 19/08/2019	
half wave and full wave rectifiers-bridge rectifier-ripple factor, efficiency.	20/08/2019 21/08/2019	
Bipolar junction transistor-Construction and operation	26/08/2019	
Module IV ***Magnetism***		
Properties of magnetic materials, Paramagnetism,	27/08/2019 02/09/2019	GD, Lectures
Diamagnetism, Ferromagnetism,	03/09/2019	
Hysteresis, Ferrites, Magnetostriction,	04/09/2019 03/09/2019	
Earth's magnetism-elements of earth's magnetism-dip, declination, horizontal and vertical components	16/09/2019 17/09/2019 18/09/2019	
-magnetic maps-magnetographs-cause of earth's magnetism -	23/02/2019 24/09/2019 25/09/2019	

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V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Demonstration class	1 hour	Demonstration	4th Week
Interactive section	1 hour		1st Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Wednesday of 8th Week of Course	Submit the assignment to Google Classroom before 11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 minutes duration	Wednesday of 10th Week of Course	Submit the assignment Google Classroom before 11.59 pm

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. *Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad*
2. *Principles of electronics, V K Mehta*
3. *Digital principles and applications- A. P. Malvino and P. Leach*
4. *Concepts of Modern Physics: Arthur Beiser (TMH).*
5. *Basic Electronics B L Thereja (S. Chand)*

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St. Albert's College (Autonomous)

PHY3CMT0119: MODERN PHYSICS AND ELECTRONICS

I. Course Instructor

Name	Sem, Programme & Batch	Email
	SemesterIII, B.Sc 2019-20	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	51(Including assignments)
2	Assessment (CAE & ESE)	7
	Total	58
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

III. Course Objectives:

- Explain the different atom models
- Compute the binding energy of nucleus
- Interprets the theory of radioactivity
- Explain the physical concepts of quantum mechanics
- Summarise the Schrödinger equation (time dependent and time independent) for a particle in a potential box.
- Explain the quantum theory of Raman Effect
- Explain the physics of semiconductors
- Evaluate the working of diodes and rectifiers
- Recognize different types of number systems as they relate to computers
- Describe the operation of the logic gates
- Construct and understand the working principles of half adder and full adder

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, field based assignments etc.

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration

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These are the topics to be covered in the modules		
Module I ***Modern Physics***		
Basic features of Bohr atom model-formula for energy-	06/06/2019 07/06/2019	Class exercises Lectures GD
vector atom model- various quantum numbers	10/06/2019	
-coupling schemes – LS & JJ	11/06/2019	
-Pauli's exclusion principle- magnetic moments of orbital electrons	12/06/2019	
Atomic nucleus-classification	17/06/2019	
-basic properties of nucleus-charge, mass, spin, magnetic moment	18/06/2019	
binding energy and packing fraction	19/06/2019	
-nuclear forces-salient features	24/06/2019	
Radioactivity- properties of alpha, beta and gamma-Soddy Fajan's displacement law,	25/06/2019	
law of radioactive disintegration-decay constant-half life and mean life-	26/06/2019	
radioactive equilibrium - measurement of radioactivity-radio carbon dating	01/07/2019	
Module II ***Quantum Mechanics***		
Inadequacies of classical physics-experimental evidences	02/07/2019 03/07/2019	
evidences for quantum theory-Planck's hypothesis-	08/07/2019	GD Lectures
foundation of quantum mechanics-wave function & probability density-	09/07/2019	

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Schrödinger equation-time dependent	10/07/2019	
and time independent particle in a potential box	16/07/2019	
Optical spectra- spectral terms, selection rules,	17/07/2019	
hyperfine structure; molecular spectra-rotational,	22/07/2019	
vibrational and electronic spectra;	23/07/2019	
Raman effect- experimental study, quantum theory;	24/07/2019 29/07/2019	
fluorescence and phosphorescence; comparison of Raman, fluorescence and IR spectra	30/07/2019	
; NMR	05/08/2019	
Module III ***Electronics***		
Current-voltage characteristics of a diode-forward and reverse bias-	06/08/2019	GD, Lectures
breakdown mechanism of p-n junction diode-Zener diode and its characteristics-.	07/08/2019 19/08/2019	
half wave and full wave rectifiers-bridge rectifier-ripple factor, efficiency.	20/08/2019 21/08/2019	
Bipolar junction transistor-Construction and operation	26/08/2019	
Module IV ***Digital Electronics***		
Different number systems – decimal, binary, octal, hexa decimal number systems	27/08/2019 02/09/2019	GD, Lectures
- conversion between different number systems-	03/09/2019	
binary mathematics – addition, subtraction (1's compliment and 2's compliment methods) -	04/09/2019 03/09/2019	
basic theorems of Boolean algebra- de Morgan's theorems – Simplification of	16/09/2019 17/09/2019	

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Boolean equations -	18/09/2019	
AND, OR, NOT, NAND, NOR, XOR gates- truth tables-	23/02/2019 24/09/2019 25/09/2019	
half adder- full adder	30/09/2019 01/10/2019 02/10/2019	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Demonstration class	1 hour	Demonstration	4th Week
Interactive section	1 hour		1st Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Wednesday of 8th Week of Course	Submit the assignment to Google Classroom before 11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 minutes duration	Wednesday of 10th Week of Course	Submit the assignment Google Classroom before 11.59 pm

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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VIII. Required reading:

1. *Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad*
2. *Principles of electronics, V K Mehta*
3. *Digital principles and applications- A. P. Malvino and P. Leach*
4. *Concepts of Modern Physics: Arthur Beiser (TMH).*
5. *Basic Electronics , B L Thereja (S. Chand)*

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St. Albert's College (Autonomous)

PHY4CMT0119: OPTICS AND ELECTRICITY

I. Course Instructor

Name	Programme	Batch	Semester	Email
Dr. Sajeesh T H	B.Sc. Chemistry	2019-22	4	sjeeshth@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	44 (Including assignments)
2	Assessment (CAE)	3
	Total	47
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

- Explain the theories and conditions for Interference
- Compare Fresnel's and Fraunhofer diffraction.
- Explain theory of plane transmission grating.
- Identify polarization by reflection, refraction and scattering.
- Discuss the theories related to Laser.
- Classify different types of lasers, its principle and properties, application
- Understand structure and principle of optic fibers.
- Categorize the Dielectrics
- Illustrate Varying Currents

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Light waves-phase difference and coherence	11/11/2019	Lectures
Optical path and phase change	13/11/2019	Lectures
Principle of superposition	15/11/2019	Lectures
Analytical treatment of interference-Young's double slit experiment	18/11/2019	Lectures
Conditions for interference	20/11/2019	Lectures

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Bandwidth Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness	22/11/2019	Lectures
Newton's rings-reflected system-measurement of wavelength	25/11/2019	Lectures
Fresnel and Fraunhofer diffractions	27/11/2019	Lectures
Fresnel's theory of approximate rectilinear propagation of light	29/11/2019	Lectures
Fraunhofer diffraction	02/12/2019	Lectures
Theory of plane transmission grating	04/12/2019	Lectures
Determination of wavelength-dispersive power of grating	06/12/2019	Lectures
Prism and grating spectra	09/12/2019	Lectures
Resolving power	11/12/2019	Lectures
Rayleigh criterion	13/12/2019	Lectures
Resolving power of grating	16/12/2019	Lectures
Polarization, types of polarization	18/12/2019	Lectures
Brewster's law, dichroism	20/12/2019	Lectures
Birefringence- e- ray and o-ray	01/01/2020	Lectures
Polarizer and analyzer	03/01/2020	Lectures
Malu's law, optical activity	06/01/2020	Lectures
MODULE II		
Principle of operation of laser-population inversion	08/01/2020	Lectures
Metastable states	10/01/2020	Lectures
Optical resonator-components of laser-active medium, pump	13/01/2020	Lectures
Optical resonant cavity-principal pumping schemes- three level and four level-laser beam characteristics	15/01/2020	Lectures
Application of lasers	17/01/2020	Lectures
Light propagation in optical fibers	20/01/2020	Lectures
Acceptance angle	22/01/2020	Lectures
Numerical aperture-step index fiber-graded index fiber	24/01/2020	Lectures
MODULE III		
Dielectrics-polar and non-polar dielectrics	27/01/2020	Lectures
Polarization-sources of polarization	29/01/2020	Lectures
Gauss's law in dielectrics-permittivity	31/01/2020	Lectures
Dielectric displacement vector-dielectric constant	03/02/2020	Lectures
Susceptibility-ferro electricity	05/02/2020	Lectures
Peak, mean, rms and effective values of A.C.	07/02/2020	Lectures
MODULE IV		
Transient currents-Growth and decay of current in an inductive circuit	10/02/2020	Lectures

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Charging and discharging of a capacitor through a resistance	12/02/2020	Lectures
Peak, mean, rms and effective values of a.c.	14/02/2020	Lectures
AC circuits	17/02/2020	Lectures
AC through RC, LC circuits	19/02/2020	Lectures
AC through LR circuits	24/02/2020	Lectures
AC through LCR circuits	26/02/2020	Lectures
Power factor	28/02/2020	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Assignment on given topic	Preparation of assignment	11-11-19	Submit Hard copy
Assignment -2`	Assignment on given topic	Preparation of assignment	13-01-20	Submit Hard copy
Seminar	Power Point Presentation on given topic	Presentation of prepared power point	13-12-19	Submit Hard copy

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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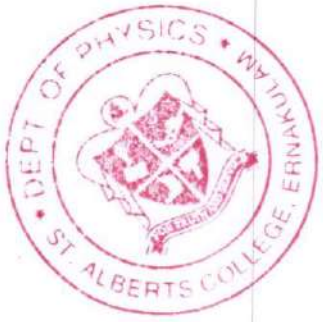
VIII. Required reading:

1. Optics - Brijlal and N. Subrahmanyam
2. Electricity and Magnetism – D. C. Tayal
3. Electricity and Magnetism – J. H. Fewkes & John Yarwood.
4. Electricity and Magnetism – R Murugeshan
5. Nuclear Physics – Irvin Kaplan
6. Lasers - Theory and Applications – Thyagarajan and Ghatak
7. Concept of Modern Physics – A. Beiser
8. Laser Physics and Applications – V. K. Jain
9. Optical Fiber Communications – John M Senior



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Dept. of Physics
St. Albert's College (Autonomous)
Ernakulam

St. Albert's College (Autonomous)

PHY4CMT0219: OPTICS AND SOLID STATE PHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Dr. Louie Frobel P. G.	B.Sc. chemistry	2019-22	4	louiefrobel@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	44 (Including assignments)
2	Assessment (CAE)	3
	Total	47
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

- Explain the theories and conditions for Interference
- Compare Fresnel's and Fraunhofer diffraction.
- Explain theory of plane transmission grating.
- Identify polarization by reflection, refraction and scattering.
- Discuss the theories related to Laser.
- Classify different types of lasers, its principle and properties, application
- Understand structure and principle of optic fibers.
- Categorize the Dielectrics
- Illustrate Crystallography

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Light waves-phase difference and coherence	12/11/19	Lectures
Optical path and phase change	14/11/19	Lectures
Principle of superposition	15/11/19	Lectures
Analytical treatment of interference-Young's double slit experiment	19/11/19	Lectures
Conditions for interference	21/11/19	Lectures

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Bandwidth Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness	22/11/19	Lectures
Newton's rings-reflected system-measurement of wavelength	26/11/19	Lectures
Fresnel and Fraunhofer diffractions	28/11/19	Lectures
Fresnel's theory of approximate rectilinear propagation of light	29/11/19	Lectures
Fraunhofer diffraction	03/12/19	Lectures
Theory of plane transmission grating	05/12/19	Lectures
Determination of wavelength-dispersive power of grating	06/12/19	Lectures
Prism and grating spectra	10/12/19	Lectures
Resolving power	12/12/19	Lectures
Rayleigh criterion	13/12/19	Lectures
Resolving power of grating	17/12/19	Lectures
Polarization, types of polarization	19/12/19	Lectures
Brewster's law, dichroism	20/12/19	Lectures
Birefringence- e- ray and o-ray	31/12/19	Lectures
Polarizer and analyser	03/01/19	Lectures
Malu's law, optical activity	07/01/19	Lectures
MODULE II		
Principle of operation of laser-population inversion	09/01/19	Lectures
Metastable states	10/01/19	Lectures
Optical resonator-components of laser-active medium, pump	14/01/19	Lectures
Optical resonant cavity-principal pumping schemes- three level and four level-laser beam characteristics	16/01/19	Lectures
Application of lasers	17/01/19	Lectures
Light propagation in optical fibers	21/01/19	Lectures
Acceptance angle	23/01/19	Lectures
Numerical aperture-step index fiber-graded index fiber	24/01/19	Lectures
MODULE III		
Dielectrics-polar and non-polar dielectrics	28/01/19	Lectures
Polarization-sources of polarization	30/01/19	Lectures
Gauss's law in dielectrics-permittivity	31/01/19	Lectures
Dielectric displacement vector-dielectric constant	04/02/19	Lectures
Susceptibility-ferro electricity	06/02/19	Lectures
Peak, mean, rms and effective values of A.C.	07/02/19	Lectures
MODULE IV		
Crystal structure- crystal lattice and translation vectors	11/02/19	Lectures
Unit cell-types of lattices	12/02/19	Lectures

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Miller indices-lattice directions and planes	13/02/19	Lectures
Interplanar spacing	18/02/19	Lectures
Simple crystal structures-sc, fcc, bcc	20/02/19	Lectures
Hcp close packed structures	21/02/19	Lectures
Sodium chloride structure	25/02/19	Lectures
X-ray crystallography-diffraction of x-rays-Bragg's law	27/02/19	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Assignment on given topic	Preparation of assignment	28/11/19	Submit Hard copy
Assignment -2`	Assignment on given topic	Preparation of assignment	14/01/19	Submit Hard copy
Seminar	Power Point Presentation on given topic	Presentation of prepared power point	04/02/19	Submit Hard copy

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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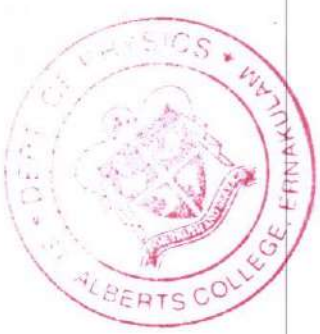
VIII. Required reading:

1. Optics - Brijlal and N. Subrahmanyam
2. Electricity and Magnetism – D. C. Tayal
3. Solid State Physics – S. O. Pillai
4. A text book of Applied Physics – A. K. Jha
5. Electricity and Magnetism – R Murugeshan
6. Solid State Physics – P. K. Palanisami
7. Lasers - Theory and Applications – Thyagarajan and Ghatak



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St. Albert's College (Autonomous)

PHY4CRT0119: SEMICONDUCTOR PHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1,3 and 4) Augustine Sumesh C (Module 2 and 3)	B.Sc. Physics	2018-21	IV	sumeshcj@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	54 (Including assignments)
2	Assessment (CAE)	3
	Total	57
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

1. Understand basic concept of doping, junction, and VI characteristics.
2. Understand biasing techniques for diodes and transistors.
3. Design basic amplifiers and oscillators.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
PN Junction, Depletion layer	11/11/2019	Lecture
Biasing- forward and reverse	12/11/2019	
Barrier potential	18/11/2019	
Reverse breakdown	19/11/2019	
Junction capacitance and diffusion capacitance	25/11/2019	
PN Junction diode – V-I characteristics	26/11/2019	
Diode current Equation, Diode testing, Ideal diode	02/12/2019	
Zener diode and its reverse characteristics.	03/12/2019	
Thermistors	09/12/2019	
Regulated Power supplies - Zener diode voltage regulator	10/12/2019	

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Rectification - Half wave	16/12/2019	
Full wave	17/12/2019	
Centre tapped, Bridge rectifier circuits	31/12/2019	
Filter circuits	06/01/2020	
Inductor Filter, Capacitor Filter	07/01/2020	
LC Filter, π Filter	13/01/2020	
Voltage multipliers – Doubler & Tripler	14/01/2020	
Wave shaping circuits -	20/01/2020	
Clipper Positive, negative and biased –s	21/01/2020	
Clamper Positive, negative and biased	27/01/2020	
MODULE II		
Bipolar junction transistors	15/11/2019	
Transistor biasing, CB	22/11/2019	
CC, CE	06/12/2019	
Active, saturation and cut-off regions	13/12/2019	
Current gain α, β, γ and their relationships	20/12/2019	
Leakage currents	03/01/2020	
Thermal runaway	10/01/2020	
DC operating point	17/01/2020	
AC and DC Load line	24/01/2020	
Q-Point	31/01/2020	
Basic principles of feedback	07/02/2020	
negative feedback circuits, current series & shunt	14/02/2020	
Module III		
Need for biasing-Stabilization	28/02/2020	
Voltage divider bias	06/03/2020	
Single stage transistor Amplifiers	13/03/2020	
CE amplifier, Decibel system, Variations in Amplifier gain with frequency.	18/03/2020	
Oscillatory Circuits	02/03/2020	
LC oscillators, RC oscillators	03/03/2020	
Hartley Oscillator, Colpit's Oscillator	09/03/2020	
Astable and monostable multivibrator	10/03/2020	
Module IV		
FET -characteristics, FET- Parameters. Comparison between FET and BJT. MOSFET	28/01/2020	
OP-amp- Symbol and terminals. Characteristics of ideal OP-amp, CMRR	03/02/2020	
inverting, Non-inverting	04/02/2020	
Unity follower and Summing amplifiers	10/02/2020	
Types of modulation – AM, FM	11/02/2020	
Pulse modulation and Phase modulation (qualitative study only)	17/02/2020	

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Amplitude modulation- modulation index	18/02/2020	
Analysis of AM wave – Sidebands	24/02/2020	
bandwidth- AM Demodulation.	25/02/2020	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to Kirchhoff's law	Solution of numerical problems	20-01-20	Submit Hard copy
Assignment -2	Problems-rectifier	Solution of numerical problems	31-01-20	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. Basic Electronics-B. L. Theraja

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2. A Text Book of Applied Electronics-R.S.Sedha

References:

1. Principles of electronics, VK Mehta, S Chand
2. Basic Electronics(7thEdition), Malvino and Bates, TMH
3. Electronics Fundamentals and Applications- D. Chattopadhyay and P.G.Rakshit, New Age International Publishers.
4. Electronics: Fundamentals of Analog circuits, Thomas L. Floyd, David Buchla, Prentice Hall
5. Electronic Devices and Circuit Theory, Robert Boylestad, Louis Nashelsky, Prentice Hall

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St. Albert's College (Autonomous)

PHY5CRT0319: DIGITAL ELECTRONICS AND PROGRAMMING

I. Course Instructor

Name	Sem, Programme & Batch	Email
Dr. Robin John	B.Sc. Physics semester VI 2019-20	louiefrobel@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	49 (Including assignments)
2	Assessment (CAE)	3
	Total	52
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	3

III. Course Objectives:

- To Explain basic logic operations.
- To Understand Boolean algebra
- To Understand the fundamentals of Digital circuits.
- To Familiarized with the basics of Python programing language

IV. Course Delivery Plan

The teaching methods include lectures, discussions, live practical sessions using mobile aaps.

Topics	Session No & Date(s)	Methodology and Duration
Module I		
Basic gates NOT, OR, AND. Universal Logic Gates- NOR, NAND, XOR and XNOR Gates.	6-6-2019	Lecture Method
Rules and Laws of Boolean algebra. Duality theorem -De Morgan's Theorems.	7-6-2019	Seminar
analysis and simplification of logic circuits. Boolean equation and truth table	10-6-2019	Lecture method

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SOP and POS. Minterms and Maxterms	13-6-2019	Lecture method
Standard SOP and Standard POS- Conversion between Standard SOP & Standard POS.	14-6-2019	Lecture method
Karnaugh Map	17-6-2019	Lecture method
Karnaugh Map simplification	20-6-019,21-6-19	Lecture method
Module 1 assessment test 1	24-6-2019	Lecture method
Module II		Lecture method
Half Adder and Full Adder	27-6-2019	Lecture method
Half and Full subtractor	28-6-2019	Lecture method
4-bit parallel Adder/Subtractor.	01-7-2019	Lecture method
Multiplexer and De-multiplexer	4-7-2019	Lecture method
Encoder & Decoder	5-7-2019	Lecture method
Assessment test 2	7-7-2019	Lecture method
Flip-Flops, RS Flip flops	11-7-2019	Lecture method
Clocked RS Flipflops	12-7-2019	Lecture method
Master Slave JK FF	15-7-2019	Lecture method
DFF, T Flip-flop	18-7-2019	Lecture method
Buffer registers- Shift register- SISO and SIPO	19-7-2019 22-7-2019	Lecture method
Counters- Binary ripple counter	25-7-2019	Lecture method
D/A converters (Ladder type)	26-7-2019	Lecture method
A/D Converter (Counter type).	29-7-2019	Lecture method
Assessment test 3	01-8-2019	Lecture method
Module III		Lecture method
Basic C++ program structure	2-8-2019	Lecture method
comments-data	5-8-2019	Lecture method
arithmetic, relational, logical and assignment operators	8-8-2019 9-8-2019 16-8-2019	Lecture method
if, if-else and else if	19-8-2019	Lecture method
do while - case	22-8-2019	Lecture method
loops and nested loops	26-8-2019	Lecture method
Arrays	29-8-2019	Lecture method
Functions-basic ideas	30–8-2019	Lecture method
Objects and classes	02-9-2019	Lecture method
Programming - basic ideas	05-9-2019 06-9-2019 16-9-2019 19-9-2019 23-9-2019 30-9-2019	Through mobile app

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Thalsamayam oru Coding.	6 Days	Experiential Learning	End of the 3rd Module

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VI. Assignments and Seminars

Assignments

No	Topics	Activity	Submission Deadlines	
1	Assignment on Logic gates	Answer the given questions based on logic gates	one week after ostin the assignment.	
2	Based on logic circuits	minimise the logic expressions using boolean algebra and K map	End of second module	

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Digital principles and applications, Malvino, Leach and Saha (6th Edition) TMH

Digital Electronics- Sedha, S Chand

Object oriented programming in Turbo C++ - Robert Lafore (Galgotia Pub.)

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Department of Physics

St. Albert's College (Autonomous)

PH5CRT0517: ELECTRICITY AND ELECTRODYNAMICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
	Sem V B.Sc Physics, 2017-20	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	42
2	Assessment (CAE & ESE)	4
	Total	**46**

I. Course Outcomes:

- Analyse AC circuits and networks using network theorems.
- Explain different laws in electrostatics and magnetostatics.
- Apply Maxwell's equations to deduce wave equation and electromagnetic field energy.
- Explain different thermoelectric effects.
- Derive Maxwell's equation and apply boundary conditions for free space.

I. Course Delivery Plan

This course is designed to make students get familiar with Electricity, electro statics and magnetostatics. They get an understanding on the underlying physics on these topics.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
EMF induced in a coil rotating in a magnetic field	06-Jun-19	LECTURES
AC applied to resistive, inductive and capacitance circuits	10-Jun-19	LECTURES
AC applied to LR and RC circuits	11-Jun-19	LECTURES
Analysis of LCR series circuits	13-Jun-19	LECTURES
LCR parallel resonant circuit	17-Jun-19	LECTURES
Power in ac circuits - Wattless current - choke coil	18-Jun-19	LECTURES

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transformer on no load- skin effect.	20-Jun-19	LECTURES
Ideal voltage source and current source - Superposition theorem	24-Jun-19	LECTURES
Thevenin's theorem	25-Jun-19	LECTURES
Norton's theorem	27-Jun-19	LECTURES
Maximum power transfer theorem., Reciprocity theorem	01-Jul-19	LECTURES
TUTORIAL	02-Jul-19	TUTORIAL
MODULE II		
Growth and decay of current in an LR circuit	04-Jul-19	LECTURES
Charging and discharging of a capacitor through a resistor	08-Jul-19	LECTURES
Growth and decay of charge in an LCR circuit.	09-Jul-19	LECTURES
Seebeck effect - Laws of thermo emf - Peltier effect	11-Jul-19	LECTURES
Thomson effect- Thermoelectric diagrams -Thermocouple	16-Jul-19	LECTURES
Explanation of thermoelectric effects based on electron theory.	18-Jul-19	LECTURES
INTERNAL EXAM	22-Jul-19	EXAM
MODULE III		
Fundamental theorems of divergence and curl	23-Jul-19	LECTURES
Electric field - Continuous charge distribution	25-Jul-19	LECTURES
Divergence and curl of electrostatic field	29-Jul-19	LECTURES
Gauss's law and applications:	30-Jul-19	LECTURES
solid sphere, infinite wire, infinite plane sheet	01-Aug-19	LECTURES
Electric potential - Poisson's and Laplace's equations	05-Aug-19	LECTURES
Potential of a localized charge distribution	06-Aug-19	LECTURES
Electrostatic boundary conditions	08-Aug-19	LECTURES
work and energy in electrostatics – The work done to move a charge	19-Aug-19	LECTURES
Energy of a point charge distribution and continuous charge distribution- Basic properties a conductor	20-Aug-19	LECTURES

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Lorentz Force law- Biot- Savart law	22-Aug-19	LECTURES
Divergence and curl of B- Applications of Amperes' law:	26-Aug-19	LECTURES
long straight wire, infinite plane, solenoid	27-Aug-19	LECTURES
Comparison of electrostatics and magnetostatics	29-Aug-19	LECTURES
Magnetic vector potential	02-Sep-19	LECTURES
Magnetostatics boundary conditions	03-Sep-19	LECTURES
Electromagnetic induction- Faraday's law	05-Sep-19	LECTURES
TUTORIAL	16-Sep-19	TUTORIAL
MODULE IV		
Maxwell's equations	17-Sep-19	LECTURES
Boundary conditions for free space	19-Sep-19	LECTURES
Continuity equations-	23-Sep-19	LECTURES
Poynting's theorem	24-Sep-19	LECTURES
Wave equations	26-Sep-19	LECTURES
Electromagnetic wave in vacuum -	30-Sep-19	LECTURES
Wave equation for E and B	01-Oct-19	LECTURES
Monochromatic plane waves- Energy of electromagnetic waves	03-Oct-19	LECTURES
INTERNAL EXAM	10-Oct-19	EXAM

III. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Estimating the power consumption and power optimisation in house	2 Days	Survey and analysis	2nd Week

IV. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines

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Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

V. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VI. Required reading:

1. Introduction to Electrodynamics, David J Griffiths .
2. Electricity and Magnetism, R. Murugeshan
3. Fundamentals of Magnetism and Electricity, D.N Vasudeva - S Chand
4. Principles of Electromagnetics, Mathew N.O Sadiku- 4 th Ed. , Oxford
5. Electricity and Magnetism, KK Tewari- S Chand
6. Electricity and Electronics, Saxena, Arora and Prakash- Pragati Prakashan
7. Classical Electromagnetism, Jerrold Franklin- Pearson
8. Electromagnetic Fields and Waves, KD Prasad- Satya Prakashan
9. Field and wave Electromagnetics, David K Cheng- Pearson.

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St. Albert's College (Autonomous)

PHY6CBT0117 : COMPUTATIONAL PHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1 and 3) *(Module 2)*	B.Sc. Physics	2	VI	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	54 (Including assignments)
2	Assessment (CAE)	3
	Total	**37**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Discuss and compare the methods to solve algebraic and transcendental equations
- Explain curve fitting and interpolation.
- Discuss various numerical integration and differentiation methods.
- Ability to solve nonlinear problems using numerical methods
- Application of numerical skill to solve differential equations

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Bisection Method	11-Nov-19	Lectures
Regula-Falsi Method	15-Nov-19	Lectures
Fixed point iteration method	18-Nov-19	Lectures
Newton Raphson method	22-Nov-19	Lectures
Secant method	25-Nov-19	Lectures

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Rate of convergence	29-Nov-19	Lectures
comparisons of these Methods	02-Dec-19	Lectures
Newton Raphson method (two equation solution)	06-Dec-19	Lectures
Tutorial	09-Dec-19	Lectures
Gauss elimination method	13-Dec-19	Lectures
pivoting strategies	16-Dec-19	Lectures
Gauss-Jordan method	20-Dec-19	Lectures
LU Factorization	03-Jan-20	Lectures
Iterative methods	06-Jan-20	Lectures
Jacobi method	10-Jan-20	Lectures
Gauss-Seidel method	13-Jan-20	Lectures
Tutorial	17-Jan-20	Lectures
MODULE II		
Least square method of linear fit	11-Nov-19	Lectures
Problem solving with LSM linear fit	18-Nov-19	Lectures
Least square method of parabola	25-Nov-19	Lectures
problem solving with LSM parabola	02-Dec-19	Lectures
LSM for polynomial	09-Dec-19	Lectures
LSM for exponential	16-Dec-19	Lectures
Tutorial	03-Jan-20	Lectures
Finite difference operators: forward and backward	10-Jan-20	Lectures
shift, average and differential operators	17-Jan-20	Lectures
Newton forward difference interpolation	24-Jan-20	Lectures
Lagrange interpolation	31-Jan-20	Lectures
divide difference interpolation	10-Feb-20	Lectures
Problem solving	17-Feb-20	Lectures
Tutorial	24-Feb-20	Lectures
Internal exam	28-Feb-20	Online
MODULE III		
Numerical Differentiation formulae	20-Jan-20	Lectures
Maxima and minima of a tabulated function	24-Jan-20	Lectures
Newton- Cote general quadrature formula	27-Jan-20	Lectures
Trapezoidal rule, Simpson's 1/3 and 3/8 rule	31-Jan-20	Lectures

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Taylor Series Method, Picard's method	07-Feb-20	Lectures
Euler's and modified Euler's method	10-Feb-20	Lectures
Runge Kutta methods for 1st order	14-Feb-20	Lectures
Runge Kutta methods for 2nd order	17-Feb-20	Lectures
Tutorial	24-Feb-20	Lectures
Internal Exam	28-Feb-20	Online

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Development of Algorithms	1 day	Experiment	4th Week
Use the methods to fit experimental Data	2 days	Discussion	6th Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Assignment -2`	Assignment on given topic	Preparation of assignment	**As the topics are covered**	Submit Hard copy
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

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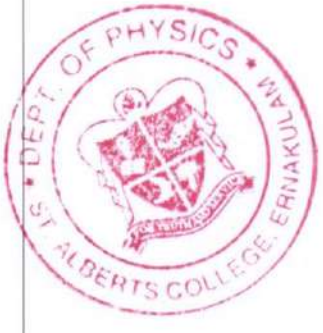
VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. *Numerical Methods, Balagurusamy, TMH*
2. *Numerical Methods for Scientists and Engineers- K Sankara Rao- PHI*
3. *Introductory Numerical Methods, S S Sastry, PHI.*



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PHY6CRT0419: SOLID STATE PHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Prof. Justine Paiva	B.Sc. Physics	2017-20	VI	justinepaiva@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	66 (Including assignments)
2	Assessment (CAE)	3
	Total	**69**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Have a basic knowledge of crystal systems and spatial symmetries.
- Account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor and scattering amplitude.
- Know the principles of structure determination by diffraction.
- Understand the concept of reciprocal space and be able to use it as a tool.
- Know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
- Calculate thermal and electrical properties in the free electron model.
- Understand semiconducting, dielectric and magnetic properties of materials
- Have a knowledge of superconductivity

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Crystal Structure		
Solid State, Crystalline, Polycrystalline and Amorphous materials	11/11/2019	Lectures
Crystal Lattice, Periodicity, Translation Vectors	13/11/2019	Lectures
Unit Cell, Basis	14/11/2019	Lectures
Symmetry operations	15/11/2019	Lectures
Bravais Lattice in 2 and 3 dimensions	18/11/2019	Lectures

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Miller indices	20/11/2019	Lectures
Inter planar spacing	21/11/2019	Lectures
Simple crystal structures-hcp, fcc	22/11/2019	Lectures
Bcc and simple cubic	25/11/2019	Lectures
Structures of NaCl, diamond and ZnS	27/11/2019	Lectures
X-ray diffraction from crystals	28/11/2019	Lectures
Bragg's law, Powder method	29/11/2019	Lectures
Reciprocal Lattice-properties	02/12/2019	Lectures
Reciprocal Lattice to sc, bcc and fcc	04/12/2019	Lectures
Bragg's law in reciprocal lattice	05/12/2019	Lectures
MODULE II		
Bonding in Solids		
Inter-atomic forces, ionic bonding	06/12/2019	Lectures
Bond dissociation and cohesive energy	09/12/2019	Lectures
Madelung energy	11/12/2019	Lectures
Covalent bonding	12/12/2019	Lectures
Metallic bonding	13/12/2019	Lectures
Hydrogen bonding	16/12/2019	Lectures
Van der Waal's bonding (basic ideas only)	18/12/2019	Lectures
Free Electron Theory and Elementary Band Theory		
Free electron gas in one dimension	19/12/2019	Lectures
Three dimension	20/12/2019	Lectures
Electronic specific heat	01/01/2020	Lectures
Band Theory	03/01/2020	Lectures
Bloch Theorem	06/01/2020	Lectures
Kronig-penney model (derivation not expected)	08/01/2020	Lectures
Energy-wave vector relations	09/01/2020	Lectures
Different zone schemes	10/01/2020	Lectures
Velocity and effective mass of electrons	13/01/2020	Lectures
Distinction between metals, insulators and semiconductors	15/01/2020	Lectures
Semiconducting Properties of Materials		
Intrinsic and Extrinsic Semiconductors	16/01/2020	Lectures
Drift Velocity	17/01/2020	Lectures
Mobility and Conductivity of Intrinsic Semiconductors	20/01/2020	Lectures
Carrier Concentration of Intrinsic Semiconductors	22/01/2020	Lectures
Fermi Level for Intrinsic Semiconductors	23/01/2020	Lectures
Carrier Concentration for Extrinsic Semiconductor	24/01/2020	Lectures
Conductivity and Fermi Level for Extrinsic Semiconductor	30/01/2020	Lectures
Hall Effect	03/02/2020	Lectures
Direct and Indirect Band Gap	05/02/2020	Lectures

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Principles of LED	06/02/2020	Lectures
Principles of Photo Diodes	07/02/2020	Lectures
Module III		
Dielectric Properties of Materials		
Polarization and Susceptibility	10/02/2020	Lectures
Local Field	12/02/2020	Lectures
Dielectric Constant and Polarizability	13/02/2020	Lectures
Sources of Polarizability	14/02/2020	Lectures
Clausius-Mossoti Relations, Piezo Electricity	17/02/2020	Lectures
Magnetic Properties of Materials		
Response of Materials to Magnetic Field	19/02/2020	Lectures
Classification of Magnetic Materials	20/02/2020	Lectures
Langevin's Classical Theory of Diamagnetism and Paramagnetism	24/02/2020	Lectures
Ferro Magnetism	26/02/2020	Lectures
Weiss Theory	27/02/2020	Lectures
Domain Theory	28/02/2020	Lectures
Antiferro Magnetism and Ferimagnetism	02/03/2020	Lectures
Superconductivity		
Origin of Superconductivity	04/03/2020	Lectures
Response of Magnetic Field	05/03/2020	Lectures
Meissner Effect	06/03/2020	Lectures
Super Current and Penetration Depth	09/03/2020	Lectures
Critical Field and Critical Temperature	11/03/2020	Lectures
Type I and Type II Superconductors	12/03/2020	Lectures
Thermodynamic and Optical Properties	13/03/2020	Lectures
Isotope Effect, Josephson Effect and Tunnelling	16/03/2020	Lectures
SQUID BCS Theory	17/03/2020	Lectures
Cooper Pairs	18/03/2020	Lectures
Existence of Band Gap	19/03/2020	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

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No	Topics	Activity	Submission Deadlines	
Assignment -1	Assignment on given topic	Preparation of assignment	01/01/2020	Submit Hard copy
Assignment -2	Assignment on given topic	Preparation of assignment	17/03/2020	Submit Hard copy
Seminar	Power Point Presentation on given topic	Presentation of prepared power point	12/02/2020	Submit Hard copy

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. Solid State Physics by Puri and Babbar
2. Heat and Thermodynamics-Brijlal & Subrahmanyam (S.Chand))

References:

1. Solid State Physics, M. A. Wahab, (2nd Edition), Narosa
2. Introduction to Solid State Physics, Charles Kittel, (7th Edition), Wiley
3. Crystallography applied to solid state physics, AR Verma, ON Srivastava, New age
4. Solid State Physics, AJ Dekker-Macmillian
5. Solid state Physics, NW Ashcroft, ND Mermin- Cengage Learning
6. Elementary Solid-State Physics, M Ali Omer, Pearson
7. Solid State Physics, R L Singal, KNRN & Co.
8. Solid State Physics, S O Pillai, New Age

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PHY6CRT0219: RELATIVITY ND SPECTROSCOPY

I. Course Instructor

Name	Programme	Batch	Semester	Email
Augustine Sumesh C J. (Module 1 and 4) Dr. Sajeesh T H (Module 2 and 3)	B.Sc. Physics	2020-21	VI	sumeshcj@alberts.edu.in sajeeshth@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72 (Including assignments)
2	Assessment (CAE)	7
	Total	**79**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Understand Special Theory of Relativity
- Analyze Lorentz transformnation equations
- Apply relativistic variations in mass, length and time
- Describe various atom models
- Explain Zeeman effect
- Familiarize the various regions of electromagnetic spectra and the spectroscopic technique outlaying in each region.
- Classify molecule based on the principle moment of inertia.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I - Special Theory of Relativity	17-11-21	
Inertial and non inertial frames of reference	18-11-21	
Galilean transformation	24-11-21	
Significance of Michelson-Morley experiment	25-11-21	

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Postulates of Special Theory of Relativity	1-12-21	
Lorentz transformation.	2-12-2022	
Derivation of Lorentz transformation	8-12-22	
Spatial contraction	9-12-22	
Spatial contraction -problems	15-12-22	
Time dilation	16-12-22	
Time dilation - problems	22-12-22	
composition of velocities	23-12-22	
Velocity addition -problems	5-1-22	
mass of moving particle	6-1-22	
Equivalence of mass and energy	12-1-22	
Mass – energy relation -applications	13-1-22	
Introductory concept of general theory of relativity	19-1-22	
composition of velocities	20-2-22	
MODULE II - Atomic Spectroscopy		
Introduction to spectroscopy	17-11-2021	
Electromagnetic spectrum	17-11-2021	
Characterisation of wave	17-11-2021	
quantum theory-review	12-1-22	
early atom models.	18-1-22	
early atom models	19-1-22	
Bohr model	25-1-22	
electron spin and magnetic moment	26-1-22	
Exclusion principle	1-2-22	
Stern-Gerlach experiment	2-2-22	
Vector atom model	8-2-22	
quantum numbers	9-2-22	
Spin orbit iteraction	15-2-22	
Total angular momentum and LS coupling	16-2-22	
fine structure of Sodium D lines	22-2-22	
Zeeman effect	22-2-22	
Anomalous Zeeman effect	22-2-22	
quantum mechanical explanation for anomalous Zeeman effect	23-2-22	
Paschen-Back effect	23-2-22	
Problems	23-2-22	
Module III - Molecular Spectrocopy		
Molecular energy levels	18-11-21 (Special Class)	
Interaction of em radiation with molecules	23-11-21	
Electronic energy	24-11-21	
rotational energy	30-11-21	
vibrational energies	1-12-21	

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rotational spectra	2-12-21	
explanation in terms of rigid rotator model	7-12-21	
vibrational energy levels	8-12-21	
explanation in terms of harmonic oscillator	14-12-21	
problems	15-12-21	
Electronic energy levels of atoms	21-12-21	
Fluorescence	22-12-21	
Phosphorescence	23-12-21	
Raman effect	28-12-21	online
experimental arrangement and result	29-12-21	online
classical theory	4-1-22	
Failiure of classical theory	5-1-22	
quantum theory of Raman effect.	5-1-22	
Application of spectroscopy	11-1-22	
Problems	12-1-22	
Module III – NMR and ESR		
NMR Spectroscopy- Basic principles	23-2-22	
NMR Spectroscopy instrumentation	23-2-22	
Medical applications of NMR.	23-2-22	
ESR Spectroscopy- Basic principles	24-2-22	
ESR Spectroscopy- instrumentation	24-2-22	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to entropy	Solution of numerical problems	6-12-21	Submit Hard copy
Assignment -2	Problems- Relativity	Solution of numerical problems	17-1-22	Submit Hard copy
Seminar	Early atom model, tutorials		12-2-22	

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Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. *Molecular structure and spectroscopy, Aruldas 2nd ed. EEE.*
2. *Modern Physics, Kenneth S Krane (2nd Edition) -Wiley.*
3. *Concepts of modern Physics, Arthur Beiser (6th Edition) - SIE*

References:

1. *Spectroscopy: Straughan and Walker –(Vol.1) John Wiley*
2. *Fundamentals of Molecular Spectroscopy: CN Banwell –(4th edition) TMH.*
3. *Introduction to Atomic Spectra, HE White, TMH*
4. *Elements of spectroscopy, Guptha, Kumar and Sharma (Pragathi Prakash)*
5. *Special Relativity- Resnick, (Wiley)*
6. *Mechanics – D.S.Mathur (S.Chand).*
7. *Mechanics by J.C. Upadhayaya (Ramprasad)*
8. *Semiconductor physics and optoelectronics- V Rajendran, J Hemaletha and M S M Gibson.*

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Department of Physics

St. Albert's College (Autonomous)

PHY6CRT0317: NUCLEAR, PARTICLE PHYSICS AND ASTROPHYSICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
	Sem VI B.Sc Physics, 2017-20	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	51
2	Assessment (CAE & ESE)	2
	Total	**53**

III. Course Objectives:

* Learn radioactivity, its applications and nuclear reactors.
* Gain knowledge on the fundamentals of elementary particle physics. The students should know about the symmetries and quantum numbers of these particles.
* Introductory knowledge about Star formation and stellar evolution, Basic ideas on the celestial objects such as Neutron stars, Black holes and Supernova explosion.
* Learn about the detectors of nuclear radiations- the Geiger-Mueller counter, the scintillation counter, the photo-multiplier tube, the solid state and semiconductor detectors

IV. Course Delivery Plan

This course is designed to make students get understanding and perform numerical analysis and integration.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Nuclear composition, Nuclear properties: Nuclear radii	11/11/19	Lectures
Binding energy	12/11/19	Lectures
Nuclear electrons	13/11/19	Lectures

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Discovery of neutron	18/11/19	Lectures
Spin and magnetic moment	19/11/19	Lectures
Stable nuclei	20/11/19	Lectures
Semi empirical binding energy formula with correction factors	25/11/19	Lectures
Shell model	26/11/19	Lectures
Nuclear forces	27/11/19	Lectures
Meson theory of nuclear forces	02/12/19	Lectures
Discovery of pion	03/12/19	Lectures
Virtual Photons	04/12/19	Lectures
Interactions between energetic particles and matter	09/12/19	Lectures
Ionization chamber	10/12/19	Lectures
Solid state detectors, Proportional counter	11/12/19	EXAM
Geiger-Muller counter, The Wilson cloud chamber	16/12/19	Lectures
Bubble chamber, Scintillation counters	17/12/19	Lectures
Van de Graaff generator, Linear accelerator	18/12/19	Lectures
Cyclotron, Betatron	31/12/19	Lectures
MODULE II		
Radio activity properties of Alpha beta gamma	01/01/20	Lectures
laws of radio activity	06/01/20	Lectures
Radio active series , hazards	07/01/20	Lectures
Radio dating,	08/01/20	Lectures
Tunnel theory of alpha decay	13/01/20	Lectures
beta decay, positorn emission, electron capture,	14/01/20	Lectures
inverse beta and gamma decay	15/01/20	Lectures
Concept of interactin crossection	20/01/20	EXAM
Nuclear reactions	21/01/20	Lectures
Center of mass coordinate, Q value	22/01/20	Lectures
Nuclerar fission	27/01/20	Lectures

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Nuclear reactors	28/01/20	Lectures
nuclear fusion	29/01/20	Lectures
Reactors: confinement methods	03/02/20	Lectures
Internal Exam	04/02/20	Lectures
Lattitude effect, altitude effect, azimuth effect	05/02/20	Lectures
Primary and secondary cosmic rays	10/02/20	Lectures
Cosmic ray showers, discovery of positron	11/02/20	Lectures
Mesons, Van allen belt, Origin of Crs	12/02/20	Lectures
MODULE III		
Interaction and particles	17/02/20	Lectures
Leptons,neutrins and anti nuetrinos	18/02/20	Lectures
Hadrons, Resonace particles	19/02/20	Lectures
Elementary particle QN	24/02/20	Lectures
Symmetries and conservations	25/02/20	Lectures
Basic idea of quarks	26/02/20	Lectures
Properties of quarks, Confinement	02/03/20	Lectures
Internal Exam	03/03/20	Lectures
Classification of stars	04/03/20	Lectures
HR diagram, Luminosity of star	09/03/20	Lectures
Stellar evolution	10/03/20	Lectures
white dwarf, Chadrasekhar limit	11/03/20	Lectures
Neutron star, Black holes	16/03/20	Lectures
Supernova	17/03/20	Lectures
Photon diffusion time	18/03/20	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Thought Experiments	1 Days	Experiment	4th Week
Group Discussions	2 Days	Discussion	6th Week

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VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

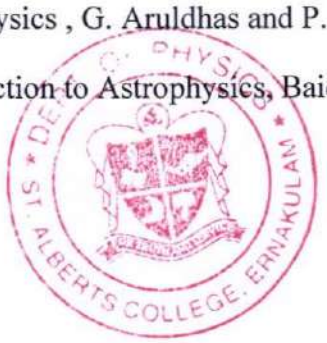
Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. Concepts of Modern Physics, Arthur Beiser, 6th Edition, Tata McGraw-Hill publishing company
2. Modern Physics, R Murugeshan and K. Sivaprasath, 15th Edition (Revised) (2010), S.Chand
3. Atomic and Nuclear Physics, S N Ghoshal, S.Chand.
4. Nuclear and Particle Physics S L Kakani and Subhra Kakani -Viva Books 2008
5. Elements of Nuclear Physics, M L Pandya and R P S Yadav, Kedar Nath RamNath
6. Modern Physics, Kennth Krane, 2nd Edition, Wiley India (Pvt) Ltd.
7. Modern Physics , G. Aruldhas and P. Rajagopal, Prentice-Hall India
8. An Introduction to Astrophysics, Baidyanath Basu, 2nd Edition, Prentice-Hall India



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PPH1CRT0319: ELECTRODYNAMICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Augustine Sumesh C. J (Module 1)	M.Sc. Physics	2019-21	I	sumeshcj@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72 (Including assignments)
2	Assessment (CAE)	3
	Total	75
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

- Explain the basic theories of electrostatics and magneto-statics and solve the problems related to these numerically.
- Discuss propagation of electromagnetic waves through different medium and categorize the conservation laws. Categorize the factors affecting the surface tension
- Investigate the power radiated from different radiating systems.Classify different thermodynamic systems
- Analyze the applications of electromagnetic radiation and wave guidesCourse Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		Lecture
Introduction	12-06-19	
Vector algebra	19-06-19	
Differential calculus	26-06-19	
Gradient Diveregence and Curl	03-07-19	
Electrostatics: Electric field of a polarized object	10-07-19	
Electric field in a conductor, dielectric ,Electric displacement -Gauss's law in dielectric medium	17-07-19	

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linear dielectric medium-. Boundary condition different interface.		
Uniqueness theorem and electrostatic potential-Solving Poisson's and Laplace equations for boundary value problems	24-07-19	
Solving Poisson's and Laplace equations for boundary value problems-II	07-08-19	
Method of images- point charge -line charge above a grounded conducting plane	21-08-19	
Potential at large distance-multipole expansion due to a localized charge distribution-Electric field of a dipole.	04-09-19	
Magnetostatics: Biot-Savart law-divergence and curl of B- Ampere's law.	18-09-19	
Magnetic vector potential-multipole expansion of vector potential-boundary conditions	25-09-19	
Magnetic field inside matter-Magnetization (M)-Magnetic flux density (B)-Auxiliary field (H).	02-10-19	
Electrodynamics: Electromotive force - motional emf - Faraday's law-, electrodynamic equations - displacement current.	09-10-19	
Uniform sinusoidal time varying fields E and B and Maxwell's equations in free space and matter. Boundary conditions of electric and magnetic field	16-10-19	
Conservation laws- continuity equation-Poynting's theorem	23-10-19	
Maxwell's stress tensor- momentum conservation.	30-10-19	
MODULE II		
Wave equation for E and B	06-06-19	
Monochromatic plane waves	07-06-19	
Plane wave- problems	11-06-19	
Energy, momentum	13-06-19	
Propagation of em waves through linear media	14-06-19	
Plane wave	18-06-19	
Normal incidence	20-06-19	
Oblique incidence	21-06-19	
Electromagnetic waves in a conducting medium	25-06-19	
Class test	27-06-19	
Reflection at conducting surface	28-06-19	
Frequency dependence of permittivity	02-07-19	

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Dispersion of electromagnetic waves in non-conductors	04-07-19	
conductors and plasma medium	05-07-19	
MODULE III		
Potential formulation of electrodynamics	09-07-19	
Gauge transformations-Coulomb and Lorentz gauge	11-07-19	
Continuous charge distribution	12-07-19	
Retarded potential-Jefmenko's equation	16-07-19	
Point charges- Lienard Wiechert potentials	18-07-19	
Field of a point charge in motion- Power radiated by a point charge	19-07-19	
Electric and magnetic dipole radiation	23-07-19	
Radiation from arbitrary distribution of charges	25-07-19	
Radiation reaction	26-07-19	
Abraham-Lorentz formula	30-07-19	
MODULE IV		
Relativistic electrodynamics	01-08-19	
Structure of space time- Four vectors-Proper time and proper velocity-	02-08-19	
Relativistic energy and momentum-Relativistic dynamics- Minkowski force.	06-08-19	
Lorentz transformation of em field	08-08-19	
field tensor-electrodynamics in tensor notation	16-08-19	
Potential formulation of relativistic electrodynamics	20-08-19	
Magnetism as a relativistic phenomenon	22-08-19	
Waveguides	27-08-19	
Waves between parallel planes-TE-TM-TEM waves	29-08-19	
Rectangular waveguide	30-08-19	
TE-TM waves -impossibility of TEM wave	03-09-19	
Cylindrical waveguide- TE-TM waves	05-09-19	

IV. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

V. Assignments and Seminars

Assignments

HEAD OF THE DEPARTMENT OF PHYSICS

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to em waves	Solution of numerical problems	11-07-19	Submit Hard copy
Assignment -2`	Problems-wave giudes	Solution of numerical problems	06-08-19	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VI. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VII. Required reading:

Text Book:

1. Introduction to Electrodynamics, David J. Griffiths, PHI.
2. Electromagnetics, John D.Kraus, McGraw-Hill International
3. Classical electrodynamics, J.D Jackson, John Wiley & Sons Inc

References:

1. Electromagnetic waves and radiating systems Edward C Jordan, Keith G Balamin, Printice Hall India Pvt.Ltd
2. Elements of Electromagnetic, Mathew N. O Sadiku, Oxford University Press
3. Antenna and wave propagation, K.D Prasad, Satyaprakashan, New Delhi
4. Electromagnetism problems with solutions, Ashutosh Pramanik, PHI

DEPT. OF PHYSICS * ST. ALBERTS COLLEGE, ERNAKULAM *

Dr. NELSON RODRIGUES
Head & Associate Professor
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HEAD OF THE DEPARTMENT OF PHYSICS
ST. ALBERT'S COLLEGE, COCHIN-682 018

Dr. NELSON RODRIGUES
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PPH1CRT02: CLASSICAL MECHANICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Dr. Sajeesh T H	M.Sc. Physics	2016-17	I	sajeeshth@gmail.com

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72 (Including assignments)
2	Assessment (CAE)	7
	Total	79
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

(i) understand the fundamental concepts of the Lagrangian and the Hamiltonian methods and will be able to apply them to various problems;

(ii) understand the physics of small oscillations and the concepts of canonical transformations and Poisson brackets ;

(iii) understand the basic ideas of central forces and rigid body dynamics;

(iv) understand the Hamilton-Jacobi method and the concept of action-angle variables. This course aims to give a brief introduction to the Lagrangian formulation of relativistic mechanics.

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I - Lagrangian formulation (14 hrs)		
Introduction to the course	01/7/2016	Video Lecture
Review of Newtonian Mechanics: Mechanics of a Particle; Mechanics of a System of Particles	04/7/2016	Lecture
Degree of freedom , Constraints	05/7/2016	Video Lecture
Principle of virtual work ; D' Alembert's principle	07/7/2016	Lecture

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and Lagrange's equations-derivation	08/7/2016	Lecture+ Recorded Video
velocity-Dependent potentials and the Dissipation Function	11/7/2016	Lecture
Lagrangian for a charged particle in electromagnetic field	12/7/2016	Lecture+Tutorial
Application of Lagrange's equation to: motion of a single particle in Cartesian coordinate system and plane polar coordinate system; bead sliding on a rotating wire.	14/7/2016	Lecture+Tutorial
Hamilton's Principle; Technique of Calculus of variations	15/7/2016	Lecture
The Brachistochrone problem	18/7/2016	Lecture+Tutorial
Derivation of Lagrange's equations from Hamilton's Principle.	19/7/2016	Lecture
Canonical momentum; cyclic coordinates	21/7/2016	Lecture+Tutorial
Conservation laws and Symmetry properties-homogeneity of space and conservation of linear momentum	22/7/2016	Lecture+Tutorial
isotropy of space and conservation of angular momentum; homogeneity of time and conservation of energy;	25/7/2016	Lecture+Tutorial
Noether's theorem(statement only; no proof is expected)	26/7/2016	Flipped Class / Assignment
MODULE I - Hamiltonian formulation: (4hrs)	28/7/2016	
Legendre Transformations	01/8/2016	Lecture
Hamilton's canonical equations of motion	04/8/2016	Lecture
Hamiltonian for a charged particle in electromagnetic field	05/8/2016	Lecture
Cyclic coordinates and conservation theorems	08/8/2016	Lecture
Hamilton's equations of motion from modified Hamilton's principle	09/8/2016	Lecture
MODULE II - Small oscillations (8hrs)	11/8/2016	
Stable equilibrium unstable equilibrium and neutral equilibrium	12/8/2016	Lecture
motion of a system near stable equilibrium-Lagrangian of the system and equations of motion	15/8/2016	Lecture
Small oscillations- frequencies of free vibrations	16/8/2016	Lecture
normal coordinates and normal modes	18/8/2016	Lecture
system of two coupled pendula-resonant frequencies normal modes and normal coordinates	19/8/2016	Lecture+Tutorial

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free vibrations of CO_2 molecule	22/8/2016	Lecture+Tutorial
resonant frequencies normal modes and normal coordinates- CO2	23/8/2016	Lecture+Tutorial
Module II -Canonical transformations and poisson brackets (10 hrs)	25/8/2016	
Equations of canonical transformations	26/8/2016	Lecture
Four basic types of generating functions and the corresponding basic canonical transformations. (F1 and F2)	30/8/2016	Lecture
F3 and F4 -functions and the corresponding basic canonicaltransformations	01/9/2016	Lecture
Examples of canonical transformations	02/9/2016	Tutorial
identity transformation	05/9/2016	Lecture
point transformation	06/9/2016	Lecture
	08/9/2016	
Module III - Central force problem (9hours)	09/9/2016	
Reduction to the equivalent one body problem	19/9/2016	Lecture
Equations of motion and first integrals	20/9/2016	Lecture
Equivalent one-dimensional problem and classification of orbits	22/9/2016	Lecture
Differential equation for the orbits	23/9/2016	Lecture
Keplerproblem.	26/9/2016	Lecture
Rigid body motion	27/9/2016	Lecture
Angular momentum	29/9/2016	Lecture
kinetic energy	30/9/2016	Lecture
Euler's angles	03/10/2016	Lecture
infinitesimal rotations	04/10/2016	Lecture
rate of change of a vector	06/10/2016	Lecture
Coriolis force	07/10/2016	Lecture
Euler's equations of motion of a symmetric top		Lecture
heavy symmetric top with one point fixed	13/10/2016	Lecture
Module IV -Hamilton-Jacobi theory and action-angle variables(12 hrs)	14/10/2016	

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Hamilton-Jacobi Equation for Hamilton's Principal Function	18/10/2016	Lecture
physical significance of the principal function.	19/10/2016	Lecture
Harmonic oscillator problem using the Hamilton-Jacobi method.	20/10/2016	Lecture
Hamilton-Jacobi Equation for Hamilton's characteristic function	21/10/2016	Lecture
Separation of variables in the Hamilton-Jacobi Equation, Separability of a cyclic coordinate in Hamilton-Jacobi equation	27/10/2016	Lecture
	28/10/2016	Lecture
Hamilton-Jacobi equation for a particle moving in a central force field(plane polar coordinates).	31/10/2016	Lecture
Action-Angle variables, harmonic oscillator problem in action-angle variables.	01/11/2016	Lecture
Module IV –Classical mechanics of relativity (6 hrs.)		
Lorentz transformation in matrix form	04/11/2016	Lecture
velocity addition,Thomas precession.	05/11/2016	Lecture
Lagrangian formulation of relativistic mechanics	07/11/2016	Lecture
Application of relativistic Lagrangian to (i)motion under a constant force (ii) harmonic oscillator	07/11/2016	Tutorial
Application of relativistic Lagrangian to (iii) charged particle under constant magnetic field	08/11/2016	Tutorial

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Student Centered micro teaching	4hrs	seminar	10-1-17
Group Discussion	3 hrs	Brain storming	17-1-17
Blended Class	3 hrs	Class + prepared video	25-10-2017, 28-10-2017, 1-11-2017

VI. Assignments and Seminars

Assignments

Newtonian Mechanics

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines

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Assignment -1	Problems related to Lagrangian mechanics	Solution of numerical problems	6-12-17	Submit Hard copy
Assignment -2`	Problems-Hamiltonian mechanics	Solution of numerical problems	17-1-17	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

<75	**Not eligible for appearing for ESE**

VIII. Required reading:

Text Book:

1. *Classical Mechanics: Herbert Goldstein , Charles Poole and John Safko, (3/e); Pearson Education.*
2. *Classical Mechanics: G. Aruldhas, Prentice Hall 2009.*

References:

1. *Theory and Problems of Theoretical Mechanics (Schaum Outline Series): Murray R. Spiegel, Tata McGraw-Hill 2006.*
2. *Classical Mechanics : An Undergraduate Text: Douglas Gregory, Cambridge University Press.*
3. *Classical Mechanics: Tom Kibble and Frank Berkshire, Imperial College Press.*
4. *Classical Mechanics (Course of Theoretical Physics Volume 1): L.D. Landau and E.M. Lifshitz, Pergamon Press.*
5. *Analytical Mechanics: Louis Hand and Janet Finch, Cambridge University Press.*
6. *Classical Mechanics: N.C.Rana and P. S. Joag, Tata Mc Graw Hill.*
7. *Classical Mechanics: J.C. Upadhyaya, Himalaya Publications, 2010.*
8. *www.nptelvideos.in/2012/11/classicalphysics.html.*

DEPT. OF PHYSICS * ST. ALBERTS COLLEGE, ERNAKULAM *

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HEAD OF THE DEPARTMENT OF PHYSICS
ST. ALBERT'S COLLEGE, COCHIN-682 018

Department of Physics

St. Albert's College (Autonomous)

PPH1CRT0419 ELECTRONICS

I. Course Instructor

Name	Sem, Programme& Batch	Email
	Sem I M.Sc Physics, 2019-21	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	59
2	Assessment (CAE & ESE)	4
	Total	**63**

III. Course Objectives:

* Apply the knowledge of op amp circuits to construct and analyze various practical op amp circuits.
* Study the application of Op Amp as a current to voltage converter and inverter
* Discuss the frequency response of compensated and non-compensated op-amps and working of oscillators, comparators, converters, voltage regulators, superheterodyne AM and FM radio receivers, generators.
* Describe the working of an instrumentation amplifier and its applications.
* Distinguish various active filters, integrator and differentiator.

IV. Course Delivery Plan

This course is designed to make students get understanding and perform numerical analysis and integration.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Inverting amplifier	26/06/19	Lectures
Non Inverting amplifier	28/06/19	Lectures
Voltage series feedback	29/06/19	Lectures
closed loop voltage gain	01/07/19	Lectures
Difference input voltage	02/07/19	Lectures
Input and output resistance with feedback	04/07/19	Lectures

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Bandwidth with feedback	05/07/19	Lectures
Total output offsetvoltagewithfeedback	08/07/19	Lectures
Voltagefollower	09/07/19	Lectures
Closed loop voltage gain : inverting input terminal and virtual ground	11/07/19	Lectures
Input and output resistance with feedback	12/07/19	Lectures
Bandwidth with feedback	16/07/19	Lectures
Total output offset voltage with feedback.	18/07/19	Lectures
Current to voltage converter	19/07/19	Lectures
Differential amplifier with one OP-AMP and 2 OP-AMP	22/07/19	Lectures
Tutorial	23/07/19	TUTORIAL
MODULE II		
Input offset voltage	25/07/19	Lectures
input bias voltage, input offset current	26/07/19	Lectures
Total outut offset voltage	29/07/19	Lectures
Effect of variation in power supply	30/07/19	Lectures
Changes in input offset voltage and current with time	01/08/19	Lectures
Noise and CMRR	02/08/19	Lectures
DC and AC amplifier	05/08/19	Lectures
AC with supply voltage	06/08/19	Lectures
Peaking summing averaging	08/08/19	Lectures
Instrumentation amp	16/08/19	Lectures
Low voltage DC AC voltmeter	19/08/19	Lectures
Voltage to current converter, current to voltage	20/08/19	Lectures
Very high input impedence	22/08/19	Lectures
integrator, differentiator	24/08/19	Lectures
Internal EXAM	26/08/19	EXAM
MODULE III		
Frequency response, copensating network	29/08/19	Lectures
frequency response, internaly compensated and non	30/08/19	Lectures

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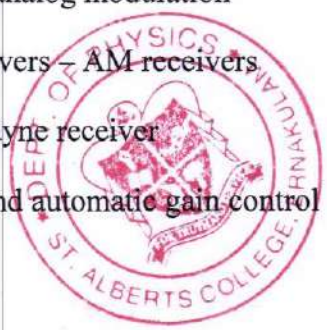
compensated		
High freq. Op-amp	01/09/19	Lectures
Open loop gain as function of freq	02/09/19	Lectures
circuit stability , slew rate	03/09/19	Lectures
First order BW filter	05/09/19	Lectures
Second order BW filter	06/09/19	Lectures
First order and second order high pass BW filter	16/09/19	Lectures
wide and narrow band filter	17/09/19	Lectures
rejector filter	19/09/19	Lectures
All pass filter, Oscillators	20/09/19	Lectures
Phase shift oscillator	23/09/19	Lectures
Wein bridge oscillator	24/09/19	Lectures
square wave, triangular, sawtooth wave, generator,	26/09/19	Lectures
Voltage controller	27/09/19	Lectures
Tutorial	28/09/19	TUTORIAL
MODULE IV		
Basic comparator- Zero crossing detector-	30/09/19	Lectures
Schmitt Trigger – Comparator characteristics-	01/10/19	Lectures
Limitations of op-amp as comparators-	02/10/19	Lectures
Voltage to frequency and frequency to voltage converters	04/10/19	Lectures
D/A and A/D converters	05/10/19	Lectures
Peak detector Sample and Hold	10/10/19	Lectures
IC555 Internal architecture	11/10/19	Lectures
Applications IC565-PLL,	14/10/19	Lectures
Voltage regulator Ics 78XX and 79XX	15/10/19	Lectures
Review of analog modulation	17/10/19	Lectures
Radio receivers – AM receivers	18/10/19	Lectures
superhetrodyne receiver	24/10/19	Lectures
detection and automatic gain control	25/10/19	Lectures



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Communication receiver – FM receiver	28/10/19	Lectures
Ratio detector – stereo FM reception.	29/10/19	Lectures
Internal EXAM	31/10/19	EXAM

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Circuit designing and evaluation	1 Days	Design	4th Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1. Op-amps and linear integrated circuits R.A. Gayakwad 4thEdn.PHI
2. Fundamentals of Electronic Devices and Circuits 5th Ed. David A. Bell, Cambridge.
3. Electronic Devices (Electron Flow Version), 9/E Thomas L. Floyd, Pearson
4. Electronic Communications Dennis Roddy and John Coolen, 4th Ed. Pearson.
5. Modern digital and analog communication systems, B.P. Lathi & Zhi Ding 4th Ed., Oxford University Press.

DEPT. OF PHYSICS ST ALBERTS COLLEGE, ERNAKULAM

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HEAD OF THE DEPARTMENT OF PHYSICS
ST. ALBERT'S COLLEGE, COCHIN-682 018

Department of Physics

St. Albert's College (Autonomous)

PPH2CRT0119: MATHEMATICAL METHODS IN PHYSICS – II

I. Course Instructor

Name	Sem, Programme& Batch	Email
	Sem II M.Sc Physics, 2019-21	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	61
2	Assessment (CAE & ESE)	4
	Total	**65**

III. Course Objectives:

* Learn the basic elements of complex analysis, including the integral theorems
* Introduce the concepts of Laplace and Fourier transforms
* Introduce the Fourier series and it's application to solutions of partial differential equations.
* Discuss special functions and differential equations as the basis for further application in theoretical physics.

IV. Course Delivery Plan

This course is designed to make students get understanding and perform mathematical methods for getting solutions of physic problems.

Topics	Session No & Date(s)	Methodology and Duration
Module I		
Functions of a complex variable	11-Nov-19	Lectures
Analytic functions	13-Nov-19	Lectures
Cauchy-Riemann equation	14-Nov-19	Lectures
Integration in a complex plane	15-Nov-19	Lectures
Cauchy Theorem	18-Nov-19	Lectures

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Cauchy's integral formulas	20-Nov-19	Lectures
Cauchy's integral formulas continues.	21-Nov-19	Lectures
Taylor expansion	22-Nov-19	Lectures
Laurent expansion	25-Nov-19	Lectures
Residue	27-Nov-19	Lectures
Poles	28-Nov-19	Lectures
Cauchy residue theorem	29-Nov-19	Lectures
Cauchy's principle value theorem	02-Dec-19	Lectures
Evaluation of integrals	04-Dec-19	Online
Tutorials and discussions	05-Dec-19	DISCUSSIONS
Module II		
Fourier Series	09-Dec-19	Lectures
Application of Fourier series	11-Dec-19	Lectures
Square Wave	12-Dec-19	Lectures
Full wave rectifier	13-Dec-19	Lectures
Fourier Integral	16-Dec-19	Lectures
Fourier Transform	18-Dec-19	Lectures
Finite Wave Train	19-Dec-19	Lectures
Convolution Theorem of parseval's relation	20-Dec-19	Lectures
Momentum representation	01-Jan-20	Lectures
Hydrogen atom	03-Jan-20	Online
Harmonicoscillator	06-Jan-20	Lectures
Laplace Transform	08-Jan-20	Lectures
Inverse Laplace Transform	09-Jan-20	Lectures
Earth Mutation	10-Jan-20	Lectures
Damped Oscillator	13-Jan-20	Lectures
LCR circuit	15-Jan-20	Lectures
Tutorials and discussions	16-Jan-20	DISCUSSIONS
Module III		

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Gamma Function	17-Jan-20	Lectures
Beta Function	20-Jan-20	Lectures
Symmetry Property of Functions	22-Jan-20	Lectures
Evaluation of Beta functions	23-Jan-20	Lectures
Other forms of Beta Functions	24-Jan-20	Lectures
Transformation of P functions	25-Jan-20	Lectures
Evaluation of Gamma Functions	27-Jan-20	Lectures
Other forms of Gamma Functions	29-Jan-20	Lectures
Transformation of Gamma Functions	30-Jan-20	Lectures
Relation between Beta and Gamma functions	31-Jan-20	Lectures
Evaluation of Integrals	03-Feb-20	Lectures
Bessel's Differential Equation,	05-Feb-20	Lectures
Legendre Differential Equation	06-Feb-20	Lectures
Associated Legendre Differential Equations	07-Feb-20	Lectures
Hermite Differential Equations	10-Feb-20	Lectures
Laguerre Differential Equations	12-Feb-20	Lectures
INTERNAL EXAM	13-Feb-20	EXAM
Module IV		
Characteristics of boundary conditions for partial differential equation	14-Feb-20	Lectures
Solution of PDF by method of separation of variables in Cartesian	17-Feb-20	Lectures
Solution of PDF by method of separation of variables in Cylindrical	19-Feb-20	Lectures
Solution of PDF by method of separation of variables in spherical polar	20-Feb-20	Lectures
Solution of Laplace eqn in cartesian	24-Feb-20	Lectures
Solution of Laplace eqn in cylindrical	26-Feb-20	Lectures
Solution of Laplace eqn in sperical polar	27-Feb-20	Lectures
Heat equation in Cartesian co-ordinates	28-Feb-20	Lectures

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Non-Homogeneous equation	02-Mar-20	Lectures
Green's function	04-Mar-20	Lectures
Symmetry of Green's Function	05-Mar-20	Lectures
Green's Function for Poisson Equation	06-Mar-20	Lectures
Green's Function for Laplace Equation	09-Mar-20	Lectures
Green's Function for Helmholtz Equation	11-Mar-20	Lectures
Application of Greens equation in scattering problem	12-Mar-20	Lectures
Internal Exam	13-Mar-20	EXAM

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Tutorials	1 Days	Experiment	4th Week
Group Discussions	2 Days	Discussion	6th Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. The assignments and seminars are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	As the topics are covered	Submit the assignment to Google Classroom before dead line
Seminar	Presentation of the given topic	Presentation of 20 minutes duration with proper exhibiting materials	20th , 23rd and 26th hour of Course	Present the seminar on the given topic

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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VIII. Required reading:

1. Mathematical methods for Physicists, G.B. Arfken& H.J. Weber 5th edition, Academic Press.
2. Mathematical Physics , V.Balakrishnan,Ane Books Pvt Limited
3. Advanced Engineering Mathematics E.Kreyszig 7thedition John Wiley
4. Mathematical Physics, B.S.Rajput,Y.Prakash 9th edition PragatiPrakashan
5. Mathematical Physics,B.D.Gupta ,Vikas Publishing House
6. Matrices and tensors in Physics,A.W.Joshi
7. Mathematical Physics , P.K.Chatopadhyay ,New Age International Publishers
8. Mathematical Physics, Sathyaprakash, Sultan Chand & Sons

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St. Albert's College (Autonomous)

PPH2CRT0419: CONDENSED MATTER PHYSICS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Augustine Sumesh C. J (Module 1) (Module 2,3 and 4)	M.Sc. Physics	2019-21	II	sumeshcj@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72 (Including assignments)
2	Assessment (CAE)	3
	Total	**75**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Formulate basic models for electrons and lattice vibrations for describing the physics of crystalline materials.
- To develop an understanding of relation between band structure and the electrical/optical properties of a material.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		Lecture
Diffraction of waves by crystals-Bragg's Law	11-11-19	
Scattered wave amplitude	18-11-19	
reciprocal lattice vectors	25-11-19	
diffraction condition-Laue equations-Ewald construction	02-12-19	
Brillouin zones- reciprocal lattice to SC, BCC and FCC lattices-properties of reciprocal lattice	09-12-19	
diffraction intensity - structure factor and atomic form factor- physical significance.	16-12-19	
Crystal symmetry-symmetry elements in crystals	06-01-20	

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point groups, space groups Ordered phases of matter	13-01-20	
translational and orientational order-kinds of liquid crystalline order	20-01-20	
Elements of Quasi crystals	27-01-20	
Energy levels in one dimension-quantum states and degeneracy	03-02-20	
density of states	03-02-20	
Fermi-Dirac statistics -Effect of temperature on Fermi-Dirac distribution	10-02-20	
Free electron gas in three dimensions-	17-02-20	
Heat capacity of the electron gas-relaxation time and mean free path	24-02-20	
Electrical conductivity and Ohm's law	02-03-20	
Widemann-Franz-Lorentz law - electrical resistivity of metals.	09-03-20	
MODULE II		
Nearly free electron model- Origin of energy gap-Magnitude of the Energy Gap	12-11-19	
Bloch functions, Kronig-Penney model	14-11-19	
Wave equation of election in a periodic potential-Restatement of Bloch theorem	15-11-19	
Crystal momentum of an Electron-Solution of the central equations	19-11-19	
Brillouin zone- construction of Brillouin zone in one and two dimensions	21-11-19	
extended, reduced and periodic zone scheme of Brillouin zone	22-11-19	
Effective mass of electron	26-11-19	
Distinction between conductors, semiconductors and insulators	28-11-19	
Equations of motion-Effective mass-Physical interpretation of effective mass - Effective mass in semiconductors	29-11-19	
Intrinsic carrier concentration	03-12-19	
Impurity conductivity-Thermal ionization of Donors and Acceptors	05-12-19	
Thermoelectric effects-semimetals-super lattices	06-12-19	
Bloch Oscillator-Zener tunnelling	10-12-19	
MODULE III		
Vibrations of crystals with monatomic basis -First Brillouin zone-Group Velocity	12-12-19	
Two atoms per Primitive Basis	13-12-19	
Quantization of elastic waves	17-12-19	

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Phonon momentum	19-12-19	
Inelastic scattering of phonons	20-12-19	
Phonon Heat Capacity-Plank distribution	31-12-19	
Density of States in one and three dimensions	03-01-20	
Debye model for density of states-Debye T3 Law	07-01-20	
Einstein Model for Density of states	09-01-20	
Anharmonic Crystal interactions-Thermal Expansion	10-01-20	
Thermal Conductivity-thermal resistivity of phonon gas	14-01-20	
Umklapp Processes-Imperfections	16-01-20	
MODULE IV		
Quantum theory of para magnetism	17-01-20	
Hund's rules-crystal field splitting-spectroscopic splitting factor	21-01-20	
Cooling by adiabatic demagnetization – Nuclear Demagnetization	23-01-20	
Ferromagnetic order-Curie point and the exchange integral	24-01-20	
Temperature dependence of the saturation-Magnetization-Saturation Magnetization at absolute Zero	28-01-20	
Magnons- Quantization of spin waves-Thermal excitation of Manganons	30-01-20	
Neutron Magnetic Scattering-	31-01-20	
Ferromagnetic order-curie temperature and Susceptibility	04-02-20	
Antiferromagnetic order-susceptibility below Neel-Temperature	06-02-20	
Ferromagnetic domains-Anisotropic Energy-transition region between Domains-origin of domains	07-02-20	
Coercivity and Hysteresis	11-02-20	
Single Domain Particles	13-02-20	
Geomagnetism and Biomagnetism-Magnetic scope microscopy	14-02-20	
Elements of superfluidity	18-02-20	

IV. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

V. Assignments and Seminars

Assignments

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The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to reciprocal lattice	Solution of numerical problems	28-2-20	Submit Hard copy
Assignment -2`	Problems-crystal symmetry	Solution of numerical problems	16-3-20	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VI. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VII. Required reading:

Text Book:

1. Introduction to Solid State Physics, Charles Kittel, Wiely, Indian reprint (2015).
2. Solid State Physics, A.J. Dekker, Macmillan & Co Ltd. (1967)
3. Introduction to Solids, L V Azaroff, McGRAW-HILL BOOK COMPANY, INC. New York (1960)

References:

1. Solid State Physics, R.L. Singhal, KedarNath Ram Nath& Co (1981)
2. Elementary Solid State Physics, M. Ali Omar, Pearson, 4th Indian Reprint (2004).
3. Solid State Physics, C.M. Kachhava, Tata McGraw-Hill (1990).
4. Elements of Solid State Physics, J. P. Srivastava, PHI (2004)
5. Solid State Physics, Dan Wei, Cengage Learning (2008)
6. Solid State Physics, J S Blackemore, Cambridge University Press (1985)
7. 8.Electronic Properties of Crystalline Solids, Richard Bube, Academic Press New York (1974)

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St. Albert's College (Autonomous)

PPH2CRT0219 QUANTUM MECHANICS

I. Course Instructor

Name	Sem, Programme & Batch	Email
	SemesterII, M.Sc 2020-21	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	51(Including assignments)
2	Assessment (CAE & ESE)	7
	Total	58
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	6

III. Course Objectives:

. To understand the fundamental concepts of the Dirac formalism .

. To understand how quantum systems evolve in time

- To understand the basics of the quantum theory of angular momentum
- This course enable the student to solve the hydrogen atom problem which is a prelude to more complicated problems in quantum mechanics

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, field based assignments etc.

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		

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UNIT-1 ***Basics Formulation of Quantum Mechanics***		
1.1 Development of the idea of state vectors from sequential Stern-Gerlach experiments ;Dirac notation for state vectors: ket space, bra space and inner products;	11/11/2019 12/11/2019 13/11/2019 14/11/2019	Class exercises Lectures GD
1.2 Operators; Associative axiom; outer product;	15/11/2019 18/11/2019	
1.3 Hermitian adjoint; Hermitian operator; Eigenkets and eigenvalues of Hermitian operators. Eigenkets of observables as base kets; concept of complete set. Projection operators	19/11/2019 20/11/2019 21/11/2019 22/11/2019	
. 1.4 Matrix representations of operators, kets and bras	28/11/2019	
1.5 Measurements in quantum mechanics; expectation value ;Compatible observables and existence of simultaneous eigenkets; General Uncertainty Relation.	26/11/2019 27/11/2019 25/11/2019	
1.6 Unitary operator, change of basis and transformation matrix, unitary equivalent observables.	29/11/2019 02/12/2019 03/12/2019	
1.7Position eigenkets, infinitesimal translation operator and its properties, linear momentum as generator of translation, canonical commutation relations. Wavefunction as an expansion coefficient; eigenfunctions, momentum eigen function	04/12/2019 05/12/2019 06/12/2019 10/12/2019 09/12/2019	
1.8 momentum space wavefunctions and the relation between wavefunctions in position space and momentum space. Gaussian wave packet- compuatation of dispersions in position and momentum.	11/12/2019 12/12/2019 16/12/2019 13/12/2019	
UNIT – 2 ***Quantum Dynamics***		
2.1 Time evolution operator and its properties.	17/12/2019	

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2.2 Schrodinger equation for the time evolution operator; solution of the Schrodinger equation for different time dependences of the Hamiltonian	18/12/2019 20/12/2019 19/12/2019 31/12/2020 02/01/2020	
2.3 Energy eigenkets; time dependence of expectation values	03/01/2020	
2.4 time evolution of a spin half system and spin precession	06/01/2020	
2.5 Correlation amplitude; time-energy uncertainty relation and its interpretation	07/01/2020 08/01/2020	
2.6 Schrodinger picture and Heisenberg picture; behavior of state kets and observables in Schrodinger and Heisenberg pictures; Heisenberg's equation of motion	09/01/2020 10/01/2020 11/01/2020	
2.7 Ehrenfest's theorem; time evolution of base kets; transition amplitudes. 2.8 Simple Harmonic Oscillator: Energy eigenvalues and energy eigenkets	13/01/2020 14/01/2020 15/01/2020	
Unit III ***Theory of Angular Momentum***		
3.1 Non-commutativity of rotations around different axes; the rotation operator; fundamental commutation relations for angular momentum operators	16/01/2020 17/01/2020	
3.2 rotation operators for spin half systems; spin precession in a magnetic field	20/01/2020	
3.3 Pauli's two component formalism; 2X2 matrix representation of the rotation operator	21/01/2020 22/01/2020 23/01/2020	
3.4 ladder operators; eigenvalue problem for angular momentum operators	24/01/2020	
3.5 matrix representation of angular momentum operators.	25/01/2020	
3.6 Orbital angular momentum ; orbital angular momentum as a generator of rotation.	27/01/2020	
3.7 Addition of orbital angular momentum and spin angular momentum; addition of angular momenta of two spin-1/2 particles. General theory of Angular Momentum addition-Computation of Clebsch-Gordon coefficients	28/01/2020 29/01/2020 30/01/2020 03/02/2020 31/01/2020	
Unit IV		

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The Hydrogen Atom		
4.1 Behaviour of the radial wavefunction near the origin; the Coulomb potential and the hydrogen atom; hydrogenicwavefunctions; degeneracy in hydrogen atom.	04/02/2020 05/02/2020 06/02/2020 07/02/2020 13/02/2020 11/02/2020 12/02/2020 10/02/2020	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Demonstration of Theoreical models	1 hour	Demonstration	4th Week
Interactive section	1 hour		1st Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given topic	Preparation of assignment	Wednesday of 8th Week of Course	Submit the assignment to Google Classroom before 11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 minutes duration	Wednesday of 10th Week of Course	Submit the assignment Google Classroom before 11.59 pm

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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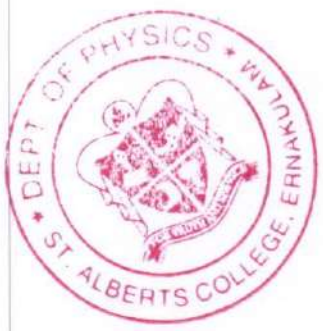
VIII. Required reading:

1. Modern Quantum Mechanics : J. J. Sakurai, Pearson Education.
2. A Modern Approach to Quantum Mechanics: J S Townsend, Viva Books.
1. Quantum Mechanics (Schaum's Outline) :Yoav Peleg *etal*. Tata Mc Graw Hill Private Limited, 2/e.
2. Quantum Mechanics: 500 Problems with Solutions: G Aruldhas, Prentice Hall of India.
3. Quantum Mechanics Demystified: David McMohan, McGrawHill 2006.
4. Introductory Quantum Mechanics: Richard L Liboff, Pearson Education .
5. Introduction to Quantum Mechanics: D.J. Grifith, Pearson Education.
6. Quantum Mechanics : V. K. Thankappan, New Age International.
7. Quantum Mechanics: An Introduction: Walter Greiner and Allan Bromley, Springer.
8. Quantum Mechanics : Non-Relativistic Theory(Course of Theoretical Physics Vol3): L. D. Landau and E. M. Lifshitz, Pregamon Press.
9. The Feynman Lectures on Physics Vol3, Narosa.



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St. Albert's College (Autonomous)

PPH3CRT0119: QUANTUM MECHANICS-II

I. Course Instructor

Name	Programme	Batch	Semester	Email
(Module 1) (Module 2,3 and 4)	M.Sc. Physics	2018-20	III	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	72 (Including assignments)
2	Assessment (CAE)	3
	Total	**75**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**5**

III. Course Objectives:

- Learning time dependent problems in quantum mechanics.
- Familiarise quantum field theory and to the techniques of quantum mechanics underlining the scattering problem.
- Learning the concepts of relativistic quantum mechanics.

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		Lecture
Non-degenerate Perturbation Theory: First order energy shift	12-06-19	
first order correction to the energy eigenstate, second order energy shift	13-06-19	
Harmonic oscillator subjected to a constant electric field	19-06-19	
Degenerate Perturbation theory First order Stark effect in hydrogen	20-06-19	
Zeeman effect in hydrogen and the Lande g-factor	26-06-19	
The variational Method	27-06-19	
Estimation of ground state energies of harmonic oscillator and delta function potential	03-07-19	

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Ground State of Helium atom; Hydrogen Molecule ion.	04-07-19	
The WKB method and its validity	10-07-19	
The WKB wavefunction in the classical region; non-classical region	11-07-19	
connection formulas (derivation not required)	17-07-19	
Potential well and quantization condition; the harmonic oscillator	18-07-19	
Tunneling; application to alpha decay	24-07-19	
MODULE II		
Time dependent potentials; interaction picture	25-07-19	
time evolution operator in interaction picture	01-08-19	
Spin Magnetic Resonance in spin half systems	07-08-19	
Time dependent perturbation theory	08-08-19	
Dyson series; transition probability	21-08-19	
constant perturbation	22-08-19	
Fermi's Golden Rule; Harmonic perturbation	04-09-19	
interaction of atom with classical radiation field; absorption and stimulated emission	05-09-19	
electric dipole approximation; photoelectric effect	18-09-19	
Energy shift and decay width.	19-09-19	
MODULE III		
Bosons and fermions; anti-symmetric wave functions and Pauli's exclusion principle	13-06-19	
The Helium Atom	14-06-19	
The Asymptotic wave function -	20-06-19	
differential scattering cross section and scattering amplitude	21-06-19	
The Born approximation- scattering amplitude in Born approximation, validity of the Born approximation	27-06-19	
Yukawa potential	28-06-19	
Coulomb potential and the Rutherford formula	04-07-19	
Partial wave analysis- hard sphere scattering	05-07-19	
S-wave scattering for finite potential well	11-07-19	
Resonances and Ramsauer-Townsend effect	12-07-19	
MODULE IV		

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Klein-Gordon Equation; continuity equation and probability density in Klein-Gordon theory	18-07-19	
Non-relativistic limit of the Klein-Gordon equation	19-07-19	
Solutions of the Klein –Gordon equation for positive	25-07-19	
Negative and neutral spin 0 particles	26-07-19	
Klein-Gordon equation in the Schrodinger form	01-08-19	
Dirac Equation in the Schrodinger form	02-08-19	
Dirac's matrices and their properties	08-08-19	
Solutions of the free particle Dirac equation	16-08-19	
single particle interpretation of the plane waves; velocity operator; zitterbewegung	22-08-19	
Non-relativistic limit of the Dirac equation	9-08-19	
spin of Dirac particles; Total angular momentum as a constant of motion	30-08-19	
Negative energy states and Dirac's hole theory	05-09-19	

IV. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

V. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Problems related to variational method	Solution of problems	07-08-19	Submit Hard copy
Assignment -2`	Problems-WKB method	Solution of problems	05-09-19	Submit Hard copy
Seminar				

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

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VI. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VII. Required reading:

Text Book:

1. Modern Quantum Mechanics: J. J. Sakurai, Pearson Education.
2. A modern Approach to Quantum Mechanics: John Townsend, Viva Books New Delhi
3. Introduction to Quantum Mechanics: D.J. Griffith, Pearson Education
4. Relativistic Quantum Mechanics: Walter Greiner, Springer-Verlag

References:

1. Quantum Mechanics (Schaum's Outline Series): Yoav Peleg etal., Tata McGraw Hill .Education Private Limited, 2/e.
2. Quantum Mechanics: 500 Problems with Solutions: G Aruldhas, Prentice Hall of India.
3. Problems and Solutions in Quantum Mechanics: Kyriakos Tamvakis, Cambridge University Press.
4. Introductory Quantum Mechanics: Richard L Liboff, Pearson Education.
5. Quantum Mechanics: V. K. Thankappan, New Age International.
6. A Textbook of Quantum Mechanics: P M Mathews and R Venkatesan, Tata McGraw Hill.
7. Quantum Mechanics: Non Relativistic Theory (Course of Theoretical Physics Course Vol3) : L. D. Landau and E. M. Lifshitz, Pregamon Press.
8. Relativistic Quantum Mechanics: James D Bjorken and Sidney D Drell, Tata McGraw Hill 2013

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ST. ALBERT'S COLLEGE, COCHIN-682 018

St. Albert's College (Autonomous)

PPH4CRT0119 NUCLEAR AND PARTICLE PHYSICS

I. Course Instructor

Name	Sem, Programme & Batch	Email
	SemesterIV, M.Sc 2020-21	

II. Duration of Course:

No	Activity	Duration
1	Contact hours	51(Including assignments)
2	Assessment (CAE & ESE)	7
	Total	**58**
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	**6**

III. Course Objectives:

- To identify the various properties of nucleus, nuclear forces, and nuclear models.
- To discuss about the different nuclear decay processes, interactions, their characteristics and analyses beta decay in detail.
- Classify the elementary particles, nuclear interactions, symmetries and their conservation law
- Explain the basic ideas of Higg's boson and the LHC experiments; detection of gravitational waves and LIGO

IV. Course Delivery Plan

This course is a course requiring lot of student centric learning processes. The teaching methods include lectures, discussions, field based assignments etc.

Topics	Session No & Date(s)	Methodology and Duration
Topics	Session No & Date(s)	Methodology and Duration
These are the topics to be covered in the modules		

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UNIT-1 ***Nuclear properties and forces between nucleons***		
Nuclear radius **Distribution of nuclear charge** - **Isotopic shft**	11/11/2019 12/11/2019	Class exercises Lectures GD
Muonic shift	13/11/2019	
Mirror nuclei	14/11/2019	
Distribution of nuclear matter	15/11/2019	
Mass and abundance of nucleids	18/11/2019	
Nuclear binding energy	19/11/2019	
Nuclear angular momentum and parity	20/11/2019	
Nuclear electromagnetic moments- quadrupole moment	21/11/2019	
The deuteron – binding energy, spin , parity	22/11/2019	
Mangnetic moment and electric quadrupole moment	25/11/2019	
Nucleon – nucleon scattering	26/11/2019	
Proton- proton interaction	27/11/2019	
Neutron – neutron interaction	28/11/2019	
Properties of nuclear forces	29/11/2019	
Exchange force model	02/12/2019	
UNIT – 2 ***Nuclear models and nuclear decay***	03/12/2019	
Liquid drop model, Bethe – Weizacker formula	04/12/2019	
Applications of semi – empirical binding energy formula	05/12/2019	GD Lectures
Shell model- shell model potential	06/12/2019	

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Spin orbit potential	09/12/2019	
Magnetic dipole moments, electric quadrupole moments, valence nucleons	10/12/2019	
Collective structure – Nuclear vibrations, nuclear rotations	11/12/2019	
Beta decay – energy release in beta decay	12/12/2019	
Fermi theory of beta decay	13/12/2019	
Angular momentum and parity selection rules – allowed and forbidden transitions	16/12/2019	
Comparative half lives and forbidden decays	17/12/2019	
Non conservation of parity in beta decay	18/12/2019	
Gamma decay – angular momentum and parity selection rules	19/12/2019	
Internal conversion	20/12/2019	
Unit III ***Nuclear reactions***		
Types of reactions	31/12/2020	GD, Lectures
Conservation laws	02/01/2020	
Energetic of nuclear reaction	03/01/2020	
Isospin	06/01/2020	
Reaction crosssections	07/01/2020	
Coulomb scattering	08/01/2020	
Rutherford formula	09/01/2020	
Nuclear scattering	10/01/2020	
Scattering and reaction cross sections in terms of partial wave amplitudes	11/01/2020	
Compound nucleus reactions	13/01/2020	
Direct reactions	14/01/2020	
Resonance reactions	15/01/2020	
Unit IV ***Particle Physics***		
Yukawa's hypothesis- Properties of pi mesons – electric charge, isospin, mass, spin and parity	16/01/2020 17/01/2020	GD, Lectures
Decay modes and production of pi-mesons	20/01/2020	
Types of interactions between elementary particles, hadrons and	21/01/2020 22/01/2020	

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leptons		
Symmetries and conservation laws	23/01/2020	
CP and CPT invariance	24/01/2020	
Applications of symmetry arguments to particle reactions	25/01/2020	
Parity non – conservation in weak interactions	27/01/2020	
Quark model confined quarks, coloured quarks and gluons	28/01/2020 29/01/2020	
Experimental evidences of quark model, quark gluon interaction, quark dynamics	30/01/2020	
Grand unified theories	31/01/2020	
Standard model of particle physics	03/02/2020	
Unit V ***Nuclear Astrophysics and particle Applications of nuclear physics***		
Particle and nuclear interactions in the early universe	04/02/2020	GD, Lectures
Primordial nucleosynthesis	05/02/2020	
Stellar nucleosynthesis(for both A<60 and A>60)	06/02/2020	
Higgs boson and LHC experiments	07/02/2020	
Detection of gravitational waves and LIGO(qualitative ideas only)	10/02/2020	
Rutherford backscattering spectroscopy and applications	11/02/2020	
Computerized axial tomography(CAT)	12/02/2020	
Positron emission tomography(PET)	13/02/2020	

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time
Nuclear models	1 hour	Demonstration	4th Week
Interactive section	1 hour		1st Week

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment	Assignment on given	Preparation of assignment	Wednesday of 8th Week of	Submit the assignment to Google Classroom before

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	topic		Course	11.59 pm
Seminar	PowerPoint presentation on given topic	PowerPoint Presentation for a presentation of 10 minutes duration	Wednesday of 10th Week of Course	Submit the assignment Google Classroom before 11.59 pm

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

VIII. Required reading:

1.Introductory nuclear physics, K. S Krane John Wiley
2.Nuclear Physics, S. N. Ghoshal, S Chand & Company

3. Nuclear Physics: Problem – based Approach Including MATLAB, Hari M Agarwal, PHI Learning Private Limited, Delhi.

4. Problems and Solutions in Atomic, Nuclear and Particle Physics: Yung – Kuo Lim, World Scientific.

5. Introduction to Nuclear and Particle Physics: V. M Mittal, R. C. Verma, S. C. Gupta(Prentice Hall India).

6. Concepts of Nuclear Physics: B. L. Cohen, Tata McGrawHill.

7. Nuclear Physics: An introduction – SB Patel. New Age International.

8. Nuclear Physics: R R Roy and B P Nigam, New Age International.

9. Nuclear Physics: R Prasad, Pearson.

10. Atomic Nucleus: R D Evans, Mc GrawHill, New York.

11. Nuclear Physics: I Kaplan, Narosa, New Delhi(2/e)

12. Introduction to Elementary Particles: David Griffith, Wlley – VCH.

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St. Albert's College (Autonomous)

PPH4CRT0320: COMMUNICATION SYSTEMS

I. Course Instructor

Name	Programme	Batch	Semester	Email
Prof. Justine Paiva	M.Sc. Physics	2016-18	4	justinpaiva@alberts.edu.in

II. Duration of Course:

No	Activity	Duration
1	Contact hours	82 (Including assignments)
2	Assessment (CAE)	3
	Total	85
	Remedial Sessions/Peer Tutoring/Tutorials (need based & Optional)	5

III. Course Objectives:

- Explain the theories of digital communication
- Discuss modulation and demodulation
- Understand multiplexing techniques
- Introduce wireless communication systems
- Explain multiple access techniques
- Illustrate fundamentals of satellite communication
- Discuss theories related to fiber optic communications
- Differentiate Chromatic, intermodal and nonlinear dispersion
- Fundamentals and basic principles in radar system

IV. Course Delivery Plan

Topics	Session No & Date(s)	Methodology and Duration
MODULE I		
Digital Communication		
Pulse Communication – Introduction	11-11-2019	Lectures
Pulse Modulation	12-11-2019	Lectures
PAM-PWM-PPM-PCM	13-11-2019	Lectures
PCM-Sampling Theorem- Quantisation-Noise Generation and Demodulation	14-11-2019	Lectures
Companding-DPCM	15-11-2019	Lectures
ADPCM-Delta Modulation	18-11-2019	Lectures

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Information Theory – Coding - Noise	19-11-2019	Lectures
Data Communication	20-11-2019	Lectures
Digital Codes- Error Detection and Correction	21-11-2019	Lectures
Data Sets and Interconnection Requirements	22-11-2019	Lectures
Modem Classification Interfacing	25-11-2019	Lectures
Multiplexing Techniques	26-11-2019	Lectures
Frequency Division Multiplex	27-11-2019	Lectures
Time Division Multiplex	28-11-2019	Lectures
Digital Transmission Techniques	29-11-2019	Lectures
ASK-FSK	02-12-2019	Lectures
PSK-QPSK	03-12-2019	Lectures
MODULE II		
Mobile Communication		
Introduction to Wireless Communication Systems-Mobile Radio Systems Around the World	04-12-2019	Lectures
Examples of Wireless Communication Systems: - Paging System- Cordless Telephone System- Cellular Telephone System	05-12-2019	Lectures
How a Cellular Telephone Call is Made-Comparison of Common Mobile Radio System	06-12-2019	Lectures
Trends is Cellular and Personnel Communications	09-12-2019	Lectures
Wireless Communication Systems-2G	10-12-2019	Lectures
Wireless Communication Systems-3G	11-12-2019	Lectures
Wireless Communication Systems-4G	12-12-2019	Lectures
Cellular Concept – Frequency Reuse	13-12-2019	Lectures
Channel Assignment Strategies-Handoff Strategies	16-12-2019	Lectures
Prioritising Handoffs and Practical Handoff Consideration	17-12-2019	Lectures
Interference and System Capacity	18-12-2019	Lectures
Improving Coverage and Capacity in Cellular Systems-Cell Splitting- Sectoring – Microcell Zone Concept	19-12-2019	Lectures
Basic Idea of Path Loss and Multipath Fading	20-12-2019	Lectures
Multiple Access Technique- Introduction- - FDMA-TDMA-SSMA	31-12-2019	Lectures
FHMA-CDMA-Hybrid Spread Spectrum Techniques	01-01-2020	Lectures
SDMA	03-01-2020	Lectures
GSM	06-01-2020	Lectures
MODULE III		
Satellite Communication		

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Satellite Communication fundamentals	07-01-2020	Lectures
Satellite orbits	08-01-2020	Lectures
Satellite positioning	09-01-2020	Lectures
Frequency allocations	10-01-2020	Lectures
Polarization	11-01-2020	Lectures
Antennas-gain-beam width	13-01-2020	Lectures
Multiple access techniques	14-01-2020	Lectures
Geostationary Satellite Communication	15-01-2020	Lectures
Satellite Parameters	16-01-2020	Lectures
VSAT(Basic Idea)	17-01-2020	Lectures
Geostationary satellite Path/Link Budget	20-01-2020	Lectures
Satellite TV Systems	21-01-2020	Lectures
Satellite TV broadcasting	22-01-2020	Lectures
GPS	23-01-2020	Lectures
MODULE IV		
Fiber Optics Communication		
Introduction, Ray theory transmission	24-01-2020	Lectures
Total internal reflection, acceptance angle	25-01-2020	Lectures
Numerical aperture, Skew rays	27-01-2020	Lectures
Electromagnetic mode theory for optical propagation	28-01-2020	Lectures
Electromagnetic waves	29-01-2020	Lectures
Modes in planar guide	30-01-2020	Lectures
Phase and group velocity	31-01-2020	Lectures
Fiber classification, cylindrical fiber	03-02-2020	Lectures
Step index, graded index	05-02-2020	Lectures
Single mode fiber, Cut off wavelength, group delay	06-02-2020	Lectures
Photonic crystal fibers, index guided micro structures	07-02-2020	Lectures
Photonic band gap fibers	10-02-2020	Lectures
Dispersion, Chromatic	11-02-2020	Lectures
Intermodal, nonlinear effects	12-02-2020	Lectures
Optical fiber connections- Fiber splices-fusion splices	13-02-2020	Lectures
Mechanical splices, Multiple splices	14-02-2020	Lectures
Fiber connectors, cylindrical ferrule connectors	17-02-2020	Lectures
Duplex and multiple fiber connectors	18-02-2020	Lectures
Fiber couplers	19-02-2020	Lectures
MODULE V		
Radar Systems		
Basic Principles, Basic radar system	20-02-2020	Lectures
Development of radar	24-02-2020	Lectures
Performance factors, radar range equation	25-02-2020	Lectures
Factors influencing maximum range	26-02-2020	Lectures
Effect of noise, target properties	27-02-2020	Lectures
Pulsed system- block diagram and description	28-02-2020	Lectures

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Antennas scanning-antenna tracking - display method	02-03-2020	Lectures
Pulsed radar system	03-03-2020	Lectures
Moving target indication: -doppler effect	04-03-2020	Lectures
Fundamentals of MTI- delay line-blind speeds- radar beacons	05-03-2020	Lectures
Other radar systems- CW Doppler Radar- frequency modulated CW Radar	06-03-2020	Lectures
Phased Array Radars- Planar Array Radars	09-03-2020	Lectures

V. Innovative Learning Programmes

Name of Programme	Duration	Type	Proposed Time

VI. Assignments and Seminars

Assignments

The following Assignment needs to be submitted to Google Classroom. Both the assignments & presentation are individual assignments.

No	Topics	Activity	Submission Deadlines	
Assignment -1	Assignment on given topic	Preparation of assignment	20-12-2019	Submit Hard copy
Assignment -2`	Assignment on given topic	Preparation of assignment	02-03-2020	Submit Hard copy
Seminar	Power Point Presentation on given topic	Presentation of prepared power point	10-02-2020	Submit Hard copy

Note: Failure to upload the assignment to Google Classroom *on the date mentioned will result in 0 marks for the assignment. Requests for extension of dates for submission not entertained.*

VII. Attendance (one component in class participation):

95-100%	5
90-95%	4
85-90%	3
80-85%	2
75-80%	1
<75	**Not eligible for appearing for ESE**

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VIII. Recommended Text Books:

1. Electronic Communication Systems by Kennedy/Davis, Mc Graw Hill Publication, 4th edition, (Module-1 and 5).
2. Wireless Communication Principles and Practice by Theodore S Rappaport, Person Publication, 2nd edition (Module-2).
3. Telecommunication Transmission Systems by Robert G Winch, McGrawHill Publication, 2nd edition, (Module-3)
4. Optical fiber communications – Principles and practice John M Senior, Pearson publications, 3rd edition, (Module-4).

Recommended References:

1. Optical Fiber Communications by Gerd Keiser (Module-2)
2. Satellite Communications by Dennis Roddy, Mc Graw Hill Publication, 3rd edition.
3. Introduction to RADAR Systems by Skolnik, McGraw Hills, 3rd edition
4. Satellite communication by Dr. D.C.Agarwal.
5. Electronic Communication Systems by Wayne Thomas, Pearson Publication, 5th Edition

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