



# SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with "A" grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

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**School of Science and Humanities**  
**Department of Physics (DST-FIST Sponsored)**  
**BOARD OF STUDIES**  
**Minutes of Meeting**

Date: 5/4/2017 (10.00AM – 1.30 PM)

Venue: Board Room, VC Office

Board of studies meeting of Department of Physics was held on 5<sup>th</sup> April 2017 between 10 am to 1.30 pm at Board Room of VC's Office.

Dean/S & H gave an introduction about the programmes and courses offered by the Department of Physics and she projected the syllabus of I year B.E./B. Tech, B. Sc (Physics) and M. Sc (Physics) on the LCD screen for discussion.

**Agenda of Meeting:**

- Reframing the syllabus for theory and lab for B.E/B. Tech, and MSc PHYSICS.
- Framing the syllabus for theory and lab of new programme - BSc PHYSICS.

S.No	Board of Studies Members
1.	<b>Dr. T. S. Natarajan</b> , Department of Physics, IIT Madras/ IIT Tirupati.
2.	<b>Dr. N. Vijayan, Senior Scientist</b> Crystal Growth and X-Ray Analysis Section, CSIR-National Physical Laboratory, New Delhi-110012.
3.	<b>Dr. D. Siva Prahasam</b> , International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Centre for Automated Energy Materials, IITM Research Park, Taramani.
4.	<b>Dr. M. Sundareswari</b> , Professor & Dean/ School of Science & Humanities, Department of Physics, Sathyabama Institute of Science & Technology, Chennai.
5.	<b>Dr. S. Ravichandran</b> Professor & Head / Department of Physics Sathyabama Institute of Science & Technology, Chennai.
6.	<b>Dr. Helen Marina Albert</b> . Professor/ Department of Physics Sathyabama Institute of Science & Technology, Chennai.
7.	<b>Dr. C. Rameshkumar</b> , Associate Professor/ Department of Physics Sathyabama Institute of Science & Technology, Chennai.

The external members had gone through the syllabus and their suggestions are listed below:

- **M.Sc (Physics) Theory**

1. As per the suggestion given by the BOS members the following topics are included in the semester 3, Spectroscopy (SPH5203) in unit 2. They are UV-Visible, Fluorescence, and UV and X-ray photoelectron spectroscopies. Qualitative and quantitative applications of these methods in biochemistry
2. As per the suggestion given by the BOS members the following topics are included in the semester 3, Spectroscopy (SPH5203) in unit 3. They are Vibrational Coarse Structure Progression ENERGY LEVELS, MOLECULAR ORBITALS AND ELECTRONIC SPECTRA OF POLYATOMIC MOLECULES.
3. As per the suggestion of the expert members in the course COMMUNICATIONELECTRONICS (SPH5204), the title of unit 5 RADAR SYSTEMS AND OPTICAL FIBER changed into RADAR SYSTEMS AND MOBILE COMMUNICATION.
4. As per the suggestion given by the BOS members the following topics are included in the semester 3, COMMUNICATIONELECTRONICS (SPH5204) in unit 5 the following topics are removed. They are Optical Fiber: Introduction to light, optical fiber and fiber cables, optical fiber characteristics and classification, losses, Fiber optic components and systems, Installation, testing and repair.
5. As per the suggestion given by the BOS members the following topics are included in the semester 3, COMMUNICATIONELECTRONICS (SPH5204) in unit 5 the following topics are included. They are MOBILE COMMUNICATION Basic cellular systems, Performance criteria, Uniqueness of mobile radio environment, Operation of cellular systems, Concept of frequency reuse channels, Co-channel interference reduction factor, Desired C/I from a normal case in an Omni-directional antenna system, Handoff mechanism, Cell splitting. Cell coverage for signal and traffic, Obtaining the mobile point-to-point model, Propagation over water or flat open area, Foliage loss, Propagation in near-in distance, Long-distance propagation.

- **B.Sc (Physics) Theory**








1. With the advice and inputs of the board members, we finalised the syllabus to introduce B.Sc., Physics course in this academic year 2017-2018.
2. External members recorded their appreciation of offering 'specific lab course' for each of the corresponding theory course in all the semester.
3. They suggested the text book "Perspectives of MODERN PHYSICS" – K. Beizer for Atomic Physics
4. The board of members reviewed B.Sc Physics syllabus and approved the following courses as electives.
  - a. Industrial Instrumentation, Thin film Physics, Astronomy and astrophysics can be included as an Elective course.

- I B.E/ B.Tech Theory and I B.E/ B.Tech Lab

- As per the Suggestion of the expert members no changes have been made in the syllabus of B.E., / B. Tech., (All Branches)

After fruitful discussion, relevant comments were incorporated appropriately in the syllabus.

**Members Present:**

External members	Signature	Internal members	signature
Dr.N.Vijayan		Dr.S.Ravichandran	
Dr.T.S.N.Natarajan		Dr.HelenMerina Albert	
Dr. D.SivaPrahassam		Dr.C.Ramesh Kumar	
		Dr. M. Sundareswari	

SPH5203	SPECTROSCOPY	L	T	P	Credits	Total Marks
		3	1	0	4	100

**COURSE OBJECTIVE**

To understand the basic principles of molecular spectroscopy in terms of the quantization of molecular energy and transitions between molecular energy levels when matter interacts with radiation.

**UNIT 1 MICROWAVE SPECTROSCOPY**

12 Hrs.

Rotation of molecules-Rotational spectra-Rigid and non-rigid diatomic rotator-Intensity of spectral lines-Isotopic substitution-Poly atomic molecules (Linear and symmetric top)-Hyperfine structure and quadrupole effects-Inversion spectrum of ammonia-Chemical analysis by microwave spectroscopy-Techniques and instrumentation.

**UNIT 2 VIBRATIONAL SPECTROSCOPY**

12 Hrs.

**Infrared spectroscopy**-Vibration of molecules-Diatomic vibrating rotator-vibrational rotational spectrum-Interactions of rotations and vibrations.

**UV-Visible, Fluorescence, and UV and X-ray photoelectron spectroscopies. Qualitative and quantitative applications of these methods in biochemistry**

**Raman Spectroscopy:** Classical and quantum mechanical picture of Raman effect-Polarizability-Pure rotational Raman spectrum-Vibrational Raman Spectrum- structural determination from IR and Raman spectroscopy techniques.

**UNIT 3 ELECTRONIC SPECTROSCOPY**

12 Hrs.

Electronic spectra-Frank-Condon principle-Dissociation energy and dissociation products-Fortrat diagram-predissociation- **Vibrational Coarse Structure Progression** shapes of some molecular orbits-Chemical analysis by electronic spectroscopy-Techniques and instrumentation- **ENERGY LEVELS, MOLECULAR ORBITALS AND ELECTRONIC SPECTRA OF POLYATOMIC MOLECULES** Mass spectroscopy-ESR spectroscopy-Introduction-techniques and instrumentation-Double resonance.

**UNIT 4 NUCLEAR SPECTROSCOPY**

12 Hrs.

Nuclear magnetic resonance spectroscopy-Introduction-Interaction of spin and magnetic field-population of energy levels-Larmor precession-Relaxation times-Chemical shift and its measurement-Coupling constant-coupling between several nuclei-quadrupole effects-<sup>13</sup>C NMR spectroscopy, Mossbauer spectroscopy: Principle-instrumentation-Effect of electric and magnetic fields.

**UNIT 5 GROUP THEORY**

12 Hrs.

Definition of a Group, sub-group, class, co-set – Lagrange's theorem – Invariant subgroup – Homomorphism and Isomorphism between groups – Representation of a group – Unitary representations – Schur's Lemmas – Orthogonality theorem – Character table – Simple application to symmetry groups and molecular vibrations (C<sub>2v</sub>, C<sub>3v</sub>, C<sub>4v</sub> point groups).

**Max. 60 Hours****TEXT/ REFERENCEBOOKS**

- Colin Banwell and Mc Cash, Fundamentals of molecular spectroscopy, 5<sup>th</sup> Edition, TMH publishers, 2013.
- J.Michael Hollas, Modern spectroscopy, 4<sup>th</sup> Edition, Wiley India Pvt. Ltd. 2010.
- S.L.Gupta, V.Kumar and R.C.Sharma, Elements of spectroscopy, 22<sup>nd</sup> Edition, Pragathi Prakasam publishers, Meerut, India, 2010.
- Gary M. Lampman, Donald L. Pavia, George S.Kriz and James R. Vyan, 4<sup>th</sup> Edition, Cengage learning India Pvt. Ltd.
- B.K.Sharma, Instrumental methods of chemical analysis, 24<sup>th</sup> edition, Goel publishing house, Meerut, 2005.
- J.Mohan, Organic spectroscopy principle and application, 2<sup>nd</sup> edition, New Age International (P) ltd, New Delhi, 2001.
- D.N.Sathyanarayana, Vibrational spectroscopy: Theory and applications, New Age International (P) ltd, New Delhi, 1996.
- Satya Prakash, Mathematical Physics, 6<sup>th</sup> revised edn, Sultan Chand & sons, Reprint, 2014.
- B.D. Gupta, Mathematical Physics, 3<sup>rd</sup> Revised Edition, Vikas **Publishing** House, 2004.

**ENDSEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks : 80**  
**Hrs.**

**Exam Duration : 3****PART A** : 6 Questions of 5 mark each - No choice.**30 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 10 marks.**50 Marks**

SPH5204	COMMUNICATION ELECTRONICS	L	T	P	Credits	Total Marks
		3	1	0	4	100

**COURSE OBJECTIVE**

To study the various types of communication techniques and their analysis based on Fourier transform and to provide fundamental knowledge of pulse modulation techniques and their types.

**UNIT 1 SIGNAL ANALYSIS****12 Hrs.**

Fourier transform of gate functions, delta functions at the origin – Two delta function and periodic delta function – properties of Fourier transform – Frequency shifting – Time shifting – Convolution theorem – Frequency convolution theorem – Sampling theorem.

**UNIT 2 PULSE MODULATION AND COMMUNICATION****12 Hrs.**

Pulse amplitude modulation – Natural sampling -Instantaneous sampling Transmission of PAM signals – Pulse width modulation – Time division multiplexing and frequency division multiplexing – Band width requirements for PAM signals – Pulse code modulation – Principles of PCU – Quantizing noise – Generation and demodulation of PCM – Effects of noise – Advantages and application of PCM – Differential PCM (DPCM) – Delta modulation.

**UNIT 3 BROAD BAND COMMUNICATION****12 Hrs.**

Coaxial cable circuit -Parallel wire line circuit – Computer communication – Digital data communication – Modems – Microwave communication links – LOS links – Tropospheric scatter microwave links – Integrated Service Digital Network (ISDN) – Architecture – Broadband ISDN – Local Area Network (LAN) – LAN topologies – Private Branch Exchange (PBX).

**UNIT 4 SATELLITE COMMUNICATION****12 Hrs.**

Introduction – Communication satellite systems – Transmitting and receiving earth station – Satellite orbits – Satellite frequency bands – Satellite multiple access formats – FDMA – CDMA – Satellite channel, Power flow – Polarization antenna gain – Parabolic dish antenna – Power loss – Rainfall effect – Receiver noise –satellite system power budget: EIRP, received power Carrier to noise ratio, G/T ratio. – Satellite link analysis – Up link – Down link – Cross link – Direct Home TV broadcasting – Satellite transponders.

**UNIT 5 RADAR SYSTEMS AND OPTICAL FIBER****12 Hrs.**

Introduction, Basic Radar systems, Radar systems – Radar range – Pulsed radar system – A Scope – Plan Position Indicator (PPI) – Search Radar – Tracking Radar – Moving Target Indicator (MTI) – Doppler Effect – MTI principle – Digital MTI – Radar Beacons .**Optical Fiber: Introduction to light, optical fiber and fiber cables, optical fiber characteristics and classification, losses, Fiber optic components and systems, Installation, testing and repair.**

**MOBILE COMMUNICATION**

Basic cellular systems, Performance criteria, Uniqueness of mobile radio environment, Operation of cellular systems, Concept of frequency reuse channels, Co-channel interference reduction factor, Desired C/I from a normal case in an Omni-directional antenna system, Handoff mechanism, Cell splitting. Cell coverage for signal and traffic, Obtaining the mobile point-to-point model, Propagation over water or flat open area, Foliage loss, Propagation in near-in distance, Long-distance propagation.

**TEXT/ REFERENCE BOOKS**

1. Anokh singh, Chhabra, A.K. Principle of communication engineering, S,Chand, New Delhi, 2006.
2. Robert M.Ganliardi, Satellite Communication, CBS Publication New Delhi.
3. Arumugam .M., Semiconductor Physics and Opto electronics, Anuradha Agencies, Kumbakonam, 2006.
4. Subir Kumar Sarkar, Optical Fibers and Fiber optical communication systems, S. Chand, New Delhi, 2007.
5. Lathi, B.P., Communication systems, B.S .Publication, 2001.
6. Dennis Roddy and John Coolen, Electronic communications, Prentice Hall of India Pvt. Ltd, New Delhi, 1998.

**ENDSEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 80****Exam Duration : 3 Hrs.****PART A :6** Questions of 5 mark each - No choice.**30 Marks****PART B :2** Questions from each unit of internal choice, each carrying 10 marks.**50 Marks**