

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (Autonomous) OOTY ROAD, MYSURU- 570 025

DEPARTMENT OF PHYSICS

Syllabus under State Educational Policy

For Ist BSc Programmes

- ✓ Physics, Chemistry, Mathematics
- ✓ Physics, Mathematics, Computer Science
- ✓ Physics, Mathematics, Electronics

Wef

2024-25

Program Outcomes (POs) for Bachelor of Science

PO 1: Domain Knowledge - Acquire and apply knowledge of science in relevant areas.

PO 2: Investigation & Research – Ability to formulate a hypothesis, augment research questions and identify & refer relevant sources for examining or inspecting technical issues as per their level of understanding and knowledge.

PO 3: Impact of Science on Society – To prepare competent human resources and to develop scientific attitudes at local and global levels for social benefit.

PO 4: Environment and Sustainability – Apply the knowledge gained for conserving the environment and to handle environmental issues with sustainable solutions.

PO 5: Moral and Ethical Values – Imbibe moral values and professional ethics to maintain integrality in a professional scenario while being aware of cultural diversities.

PO 6: Communication – Develop the caliber to convey various concepts of science effectively.

List of BoS Members

Sl	Category	Name &	Address for	Email &
No		Designation	Communication	Mobile No.
1	Chairperson	Dr. Vinaykumar.L Assistant Professor & HoD	Department of Physics JSS College of Arts,Commerce & Science (A), Ooty road, Mysuru - 25	vinaykumarphy@gmail.co m 9844583597
2	Member	Jagadish B Assistant Professor	Department of Physics JSS College of Arts,Commerce & Science (A), Ooty road, Mysuru - 25	guru08mallesh@gmail.co m 9880622421
3	Experts from Other University	Dr. Prasanna G D Assistant Professor	DOS in Physics, Shivagangothri, Davanagere University Davabagere	
4	AC Nominee	Dr. Shanmukhappa B Kaginelli Professor	Department of Physics JSSAHER Mysuru	
5	Nominee by the Vice Chancellor	Dr. S.Krishnaveni Professor	DOS in Physics, Manasagangothri, Mysuru.	<u>sk@physics.uni-</u> <u>mysore.ac.in</u> 9844023568
6	Alumnus/ One Person from Industry/ Corporate Sector/Allie d Area	Dr. Siddesha Associate Professor	Department of MCA SJCE, Mysuru	siddesh.shiv@sjce.ac.in 8884885076

Course Structure (2024)

Discipline Specific Courses (DSC)

I Year

Course type, Code and Title		Hours/week		Credits	Maximum Marks		Exam Duration	Total Marks	
			T/P	L: T: P	C1	C2	C3	Duration	IVIAI KS
	Physics- I Sem								
DSC(1)	Mechanics and Properties of Matter GPH 101	3	0	3:0:2	10	10	80	03 hours	150
	DSC(1)- Lab GPH 102	0	4	5 credits	05	05	40	03 hours	
			Physics	s- II Sem					
DSC(2)	Heat and Thermodynamics GPH 201	3	0	3:0:2 5 credits	10	10	80	03 hours	150
	DSC(2)- Lab GPH 202	0	4	3 creaits	05	05	40	03 hours	

DSC(1) Syllabus for B.Sc. Physics

Semester 1	[
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Course Code: GPH 101 GPH 102	Course Title: DSC(1)- Mechanics and Properties of Matter (Theory) DSC(1)- Lab (Practical)
Course Credits:	Hours of Teaching/Week:
05 (3:0:2)	03 (Theory) + 04 (Practical)
Total Contact Hours:	Formative Assessment Marks:
48 Hours (Theory)	20 (Theory)
60 Hours (Practical)	10 (Practical)
Exam Duration:	Semester-End Examination Marks:
03 Hours (Theory)	80 (Theory)
03 Hours (Practical)	40 (Practical)

	Course Outcomes (COs)					
CO1	Gaining the knowledge on concepts of Frame of reference, Dynamics of Point Particles and theory of Rigid bodies.					
CO2	Comprehending the conservation laws of Linear Momentum, Angular Momentum and Energy.					
CO3	Apprehending the theory of elasticity, Fluid mechanics and surface tension.					

PART A: 16 Hours

Frames of Reference: Inertial and Non-inertial reference frames with examples. Uniform rectilinear motion in an inertial frame. Uniformly accelerated rectilinear motion-concept of fictitious force-illustration; plumb line accelerometer and a freely falling elevator. Qualitative discussion of centrifugal force, Coriolis force and earth as a non-inertial frame, Numerical problems. [4 hours]

Motion of a Point Particle: Point mass. The position vector r(t) of a moving point particle and its Cartesian components. Velocity and acceleration as the vector derivatives. Derivation of planar vector of a constant magnitude. Radial and transverse components of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion centripetal force, Numerical problems.

[4 hours]

Rigid Body Dynamics: Review of definitions, Moment of inertia and radius of gyration. Review of statements of the theorems of the parallel and perpendicular axes. Relation between torque and angular acceleration. Expression for kinetic energy of a rigid body. Calculation of moment of inertia of rectangular lamina, circular lamina and of a solid cylinder. Theory of compound pendulum. Numerical problems.

[8 hours]

PART B: 16 Hours

Conservation of linear Momentum: Conservation of the linear momentum for a system of two particles. Rocket motion in a uniform gravitational field (single stage rocket equation with and without gravity). Multistage rocket elementary ideas. Elastic and inelastic collisions – Elastic head-on collision and elastic oblique collision in a lab frame, reduced mass. Numerical problems.

[5 hours]

Conservation of Angular Momentum: Review of angular momentum and Torque. Relation between angular momentum and torque. Law of conservation of angular momentum. Areal velocity derivation $\frac{dA}{dt} = \frac{1}{2}r^2 \dot{\theta} \hat{n}$. Central force: Physical insight into the nature of central forces. Kepler's laws of planetary motion- Derivations using Newton's laws. Numerical problems.

[06 hours]

Conservation of Energy: Conservative force and non-conservative forces with examples. Conservation of energy in a conservative force field. Applications: (i) Vertical oscillations of a loaded light spiral spring (derivation) and (ii) Calculation of escape velocity in the

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gravitational field of the earth (derivation). Condition for a geo-stationary satellite. Numerical problems. [5 hours]

PART C: 16 Hours

Elasticity: Concept of moduli of elasticity, Hooke's Law and Poisson's ratio σ . Relation between the elastic constants q, k, η and σ , Limiting values for σ . Workdone in stretching. Elastic potential energy. Bending moment. Theory of light single cantilever. I-section griders. Torsion- calculation of a couple per unit twist. The torsional pendulum, Static torsion, Searle's double bar experiment. Numerical problems. [7 hours]

Fluid Mechanics: Ideal fluid, equation of continuity, Bernoulli's theorem and applications of Bernoulli's equation-curved flight of a spinning ball-Magnus effect, the lift on an aircraft wing. Streamline flow and turbulent flow. Critical velocity and Reynolds number. Viscosity-Variation of viscosity of liquids with temperature and pressure. Theory of rotation viscometer. Numerical problems.

[5 hours]

Surface Tension: Surface Energy and Surface Tension-examples. Pressure inside curved liquid surface, excess of pressure inside a soap bubble. Angle of contact. Surface tension and interfacial tension by drop-weight method. Surface tension of mercury by Quincke's method – Theory. Numerical problems.

[4 hours]

References

- 1. Halliday D, Resnick R, and Walker J, Principles of Physics, 9th Edn., Wiley India Pvt. Ltd. (2013).
- 2. Upadhyaya J C, Classical Mechanics, 2nd Edn., Himalaya Publishing House (2017).
- 3. Arora C L, and Hemne P S, Physics for Degree Students, Revised Edn., S Chand and Company (2012).
- 4. Charles Kittel, and Walter Knight, Berkeley Physics Course, Mechanics Vol1, 2nd Edn., Tata McGraw Hill (2011).
- 5. Mathur D S, Elements of Properties of Matter, S Chand and Company(2007).
- 6. Mathur D S, Mechanics, S Chandand Company (2007).
- 7. Brij Lal, and Subrahmanyam N, Properties of Matter, 6th Edn., S Chand and Company (2002).
- 8. Shankara Narayana S R, Mechanics and Properties of Matter, 2nd Revised Edn., Sultan Chand and Sons (1998).
- 9. Gaur R. K and S.L Gupta, Engineering Physics, Dhanpant Rai Publications, Eighth edition (2001).

Weblinks

- https://www.fullonstudy.com/bsc-1st-year-physics-notes
- https://byjus.com/chemistry/properties-of-matter/
- https://edscl.in/course/view.php?id=347§ion=3

DSC(1) lab List of Experiments

Credit : L:T:P 0:0:2

(Minimum EIGHT experiments must be completed)

Sl. No.	Experiments
1.	Determination of g using bar pendulum.
2.	Determination of the moment of inertia of a Fly Wheel.
3.	Determination of rigidity modulus using a torsional pendulum.
4.	Modulus of rigidity of a rod – Static torsion method.
5.	Determination of elastic constants of a wire by Searle's method.
6.	Young's modulus by Koenig's method.
7.	Viscosity by Stoke's method.
8.	Determination of surface tension of a liquid and the interfacial tension between two liquids using the drop weight method.
9.	Study of motion of the spring and to calculate the Spring constant, g and unknown mass.
10.	Determination of Young's modulus of a bar by the single cantilever method.
11.	Determination of Young's modulus of a bar by uniform bending method.
12.	Verification of parallel and perpendicular axis theorems.

Course Articulation Matrix- Course code : GPH 101

Course	Program outcomes					
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	2	2
CO2	3	2	2	1	2	2
CO3	3	2	1	1	2	2
Weighted average	3	2	1.3	1	2	2

DSC(2) Syllabus for B.Sc. Physics

Course Code: GPH 201 GPH 202	Course Title: DSC(2)- Heat and Thermodynamics (Theory) DSC(2)-lab		
Course Credits:	Hours of Teaching/Week:		
05 (3:0:2)	03 (Theory) + 04 (Practical)		
Total Contact Hours:	Formative Assessment Marks:		
48 Hours (Theory)	20 (Theory)		
60 Hours (Practical)	10 (Practical)		
Exam Duration:	Semester-End Examination Marks:		
03 Hours (Theory)	80 (Theory)		
03 Hours (Practical)	40 (Practical)		

Semester II

	Course Outcomes (COs)					
CO1	Comprehension of kinetic theory and radiation laws, Thermal conductivity and statistical physics.					
CO2	Gaining the knowledge on the Concepts of Thermodynamics and Entropy.					
CO3	Acquiring the knowledge on thermodynamics systems through derived thermodynamic relations, low temperature physics and vacuum technology.					

PART A: 16 Hours

Kinetic Theory: Maxwell's law of distribution of molecular velocity (no derivation); its interpretation. Degrees of freedom. Principle of equipartition of energy based on Kinetic theory of gases. Derivation of U = 3/2 RT. Mean free path, expression for mean free path, probability of a particle having mean free path. Real gases, Andrew's isothermals, Van der Waals equations – expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. Numerical problems.

Thermal Conductivity: Equation for the flow of heat through a solid bar. Determination of thermal conductivity of a bad conductor by Lee and Charlton method. Numerical problems.

[2 hours]

Statistical Physics: The Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the MB, BE and FD statistics and their applications. [2 hours]

Radiation: Planck's quantum theory of radiation. Induced and spontaneous emission of radiation. Derivation of Planck's law of radiation using Einstein's A and B coefficients. Deduction of Rayleigh-Jeans law, Stefan's law and Wien's displacement law from Planck's law. Numerical problems.

[4 hours]

PART B: 16 Hours

Thermodynamics: Review of basic concepts of heat and temperature - the Zeroth law of thermodynamics. Differential form of the first law of thermodynamics, Work done in an isothermal and adiabatic process for an ideal gas (Derivations). Second law of thermodynamics (Kelvin's & Clausius' statements and their equivalence), Reversible and irreversible processes with examples. Carnot theorem (statement and proof). Carnot cycle and its efficiency(derivation). Carnot Engine. Refrigerator-Coefficient of performance. Thermodynamic scale of temperature and its identity with perfect gas scale. First order Phase transition with examples. Clausius-Clapeyron first latent heat equation. Numerical problems

[10 hours]

Entropy: The concept of entropy. Change of entropy in reversible and irreversible cycles. Entropy and non-available energy. Second law of thermodynamics in terms of entropy. Entropy of ideal gas, entropy of steam and mixtures. T-S diagram. Third law of thermodynamics - statement, significance and unattainability of absolute zero. Microscopic interpretation of entropy (Boltzmann relation). Numerical problems.

[6 hours]

[8 hours]

PART C: 16 Hours

Thermodynamic Potentials and Maxwell's Thermodynamic Relations:

Internal Energy, Enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs-Helmholtz Equations. Derivation of Maxwell's Thermodynamic Relations (using Thermodynamic Potentials). TdS equations for C_p and C_v . Heat Capacity equations. Derivation of C_p - C_v =R using Maxwell's Relations. Internal Energy equations. Numerical problems.

[6 hours]

Low Temperature Physics: Ideal gas and real gas. Van der Waals equation of state. Porous plug experiment and its theory. Joule-Thomson expansion expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's method. Adiabatic demagnetization. Cryogenics and its applications(qualitative). Numerical problems.

[6 hours]

Vacuum Technology: Introduction, Exhaust pump and their characteristics, Measurement of low pressure, Pirani gauge. Numerical problems. [4 hours]

References

1. Halliday and Resnick: Fundamentals of Physics, 9th edition, Wiley India, 2011.

2. R. H. Dittaman and M. W. Zemansky: Heat and Thermodynamics, 7th edition, Tata McGraw-Hill companies, 2007.

3. S. J. Blundell and K. M. Blundell: Concepts in Thermal Physics, 2nd edition, Oxford University Press, 2006.

4. Brijlal, N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1st edition. S Chand Publishing, 2007.

5. S C Gupta: Thermodynamics, 1st edition, Pearson, 2005.

6. C. L. Arora: Refresher Course in Physics Vol I, S Chand publishing, 2011.

7. S. R. Shankara Narayana: Heat and Thermodynamics, 2nd edition, Sulthan Chand and Sons, 1990.

8. Gaur R.K and S.L Gupta, Engineering Physics, Dhanpant Rai Publications, 8th edition (2001).

9. Mark W. Zemansky, Heat and Thermodynamics, Tata McGraw Hill, 7th edition (1997).

Weblinks

- https://deepblue.lib.umich.edu/bitstream/handle/2027.42/75853/ayd_1.pdf/
- https://sites.ualberta.ca/gingrich/courses/phys395/notes/phys395/
- https://www.researchgate.net

DSC(2) lab List of Experiment

Credit : L:T:P 0:0:2

(Minimum EIGHT experiments must be completed)

Sl.No.	Experiments
1	Verification of Gaussian distribution law and calculation of standard deviation –
	Monte Carlo experiment.
2	Specific heat by Newton's law of cooling -graphical method
3	Verification of Stefan's Boltzmann fourth power law using Meter bridge.
4	Determination of thermal conductivity of a bad conductor by Lee- Charlton
	method.
5	Coefficient of thermal conductivity of copper by Searle's apparatus
6	Estimation of Stephen's constant.
7	Determination of Solar constant.
8	Determination of boiling point of a liquid by using a platinum resistance
	thermometer.
9	Determination of temperature coefficient of resistance of a platinum resistance
	thermometer.
10	Verification of Stefan's fourth power law using an electrical lamp.

Course Articulation Matrix- Course code : GPH 201

Course	Program outcomes					
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	2	2
CO2	3	2	1	1	2	2
CO3	3	2	1	1	2	2
Weighted average	3	2	1	1	2	2

Scheme of Valuation for Theory and Practicals

Theory: The student performance is evaluated for 20 marks each in C1 and C2, and they must be reduced to 10 marks each. C3 should be conducted for 80 marks as per the university order.

Practical: C1 and C2 are internal tests to be conducted during 8th and 16th weeks respectively of the semester. C3 is the semester-end examination conducted for 3 hours. The student will be evaluated on the basis of skill, comprehension and recording the results.

The students has to compulsorily submit the practical record during C1 and C2. For C3, the record has to be certified by the Headof the Department.

• The student is evaluated for 10 marks in C1 and C2 as per the following scheme: Experiment: 08, Record: 02.

The marks scored is then normalised for 5.

• The student is evaluated for 40 marks in C3 as per the following scheme:

Component	Marks
Experiment	35
Viva	05
Total	40

The experiment portion of evaluation is carried out as per the following scheme:

Heading	Marks
Write up:Observations, Formula with proper units and explanation, relevant tabular column, diagrams/circuitdiagrams,nature of curves, if there are any and calculations from it.	08
Setting up the apparatus/circuit connection	05
Taking reading and tabulating	10
Calculation with or with out graph	10
Accuracy of result	02
Total	35

DSC THEORY QUESTION PAPER PATTERN FOR I AND II SEMESTER

Max Marks: 80Exam duration: 03 hoursPART – AExam duration: 03 hoursLong answer questions; Answer 2 out of 3 $2 \ge 10 = 20$ PART – BPART – BLong answer questions; Answer 2 out of 3 $2 \ge 10 = 20$

PART – D

Long answer questions; Answer 2 out of 3 $2 \times 10 = 20$

$\mathbf{PART} - \mathbf{E}$

Numerical problems; two from each PART; Answer 4 out of 6 $4 \times 5 = 20$

Panel of Examiners recommended by Board of Studies in Physics (2023-24)

Dr. Vinaykumar. L	Prof. Madhusudhan G J
JSS College of Arts, Commerce & Science	Associate Professor,
(Autonomous), BN Road,	Govt. First grade college,
Mysuru-25	Bengaluru
Dr. T.N.Mahadeva Prasad	Mr. Dhanushchandraguru H M
Govt. First Grade College	Sharadavilas College,
Gundulpete	Mysuru
Prof. Nagesh babu	Sri.M.Mallikarjunaswamy
Yuvaraja college	JSS College for Women,
Mysuru	Chamarajanagar.
Dr.S R Kumarswamy	Smt.N.Bharathi
GFGWC, Byrapura	MMK & SDM College,
T.N.Pura	Mysuru
Dr.Tippeswamy	Mr. Niranjan
Government first grade college	KSOU,
Mysuru	Mysuru
Smt. Sowmya. B	Mr. Gowtham G K
JSS College for Women,	Shivagangothri, Davangere University,
Saraswathipuram Mysuru	Davangere
Sri. Umesh	Mr. Karthik K G
JSS College for Women,	JSS College of Arts, Commerce & Science
Saraswathipuram, Mysuru	(Autonomous), BN Road, Mysuru-25
Sri. Jagadish.B	Sri. Sukanth.B.M
JSS College of Arts, Commerce & Science	Yuvaraja College,
(Autonomous), BN Road, Mysuru	Mysuru
Dr. Prasanna G D	Dr. Khaleel Ahmed
Shivagangothri, Davangere University,	Govt. College,
Davangere	Hassan
Sri. Sadashivaiah	Mr. Krishna Mohan
Yuvaraja college	Maharani's science college for women
Mysuru	Mysuru
Dr. Manjunatha. B.C.	Smt. Lakshmi S
Yuvaraja college	JSS College of Arts, Commerce & Science
Mysuru	(Autonomous), BN Road, Mysuru-25
Mr. Yashwanth D B	Smt. Shwetha
JSS College for Women, Saraswathipuram,	Yuvaraja college,
Mysore	Mysuru
Smt. Asharani T S	Mr. Ravitheja R
JSS college for women	JSS College,
Chamarajanagar	Nanjangud
Chaillaiajallagai	เงลามูลแซนน

Smt. Harshitha D B	Dr. Manjunatha M S	
JSS college for women	Govt. first Grade College,	
Chamarajanagar	Chamarajanagara	
Smt. Thejakshi	Smt. Roopadevi	
Govt. college for Boys , Mandya	Govt. College for Boys, Mandya	
Kum. Manjuladevi.M	Smt. Mahalakshmi	
Marimallappa college,	Govt. College for boys,	
Mysuru	Mandya	
Dr.Raman	Mr. Elizer vishwas	
RIE , Mysuru	St. Philomenea's college, Mysuru	
Dr.Santhosh	Dr. Shankarashan	
RIE , Mysuru	NIE, Mysuru	
Mr. Madhusudhana R	Mr. Mahadevaprasad P	
NIE, Mysuru	SJCE, Mysuru	
Smt. Shwetha U S	Smt. Thejaswini	
JSS College of Arts, Commerce & Science	Yuvaraja college,	
(Autonomous), BN Road, Mysuru-25	Mysuru	
Smt. Milana Nagaraju	Mr. Prathap	
Yuvaraja college,	Sharadavilas College,	
Mysuru	Mysuru	
Ms. Meghana R	Ms. Krupashree P	
JSS College for Women, Saraswathipuram,	Yuvaraj's science college	
Mysuru	Mysuru	
Ms. Geethanjali	Smt. Sowmya.H.B	
Sharadavilas college,	JSS college,	
Mysuru	Nanjangud	

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (AUTONOMOUS) OOTY ROAD, MYSURU-25

DEPARTMENT OF PHYSICS

PROCEEDINGS OF THE MEETING OF BOARD OF STUDIES FOR THE PROGRAMMES BSc IN PHYSICS-CHEMISTRY-MATHEMATICS, PHYSICS-MATHEMATICS-COMPUTER SCIENCE AND PHYSICS-MATHEMATICS-ELECTRONICS, HELD ON 13th AUGUST 2024 AT 10.30 AM IN THE CHAMBER OF THE CHAIRMAN, DEPARTMENT OF PHYSICS, JSS COLLEGE, OOTY ROAD, MYSURU-25

MEMBERS PRESENT	SIGNATURE
Dr. Vinaykumar. L	
Asst. Professor & HOD	
Department of Physics	
JSS College, Ooty Road, Mysuru-25	
Chairman	
Dr. S. Krishnaveni	
Professor and Chairperson	
DOS in Physics, Manasagangothri	
University of Mysore	
(VC Nominee)	
Dr. Shanmukhappa B Kaginelli	
Professor	
Department of Physics	
JSSAHER, Mysuru	
(AC Nominee)	
Dr. Prasanna .G. D	
Assistant Professor,	
Dos in Physics	
Shivagangothri, Davangere University, Davangere	
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Alumini	
Mr. Jagadish.B	
Assistant Professor, Department of Physics	
JSS College, Ooty Road, Mysuru-25	
Senior faculty	

At the outset, the Chairman, BOS in Physics, welcomed the members to the meeting of BOS and briefed about the agenda to be discussed. The following agenda was placed by the Chairman which was discussed and resolved as follows:

Agenda 1: To frame/ revise, discuss and approve the Scheme/ Syllabus under SEP for the programmes: BSc in PCM, PMCs, PME from the academic year 2024-25 onwards.

The Chairman appraised the members about the three year SEP implementation for degree students as per University of Mysore norms and a draft revised/ modified Scheme/ Syllabus/panel of examiners was presented and placed before the Board for their opinion and approval.

Resolution: The BOS discussed about various aspects of the SEP and also suggested that as per the guidelines of University of Mysore and Government of Karnataka, the SEP programme can be implemented for the academic year 2024-25.

Agenda 2: To prepare the Panel of Examiners for the examinations for the year 2024-25.

The Chairman presented the proposed Panel of Examiners to I to VIII Semester examinations of 2024-25.

Resolution: After incorporating of certain changes suggested by the members, the Panel of Examiners was approved.

Agenda 3: Approval of Reference Books

The Chairman presented the proposed list of Reference Books to the Members.

Resolution: After incorporating of certain changes suggested by the members, the list of Reference Books was approved.

--NIL--

Finally the meeting was concluded with the Chairman thanking the Members for their active participation in the deliberations of the meeting.

Chairman