

# **BANASTHALI VIDYAPITH**

## **Bachelor of Technology (ECE)**



### **Curriculum Structure**

Sixth Semester Examination

**BANASTHALI VIDYAPITH**  
**P.O. BANASTHALI VIDYAPITH**  
**(Rajasthan)-304022**

July, 2020

**No. F. 9-6/81-U.3**

**Government of India  
Ministry of Education and Culture  
(Department of Education)**

New Delhi, the 25th October, 1983

**NOTIFICATION**

In exercise of the powers conferred by Section 3 of the University Grants Commission Act, 1956 (3 of 1956) the Central Government, on the advice of the Commission, hereby declare that Banasthali Vidyapith, P. O. Banasthali Vidyapith, (Rajasthan) shall be deemed to be a University for the purpose of the aforesaid Act.

Sd/-

**(M. R. Kolhatkar)**

Joint Secretary of the Government of India

**NOTICE**

Changes in Bye-laws/Syllabi and Books may from time to time be made by amendment or remaking, and a Candidate shall, except in so far as the Vidyapith determines otherwise, comply with any change that applies to years she has not completed at the time of change.

# **Bachelor of Technology**

## **Electronics and Communication Engineering**

### **Programme Educational Objectives**

The B.Tech. (ECE) programme aims for the holistic development of students through the unique and innovative fivefold educational ideology of Banasthali Vidyapith. Electronics now become the integral part of our lives. As the world continues to rely on Electronics technology, there is a great requirement for those engineers who are able to design, create, and maintain the many products and systems that support electronics technology. Electronics engineers develop innovative technology solutions in a wide range of areas from handheld communications to solar panels; from cardiac pacemakers to autonomous robots; from wireless networks to bio-engineered sensors that detect dangerous pathogens; and intelligent surveillance systems that perform face and motion recognition.

The program aims to deepen the knowledge and skills of the students on the basic concepts and theories that will equip them in their professional work involving analysis, systems implementation, operation, production, and maintenance of the various applications in the field of Electronics and Communications. The curriculum is designed in a way that it will equip students with a solid grasp of mathematical, scientific, and engineering concepts, through classroom education and laboratory exercises. Graduates of the program are expected to develop and use professional skills that facilitate their continued carrier growth well beyond their graduation.

The main objectives of the program are:

- To provide students solid foundation in mathematical and engineering fundamentals required to solve engineering problems and also to pursue advanced studies. This serves them lifelong in their professional domain as well as higher education.
- To develop an ability to integrate fundamental knowledge of basic science, mathematics and engineering to work on complex problems in the field of Electronics and Communication.
- To prepare engineers to work in inter-disciplinary environment, either independently or in a team, and demonstrate leadership qualities.
- Practice the ethics of their profession, consistent with a sense of social responsibility and develop their engineering design, problem-solving skills and aptitude for innovations as they work individually and in multi-disciplinary teams.
- Inculcate a lifelong learning culture.
- To formulate problems and projects and to plan a process for solution.
- Communicate effectively and manage resources skillfully as members and leaders of the profession.

- To prepare competent engineers at various national and international levels.

### **Programme Outcomes**

- PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and Electronics engineering to the solution of complex engineering problems.
- PO2. Problem analysis:** Review, Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences, and engineering sciences.
- PO3. Design/development of solutions:** Develop solutions for complex engineering problems and design system components/processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. Conduct investigations of complex problems:** Use scientific and engineering knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. Modern tool usage:** Apply appropriate techniques, resources, and modern engineering tools including MATLAB, LabView, Proteus, VHDL, Arduino and related hardware to complex engineering activities with an understanding of the limitations.
- PO6. The engineer and society:** Apply reasoning gained by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge for sustainable development.
- PO8. Ethics:** Apply ethical principles and commit to professional ethics responsibilities and norms of the engineering practice.

- PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary surroundings.
- PO10. Communication Skill:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Curriculum Structure

### Bachelor of Technology (Electronics and Communication Engineering)

#### Semester – VI

Course	Code	Course Name	C*
BVF	009/	Women in Indian Society/ Parenthood	3
BVF	006	and Family Relation	
MGMT	310/	Principles of Management/	3
ECO	307	Fundamentals of Economics	
STAT	204/	Probability and Statistical Methods/	4
MATH	311	Numerical Methods	
ECE	305	Microwave Engineering	4
ECE	305L	Microwave Engineering Lab	1
EIE	311	Control Systems	4
EIE	302L	Control Systems Lab	1
ECE	304	Digital Communication	4
ECE	304L	Digital Communication Lab	1
ECE	306P	Project	2
<b>Semester Total:</b>			<b>27</b>

\* C- Credit Points of the Course

## Five Fold Activities

<b>Aesthetic Education I/II</b>	<b>Physical Education I/II</b>
BVFF 101 Classical Dance (Bharatnatyam)	BVFF 201 Aerobics
BVFF 102 Classical Dance (Kathak)	BVFF 202 Archery
BVFF 103 Classical Dance (Manipuri)	BVFF 203 Athletics
BVFF 104 Creative Art	BVFF 204 Badminton
BVFF 105 Folk Dance	BVFF 205 Basketball
BVFF 106 Music-Instrumental (Guitar)	BVFF 206 Cricket
BVFF 107 Music-Instrumental (Orchestra)	BVFF 207 Equestrian
BVFF 108 Music-Instrumental (Sarod)	BVFF 208 Flying - Flight Radio Telephone Operator's Licence (Restricted)
BVFF 109 Music-Instrumental (Sitar)	BVFF 209 Flying - Student Pilot's Licence
BVFF 110 Music-Instrumental (Tabla)	BVFF 229 Aeromodelling
BVFF 111 Music-Instrumental (Violin)	BVFF 210 Football
BVFF 112 Music-Vocal	BVFF 211 Gymnastics
BVFF 113 Theatre	BVFF 212 Handball
<b>Practical Education I/II</b>	BVFF 213 Hockey
BVFF 301 Banasthali Sewa Dal	BVFF 214 Judo
BVFF 302 Extension Programs for Women Empowerment	BVFF 215 Kabaddi
BVFF 303 FM Radio	BVFF 216 Karate - Do
BVFF 304 Informal Education	BVFF 217 Kho-Kho
BVFF 305 National Service Scheme	BVFF 218 Net Ball
BVFF 306 National Cadet Corps	BVFF 219 Rope Mallakhamb
	BVFF 220 Shooting
	BVFF 221 Soft Ball
	BVFF 222 Swimming
	BVFF 223 Table Tennis
	BVFF 224 Tennis
	BVFF 225 Throwball
	BVFF 226 Volleyball
	BVFF 227 Weight Training
	BVFF 228 Yoga

Every Student shall also opt for:

Five Fold Education: Physical Education I, Physical Education II,

Five Fold Education: Aesthetic Education I, Aesthetic Education II,

Five Fold Education: Practical Education I, Practical Education II

one each semester

## Evaluation Scheme and Grading System

Continuous Assessment (CA) (Max. Marks)					End-Semester Assessment (ESA) (Max. Marks)	Grand Total (Max. Marks)
Assignment		Periodical Test		Total (CA)		
I	II	I	II			
10	10	10	10			

In all theory, laboratory and other non classroom activities (project, dissertation, seminar, etc.), the Continuous and End-semester assessment will be of 40 and 60 marks respectively. However, for Reading Elective, only End semester exam of 100 marks will be held. Wherever desired, the detailed breakup of continuous assessment marks (40), for project, practical, dissertation, seminar, etc shall be announced by respective departments in respective student handouts.

Based on the cumulative performance in the continuous and end-semester assessments, the grade obtained by the student in each course shall be awarded. The classification of grades is as under:

Letter Grade	Grade Point	Narration
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C+	5	Average
C	4	Below Average
D	3	Marginal
E	2	Exposed
NC	0	Not Cleared

Based on the obtained grades, the Semester Grade Point Average shall be computed as under:

$$SGPA = \frac{CC_1 * GP_1 + CC_2 * GP_2 + CC_3 * GP_3 + \dots + CC_n * GP_n}{CC_1 + CC_2 + CC_3 + \dots + CC_n} = \frac{\sum_{i=1}^n CC_i * GP_i}{\sum_{i=1}^n CC_i}$$



Where n is the number of courses (with letter grading) registered in the semester,  $CC_i$  are the course credits attached to the  $i^{\text{th}}$  course with letter grading and  $GP_i$  is the letter grade point obtained in the  $i^{\text{th}}$  course. The courses which are given Non-Letter Grades are not considered in the calculation of SGPA.

The Cumulative Grade Point Average (CGPA) at the end of each semester shall be computed as under:

$$CGPA = \frac{CC_1 * GP_1 + CC_2 * GP_2 + CC_3 * GP_3 + \dots + CC_n * GP_n}{CC_1 + CC_2 + CC_3 + \dots + CC_n} = \frac{\sum_{i=1}^n CC_i * GP_i}{\sum_{i=1}^n CC_i}$$

Where n is the number of all the courses (with letter grading) that a student has taken up to the previous semester.

Student shall be required to maintain a minimum of 4.00 CGPA at the end of each semester. If a student's CGPA remains below 4.00 in two consecutive semesters, then the student will be placed under probation and the case will be referred to Academic Performance Review Committee (APRC) which will decide the course load of the student for successive semester till the student comes out of the probationary clause.

To clear a course of a degree program, a student should obtain letter grade C and above. However, D/E grade in two/one of the courses throughout the UG/PG degree program respectively shall be deemed to have cleared the respective course(s). The excess of two/one D/E course(s) in UG/PG degree program shall become the backlog course(s) and the student will be required to repeat and clear them in successive semester(s) by obtaining grade C or above.

**After successfully clearing all the courses of the degree program, the student shall be awarded division as per following table.**

Division	CGPA
Distinction	7.50 and above
First Division	6.00 to 7.49
Second Division	5.00 to 5.99
Pass	4.00 to 4.99

**CGPA to % Conversion Formula: % of Marks Obtained = CGPA \* 10**

## **BVF 006 Parenthood and Family Relation**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

Upon completion of the course students will be able to:

- Observe children at different age levels in different situations and record them
- Prepare age related teaching aids
- Evaluate ,modify and compose age related printed materials / songs /and stories
- Plan and organize play activities / games, role plays, parties/ get together for children of different age groups

**Note :** The paper will contain seven questions in all. Candidates are required to attempt any four.

- Meaning and definition of parenthood, Human reproductive system and conception.
- Symptoms of pregnancy, common discomforts during pregnancy, Care during pregnancy.
- Child Care - Feeding, weaning, toilet training, rest & sleep, personal grooming common ailments in children.
- Techniques of child rearing and impact on child's personality. Role of parents as facilitators of growth and development.
- Family Life Education Meaning and significance of family Interpersonal relationship within the family. Role conflicts and its resolution.
- Brief introduction to different aspects of development - (Physical, Motor, Social, Emotional, Cognitive, Language and Moral.)
- Introduction to reproductive health with brief discussion on STD/AIDS and sexual misbehaviour.
- Sex education importance and methods
- Contemporary Issue, Mental health and hygiene, Drug Addition, Marriage and family counseling.

### **Learning Experiences :**

1. Observing children at different age levels in different situations.

2. Recording observations, including Anecdotal records on Individual differences in difference aspects of behaviour.
3. Preparing age related teaching aid
4. Viewing educational films followed by group discussion.
5. Case Studies.
6. Evaluating printed materials - (Magazines, news papers, articles from the books)
7. Collecting, composing and modifying age related songs and stories.
8. Introspecting one's own past childhood experiences, with parents, siblings, friends neighbours etc.
9. Planning and organizing play activities and games for children of different age groups.
10. Group discussions/Buzz sessions.
11. Role playing.
12. Planning for celebrating festivals, parties, get together.

#### **References :**

1. Agrawal, N. (1995). Matrakala Evam Shishu Palan. Agra: Vinod Pustak Mandir.
2. Bhargav, B. (1999). Family Health and Community Welfare. Jaipur: University Book House.
3. Hurlock, E.B. (1980). Developmental Psychology – A life span Approach (5th ed.). New York, NY: Tata McGraw Hill Publishing Co. Ltd.
4. Kulkarni, S., & Kulkarni, S. (1995). Responsible Parenthood and Harmonious Families. Jaipur: Classis Pub. House.
5. Minett, P.M. (2001). Child Care and Development (4th ed.). London, United Kingdom, UK: John Murray.
6. Santrock, J.W. (2008). Life Span Development. New York, NY: Tata McGraw Hill Companies, Inc.
7. Sharma, K. (1993). Bal Vikas. Agra: Star Publications.
8. Sharma, K., & Sharma, L. (1993). Matrkala Evam Bal Vikas (pancham sanskarn). Agra: Star Publications.
9. Sharma, N. (1999). Understanding Adolescence. New Delhi: National Book Trust.

10. Sheri, J.P. (1991). Matrkala Evam Shishu Kalyan. Agra: Vinod Pustak Mandir.
11. Singh, V. (2012). Matrkala Evam Shishu Kalyan (5th ed.). Jaipur: Panchsheel Prakashan.
12. Hurlock, E.B. (1988). Child Development (6th ed.). New York, NY: Tata McGraw Hill Publishing Co. Ltd.

#### **E-resources:**

1. Childhood and Growing Up 1MB  
<https://drive.google.com/open?id=0Bwk5FIIsI0ctxTUNrazYzRfPsdms>
2. Guidance and Counseling 14MB  
<https://drive.google.com/open?id=Bwk5FIIsI0ctxSm5ERUNtTG1KaLU>

### **BVF 009 Women in Indian Society**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

#### **Learning Outcomes:**

After the completion of the course, the students will be able to

- Understand the basic concept of equality in mythological narratives.
- Develop an understanding of how identity formation of women in socio cultural and professional settings takes place and sustains in our social setting.
- Learn about life changing experiences and accomplishments of women role models in different fields and be inspired.
- Critically evaluate the contributions of women's universities in making of women leaders.

**Note :** There will be 7 questions in all the students are required to attempt 4 questions.

Concept of Sex, Gender and Identity Formation of Women.

Concept of Justice and Equality: Constitutional Provisions, their Implication with reference to Customary and Discriminatory Practices.

Women in Pre-independence India: Social Reform Movements with reference to Prohibition of 'Child Marriage' and 'Sati'; Women's Participation in Indian Freedom Struggle.

Status of in Post Independence India with reference to Social, Educational, Health, Political and Economics status.

Rights and laws for the Empowerment of Women. Personnel Laws and debate on Uniform Civil Code, Property Rights of Women among Hindus, Muslims and Christians.

Domestic Violence Act, 2005

Sexual Harasment at Work Place. (**Vishakha Case**)

Women's Movements in India and Challenges Ahead

### **Recommended Books**

1. Ahuja, M. L. (2011). *Women in Indian Mythology*. Delhi: Rupa Publications.
2. Altekar, A. S. (1956). *Position of Women in Hindu Civilization*. Delhi: Motilal Banarsidas.
3. Desai, Neera. (2001). *Women in Modern India*. Delhi: National Book Trust.
4. Desai, Neera & Maitreyi. (1986) *Women and Society*. Delhi: Ajanta Publications.
5. Kumar, Radha. (1993). *The History of Doing; An Illustrated Account of Movements For Women's Rights And Feminism in India, 1800-1990*, Zubaan, New Delhi.
6. Bhalla, K. S. (2006). *Great Women of India*. Delhi: Kalpaz Publications.
7. Forbes, Geraldine. (2008). *Women in Independent India*. New York: Cambridge University Press.

### **Suggested E-Resources**

1. Women in Ancient India, Mythology  
<http://www.legalservicesindia.com/article/1867/The-Socio-Economic-Status-of-Women-in-India-Ancient-to-Modern-Era.html>  
<https://timesofindia.indiatimes.com/life-style/books/photo-stories/fascinating-women-from-mythology/photostory/58495315.cms>
2. Gender, Identity and Socialization  
<https://blogs.unicef.org/evidence-for-action/what-is-gender-socialization-and-why-does-it-matter/>  
[https://www.jstor.org/stable/27520847?seq=1#metadata\\_info\\_tab\\_contents](https://www.jstor.org/stable/27520847?seq=1#metadata_info_tab_contents)

3. Women & Freedom Movement  
[https://www.academia.edu/6399139/Role\\_of\\_Women\\_in\\_India\\_s\\_Struggle\\_for\\_Freedom](https://www.academia.edu/6399139/Role_of_Women_in_India_s_Struggle_for_Freedom)
4. Women and Socio-economic, Political, Health Status  
[http://shodhganga.inflibnet.ac.in/bitstream/10603/8562/7/07\\_chapter%202.pdf](http://shodhganga.inflibnet.ac.in/bitstream/10603/8562/7/07_chapter%202.pdf)
5. Inspiring Women of India  
<https://www.indiatoday.in/entertainment/photo/indias-25-most-influential-women-369340-2013-03-13/14>  
<https://owlcation.com/humanities/Greatest-Indian-Women-From-History>

## **ECO 307 Fundamentals of Economics**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

Upon Completion of the course student will be able to:

- Understand various aspects of economics that affects the day today functioning of business.
- Understand the concept of demand, supply and production and how the same is related to market.
- Understand the basic financial concepts that affects the functioning of the business.

### **Section A**

What Economics is all about? Micro and Macro Economics. Origin and meaning of Engineering Economics, Role of Economics in Engineering, Scope of Engineering Economics.

Theory of Demand: Law of Demand, Demand Function and Determinants of Demand, Types of Demand.

Elasticity of Demand: Concept, Types and Measurement.

### **Section B**

Production function and Laws of Production. Optimal Input combination. Cost concepts and cost output relationship.

Types of market structures; Determination of equilibrium price and output under perfect competition.

### **Section C**

Timevalue of Money and Project Evaluation: Interest Formulas; Cash Flow Diagram; Principles of Economic Equivalence, Evaluation of Engineering Projects using methods of Present Value and Internal Rate of Return.

Capital Budgeting: Concept and significance of capital budgeting.

Depreciation Analysis: Meaning and causes of depreciation; methods of calculating depreciation – straightline and declining balance methods.

#### **Suggested Readings:**

1. Thuesen. G.J., and Fabrycky, N. Engineering Economy, (9 ed) PHI Learning Private Limited, New Delhi.
2. S. Park Chan: Contemporary Engineering Economics: 3rd Edition, Prentice Hall.
3. M. Parkin: Economics: 5th Edition, Addison Wesley.
4. Mahendra P. Agasty: Engineering Economics and Costing, Second Edition: Scitech Publications (India) Pvt. Ltd.
5. R. Panneerselvam: Engineering Economics, Tenth Printing: PHI Learning Private Limited, New Delhi.

#### **Suggested E learning Material**

1. Agrawal, D. (2017, Mar 8). Indifference Curve. Retrieved from Youtube: [https://www.youtube.com/watch?v=3l\\_rYca4eio](https://www.youtube.com/watch?v=3l_rYca4eio).
2. econ (2012). Cost. Retrieved from: Guide: <http://www2.econ.iastate.edu/classes/econ301/jintanakul/Notes/Ch7.pdf>
3. Khan, Y. (2014, Dec 18). Production Function . Retrieved from Youtube: <https://www.youtube.com/watch?v=MwuTt3L2hEQ>.
4. Bhogal, S. (2018, June 04). Income and Cross Elasticity. Retrieved from Youtube: <https://www.youtube.com/watch?v=i7O4CriwwrY>.

## **MGMT 310 Principles of Management**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

Upon completion of the course the student will be able to:

- Evaluate the global context for taking managerial actions.
- Understand conflict resolution, motivation and leadership.
- Understand application of theories and management principles.

### **Section A**

What is management? Scientific approach-Taylor's contribution, administrative approach-Henry Fayol's contribution, human relation approach-Elton Mayo's contribution, system approach.

Planning: Need and process, types of plans-goals, objectives, policies and strategies; decision making-situations and process.

### **Section B**

Organizing: Organization structure, departmentation, centralization v/s decentralization, span of management, delegation and power of authority.

Motivation-importance, theories of motivation-Maslow, McClelland Herzberg, theories.

### **Section C**

Theories and styles of leadership-Trait, behavioral.

Communication: Process and principles, types of communication, barriers to communication.

Control: Process of evaluation & control, method of control.

### **Suggested Reading:**

1. Tripathi, P. C., & Reddy, P. N. (2017) Principles of Business Management, (22ed.) Tata McGraw Hill, New Delhi
2. Robbins & D. Cenzo. *Fundamentals of Management (10ed)*, New Delhi, Pearson Education Asia
3. Prasad, L.M. *Principles and practice of Management (9ed)*. Sultan Chand & sons, New Delhi
4. Wehrich & Koonts. *Management-A Global Perspective (13ed)*, Tata McGraw Hill, New Delhi



**Suggested E-Learning Material:**

1. Prachi, J. (2016). *Planning Function of Management*. Retrieved from Management Study Guide:  
[https://www.managementstudyguide.com/planning\\_function.htm](https://www.managementstudyguide.com/planning_function.htm)
2. Amit, L. (2018, December). *Controlling: Features, process and types*. Retrieved from: <https://www.youtube.com/watch?v=JRVXfaFrMEM>
3. Brian, T. (2017, May 11). *Different Types of Leadership Styles*. Retrieved from: <https://www.youtube.com/watch?v=vilZazhIjoc>
4. Chandan, P (2017, September 26). *Organising: Meaning, Process and Types*. Retrieved from  
[https://www.youtube.com/watch?v=XrmJG\\_8d9Cg](https://www.youtube.com/watch?v=XrmJG_8d9Cg)

**MATH 311 Numerical Methods****Max. Marks : 100****(CA: 40 + ESA: 60)****Learning Outcomes:**

On completion of the course, the student will be able to,

- apply numerical methods to obtain approximate solutions to mathematical problems.
- analyze and evaluate the accuracy of common numerical methods.
- solve the nonlinear equations, system of linear equations and interpolation problems using numerical methods with error analysis.
- examine the appropriate numerical differentiation and integration methods to solve engineering problems.
- analyze the appropriate numerical method to find the eigen values and corresponding eigenvectors of a system.
- apply the numerical methods to solve differential equations.

**Section A**

Errors analysis- Approximations and round off and truncation errors, Root finding for nonlinear equations (transcendental and algebraic equations); Iterative method, Bisection method, Regula-Falsi method, Newton Raphson's method, Order of convergence, Numerical methods for solving system of linear equation, Ill-conditioning.

### Section B

Finite differences, Interpolation, Newton's formula for forward and backward interpolation, Newton's general interpolation formula, Lagrange's interpolation formula, Numerical differentiation.

### Section C

Numerical integration; Newton's cotes quadrature formula, Trapezoidal, Simpson's rules. Numerical solution of first and second order differential equations, Euler's method, Picard's method, Runge-Kutta's method.

#### Text Books:

1. Rao, K. S. (2006). *Numerical Methods for Scientists and Engineers* (3<sup>rd</sup> ed.). PHI learning, India.

#### Recommended Books:

1. Ramana, B.V. (2015). *Higher Engineering Mathematics* (25<sup>th</sup> reprint). McGraw Hill.
2. Kreyszig, E. (2011). *Advanced Engineering Mathematics* (9<sup>th</sup> ed.). Wiley Eastern.

#### Suggested E-learning material

1. Introduction to Numerical Analysis for Engineering, Platform: MIT open courseware  
<https://ocw.mit.edu/courses/mechanical-engineering/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/index.htm>
2. Numerical Analysis, Platform: npTEL  
<https://npTEL.ac.in/courses/111107062/>
3. Elementary Numerical Analysis, Platform: npTEL  
<https://npTEL.ac.in/courses/111101003/>

## STAT 204 Probability and Statistical Methods

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

#### Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the concepts of random variables, probability distributions and independence of random variables.
- Understand the meaning of probability and probabilistic experiment

- Familiarize with the all approaches to probability theory and particularly, the axiomatic approach.
- Understanding the meaning of conditional probability.
- Distinguish between independent and uncorrelated random variables.
- Distinguish between discrete and continuous random variables and be able to represent them using probability mass, probability density, and cumulative distribution function.
- Identify important types of distributions such as exponential, Binomial, Poisson, Normal, and use them as suitable models in basic science and engineering problems.
- Understand the concept of statistical hypothesis and able to solve such type of real life problems.

### **Section A**

Basic concepts of Probability, Classical, Empirical and Axiomatic approach to Probability. Addition and Multiplication theorems of Probability. Baye's theorem and its simple applications. Marginal, Joint and Conditional probability. Mathematical Expectation: Expectation of sum & products of random variables, Variance & Covariance.

### **SectionB**

Correlation & Regression Karl Pearson coefficient of Correlation. Partial and Multiple Correlation (upto three variables only).

Probability Distributions: Binomial, Poisson, Normal, Rectangular & Exponential distributions with simple applications. Fitting of Binomial, Poisson, and, Normal distributions.

### **SectionC**

Sampling distribution, Standard Error, Simple random sampling and stratified random sampling with their role. Test of significance for mean, variance, Proportion and correlation coefficient. Test of goodness of fit and independence of attributes. Analysis of variance with one observation per cell.

#### **Text books:**

1. Johnson, R. A., Miller, I., & Freund, J. E. (2011). *Probability and Statistics for Engineers*, Prentice Hall.

#### **Reference Books:**

1. Goon, A. M., Gupta, B. D. & M. K. Gupta.(1980). *Fundamental Of Statistics*. (Vol. I & II).The World Press Pvt. Ltd. Kolkata.
2. Mood, A. M., Graybill, F. A., & Boes, D. C. (2001). *Introduction to Theory of Statistics (3<sup>rd</sup> ed.)*. McGraw- Hill International.

### **Suggested E-learning material**

1. Probability and Random variables, MIT Open Courses,  
<https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/>
2. Probability and Statistics, NPTEL  
<https://nptel.ac.in/courses/111105041/27>
3. Statistical Inference, NPTEL,  
<https://nptel.ac.in/courses/111105043/>

## **ECE 305 Microwave Engineering**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

After successful completion of the course, student will be able to:

- Understand various parameters of waveguide and use of component as per applications
- Design impedance matching network for any transmission line or system
- Analyse and find applications and limitations of microwave Semiconductor devices.
- Find various applications of microwave engineering in specific area

### **Section- A**

Introduction to Microwaves & its application, Microwave Electromagnetic spectrum, Transmission Lines: General equation, input impedance, characteristic impedance, reflection and transmission coefficient, standing wave ratio, resonant and anti-resonant line impedance matching, Matching techniques: single stub, double stub, quarter wave transformer, baluns, coaxial transmission line, Planar transmission line: Strip line, Microstrip line, Slot line etc.

### **Section-B**

Wave Guides: Wave propagation in rectangular wave guide: solution of TE and TM modes, Power Transmission and Attenuation, Excitation of modes in rectangular waveguide, Circular Waveguide: Basic idea of TE and TM modes, Rectangular and Circular cavity resonators, Q of cavity resonators, S parameters and its conversion with Z and Y parameters, Wave guide

coupling, Microwave passive Components: S- parameter representation and analysis of microwave components such as Waveguide Tees, Two-hole directional coupler, attenuators, Phase shifters, Microwave propagation in ferrites: Faraday rotation, Isolators, Circulators.

### **Section-C**

Microwave Tubes: Limitations of Conventional vacuum tubes at microwave, Klystron: Construction and operation of two cavity and multi-cavity klystrons, Applegate Diagram and application of two cavity klystron, Construction and working of Reflex klystron, Magnetron: Types of magnetron, Construction, Operation and Analysis of cavity or travelling wave magnetron, Traveling wave tubes (TWT): Construction, Operation and practical consideration of helical type TWT, Applications of TWT, Microwave Semiconductor Devices: Tunnel diodes, principle of operation and application of tunnel diodes, Transferred Electron devices: Gunn-Effect diodes, Two-valley theory, Mode of operations of Gunn diode, Avalanche Transit-Time devices: IMPATT, TRAPATT.

### **Recommended Books:**

1. Liao, S.Y. (1995). *Microwave devices & Circuits*. New Delhi: Prentice Hall Publication.
2. Rizzi, P.A. (1998). *Microwave Engineering*. New Delhi: Prentice Hall Publication.
3. Collins, R. E. (1992). *Foundation of Microwave Engineering*. New Delhi: McGraw Hill Publication.
4. Pozar, David M. (2008). *Microwave Engineering*. New Delhi: Wiley Publication.

**Suggested E- Recourses:**

1. **Microwave Theory and Techniques** by Prof. Girish Kumar, Indian Institute of Technology, Bombay.  
<https://nptel.ac.in/courses/108101112/>
2. **Basic Building Blocks of Microwave Engineering** by Dr Amitabha Bhattacharya, Indian Institute of Technology, Kharagpur.  
<https://nptel.ac.in/courses/117105130/>
3. **Transmission Lines and E.M. Waves** by Prof. R. K. Shivgaonkar, Indian Institute of Technology, Bombay.  
<https://nptel.ac.in/courses/117101056/>

**ECE 305L Microwave Engineering Lab****Max. Marks : 100****(CA: 40 + ESA: 60)****Learning Outcomes:**

After completion of this laboratory course, students will be able to:

- Understand the concept and working of microwave bench and different components connected on a bench.
- Analyze the behaviour of various microwave components.
- Verify properties/ characteristic of microwave source, tees and directional coupler.

**List of Experiments:**

1. Determine the operating frequency of reflex klystron.
2. Draw the V-I characteristics of Reflex klystron
3. Draw the characteristics of attenuator
4. To verify the wave-guide law
5. To study the directivity and coupling coefficient of Directional Coupler.
6. To study the properties of magic Tea and also determine isolation and coupling coefficient.
7. To Measure the VSWR of (i) Short circuit (ii) Open circuit (iii) Matched Load (iv) Unmatched Load.
8. To study the properties of E-plane and H-plane Tea. Determine isolation and coupling coefficient

## **EIE 311 Control Systems**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

After successful completion of the course, student will be able to:

- Formulate mathematical model for physical systems and simplify representation of complex systems using reduction techniques.
- Use standard test signals to identify performance characteristics of first and second-order systems.
- Apply root locus technique for stability analysis.
- Analyse performance characteristics of system using Frequency response methods.

### **Section A**

Open loop and closed loop systems, servomechanism, mathematical model of systems, differential equations and transfer functions, Block diagram algebra, signal flow graphs; +ve and -ve feedback effects of feedback.

Standard test signals, time response of first and second order systems, steady state errors and error constants, Design specifications of second order systems.

### **Section B**

Effects of derivative and integral error compensation, PID controller, Design considerations for higher order systems in brief, performance indices.

Concept of stability, necessary conditions for stability, Routh Hurwitz stability criterion, relative stability criterion, relative stability in terms of Routh Hurwitz criterion; Root-locus technique.

Correlation between time and frequency response specifications; Frequency domain plots, polar plots.

### **Section C**

Bode plot, log magnitude versus phase plots; Gain-margin, Phase-margin, Nyquist stability criterion; Constant-M and constant-N circles; closed loop frequency response from these.

Preliminary considerations of classical design, cascade and feedback compensation, time-domain design using lag, lead and lag lead compensation, frequency domain design using lag.

State Variable model and solution of state equation of LTI systems.

**Recommended Books:**

1. Nagrath, I. J. (2006). *Control systems engineering*. New Delhi: New Age International.
2. Ogata, K., & Yang, Y. (2002). *Modern control engineering* (Vol. 4). India: Prentice hall.

**Suggested e-resource:**

1. **Control System** by Prof. S. D. Agashe, Indian Institute of Technology, Bombay. <https://nptel.ac.in/courses/108101037/>

**EIE 302L Control Systems Lab****Max. Marks : 100****(CA: 40 + ESA: 60)****Learning Outcomes:**

After completion of this laboratory course, students will be able to:

- Understand the concept of time response and frequency response of any physical system.
- Mathematical modeling of physical system to find out of transfer system.
- Analyze the stability of system with the help of system response.

**List of Experiments:**

1. To study and controlling action using PID controller and calculate the first overshoot temperature and plot the graph.
2. To study the DC position controller and find out the tachometer gain.
3. To determine time domain response of a second order systems for step input and obtain performance parameters.
4. To convert transfer function of a system into state space form and vice-versa.
5. To plot root locus diagram of an open loop transfer function and determine range of gain 'k for stability.
6. To plot a Bode diagram of an open loop transfer function.
7. To draw a Nyquist plot of an open loop transfers function and examine the stability of the system.



## **ECE 304 Digital Communication**

**Max. Marks : 100**

**(CA: 40 + ESA: 60)**

### **Learning Outcomes:**

After successful completion of the course, student will be able to:

- Analyse and implement the concept of Probability Theory, Random Variables, Error Control Theory and Information Theory in Digital Communication Systems
- Explain the concept of Analog to Digital Conversion, Sampling, Quantization, Pulse Modulation and PCM
- Describe and analyse mathematically the Digital Modulation Techniques-ASK, FSK, PSK

### **Section A**

Introduction to Digital Communications, Sampling Theorem, Pulse amplitude modulation, Pulse code modulation: Uniform and Non- uniform quantization, T1 Carrier System, Differential pulse code modulation, Delta Modulation

Line Coding: PSD of various line codes: polar signaling, on-off signaling, bipolar signaling; Pulse shaping: Nyquist criteria for zero ISI, signaling with controlled ISI, Duobinary pulse, Scrambling, Regenerative repeaters.

### **Section B**

Digital Modulation Techniques: Various techniques of phase shift, BPSK modulation, spectrum, Bandwidth efficiency, geometrical representation of BPSK modulation, spectrum, Bandwidth efficiency, geometrical representation of ASK, FSK & Minimum shift keying

Noise in digital Communication: PCM and Companded PCM SNR, Matched filter, Calculation of error probability for ASK, ASK, FSK.

### **Section C**

Information Theory: The concept of amount of information, Entropy, Information rate, Huffman coding, Channel capacity of a discrete memoryless channel, Shannon's Theorem, Channel capacity, capacity of a Gaussian channel, Bandwidth-S/N trade – off.

Error control coding: Rationale of coding and types of codes, Discrete memory less channel, some Algebraic concepts -Code efficiency and Hamming bound, linear block codes, Cyclic codes, Convolution codes, maximum likelihood decoding of convolution codes.

**Recommended Books:**

1. Lathi, B.P., Ding, Zhi., & Gupta, Hari Mohan. (1998). *Modern Digital and Analog Communication Systems*. New Delhi: Oxford University Press
2. Haykin, S. & Moher, M. (2007) *Introduction to Analog and Digital Communication*. New York, United States: John Wiley & Sons.
3. Shilling, D.L., & Taub, H. (2008). *Principles of Communication systems*. New Delhi: Mc-Graw Hill Publication.

**Suggested E-Resources:**

1. **Digital Communication** by Prof. Bikash Kumar Dey, Department of Electrical Engineering, Indian Institute of Technology, Bombay.  
<https://nptel.ac.in/courses/117101051/>

**ECE 304L Digital Communication Lab****Max. Marks : 100****(CA: 40 + ESA: 60)****Learning Outcomes:**

After completion of this laboratory course, students will be able to:

- Understand the concept of Sampling and various Pulse Modulation techniques i.e. Pulse Amplitude Modulation and demodulation, Pulse Position Modulation and demodulation and Pulse Width Modulation and demodulation.
- Analyze the behaviour of Pulse Code Modulation and demodulation.
- Explain the working of Digital Modulation Techniques ie: Amplitude Shift Keying, Phase Shift Keying and Frequency Shift Keying.

**List of Experiments:**

1. Familiarization with the lab instruments.
2. To understand the operation of Pulse amplitude modulation and demodulation system
3. To study Pulse width modulation system
4. To study Pulse width demodulation system.
5. To understand the principle of Pulse code demodulation system
6. To study the operation of Pulse position modulation system
7. To study Pulse position demodulation system.
8. Study of amplitude shift keying modulator and demodulator
9. Study of frequency shift keying modulator and demodulator
10. Study of phased shift keying modulator and demodulator