## MAHATMA GANDHI UNIVERSITY, KOTTAYAM

# **B.Sc ELECTRONICS**

# REVISED SYLLABUS 2010-11

## SEMESTER III & IV

**SEMESTER-III** 

EC3B08 MICROPROCESSORS

## Aim of the course:

This course aims to give a strong background in the field of Microprocessor 8085 and to expertise in assembly level programming

Contact hours: 72

Course outline

UNIT-1

## MODULE-

Text Book: Microprocessor architecture, programming, and

## **MODULE-**

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MODULE-

♦8085 Functional block diagram,8085 machine cycles and bus timings, 8085 Instruction classification, instruction set, addressing modes, data transfer ♦♦ Operations, arithmetic operations, logic operations, branch operations. (Examples of each operation) ♦♦♦ ♦♦♦

Text Book: Microprocessor architecture, programming, and

## **MODULE-**

♦ Programming techniques: Looping counting and indexing, 16 bit arithmetic Instruction, arithmetic operations related to memory, rotate instruction, compare Instructions, Examples for each operation, counters and time delays ♦ time delay Using registers-loop techniques-delay calculations-additional techniques using Time delays-counter design with time delays. ♦ ♦ ♦ ♦ ♦ ♦

Text Book: Microprocessor architecture, programming, and

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**OMEST OF THE PROPERTY OF THE** 

Stack and subroutines, restart, conditional call and return instruction, interrupts RST instructions and implementation of 8085 interrupts-Description of interrupt process ,TRAP,RST6.5,RST7.5,RST5.5, triggering levels, interrupt instructions, simple programs.

Text Book: Microprocessor architecture, programming, and

**MODULE-**

Programmable peripheral interface 8255A-block diagram of 8255, control logic,

Control word, mode0 simple I/O, BSR mode, BSR control word, port address

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TEXT BOOKS: 1. Microprocessor architecture, programming, and

## EC3B09 ANALOG CIRCUITS LAB

## Aim of the course:

To equip the students with the practical knowledge of Amplifiers, Oscillators, Analog ICs and their circuits

Contact Hours: 72

Credits

List of Experiments

Part I

- 1. Single Stage RC coupled BJT Amplifier
- 2. FET CS Amplifier
- 3. RC Phase shift Oscillator
- 4. Astable Multivibrator using BJT
- 5. Sweep Circuit Using BJT
- 6. Halfwave rectifier / Fullwave rectifier Center tapped
- 7. Bridge Rectifier (with and without C filter)
- 8. Zener Voltage Regulator
- 9. Clipping circuits
- 10. Clamping circuits

#### Part II

- 1. Measurement of 741 Op-amp parameters- Offset Voltage, CMRR and Slew Rate
- 2. Inverting And Non Inverting Amplifier
- 3. Summing And Difference Amplifier
- 4. Integrating And Differentiating Amplifier
- Active Filters-

♦♦♦♦♦♦♦♦♦♦♦ First order Low Pass Filter ♦♦♦♦♦♦♦♦♦♦♦ First order High Pass Filter ♦♦♦♦♦♦♦♦♦♦ First order Wide Band Pass Filter

- ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Narrow Band Reject Filter
  6. Wien Bridge Oscillator
- 7. Square Wave And Triangular Wave Generators
- 555 IC Astable Multivibrator
   Comparators Inverting And Non inverting
- 10. Schmitt Trigger

8 experiments are to be carried out from Part I compulsorily and 8 experiments are to be carried out compulsorily from Part II

## EC3B10 ELECTROMAGNETIC THEORY

## Aim of the course:

This course aims to excel the students in the field of electrostatics, magnetostates, electrodynamics and Maxwell sequations.

Contact hours: 72

Course Outline

## UNIT I

���� Concepts of circuits and fields � Vector analysis � Physical Interpretation of Gradient, divergent and curl � vector relation in other co-ordinate systems

Text Book: Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University press, 2004.

♦♦♦♦♦ Introduction ♦ Fundamental relation of Electrostatic field ♦ Gauss law ♦ special Gaussian surface ♦ Potential Function ♦ Divergence ♦♦ Theorem ♦ Capacitance and Dielectrics ♦ Poisson ♦s and Laplace Equations ♦♦ Boundary Conditions at the interface of two dielectrics .

Text Book: Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University press, 2004.

♦♦♦♦♦ Biot ♦ Savarts Law ♦ Force between two current soils ♦ BHM ♦ Ampere♦s Circuit Theorem ♦ Lorentz Force ♦ Magneto Vector Potential

Text Book: Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University press, 2004.

## **UNIT II**

\* Farday S Law of Induction Modified Ampere Law Maxwell S Equations Wave equations Solution of wave equation in free space

Poynting Vector Electro Magnetic Energy boundary conditions Reflection and Refraction of waves from the non-conducting boundary.

💠���� Radiation of Electromagnetic field 🏶 Polarization 🏶 Isotropic Radiator 🗣 Gain Effective area 🏶 Effective Length 🏶 Dipole Radiation Resistance.

## Text Books:

- 1. Electromagnetic Waves and Radiating systems � Jordan & Balmian � PHI.
- 2. Electronic Communication Proody and Coolen

## Reference Books:

- 1 Electromagnetic Field Theory Fundamentals � Bhag Guru and Huseyin Hiziroglu (Cambridge) �

♦ ♦ ♦ ♦ ♦ Fundamentasl of ♠ Electromagenetics ♠ Miah

♦♦ ♦4. ♦♦♦♦ Engineering Electromagnetics ♦ Hayt

## EC3B11 ANALOG COMMUNICATIONS

## Aim of the course:

\*\* To get a thorough knowledge of modulation and analog communication techniques

Contact hours: 72

Course Outline:

Unit I

## Module

Communication Systems- Modulation Noise Figure, Signal to Noise ratio, Text book: Electronic Communication Systems - Kennedy and Davis, pp 2-6, 15-26

## Module

Amplitude Modulation- Frequency spectrum of AM wave Representation of AM wave, Power relation in AM wave, Generation of AM, Basic requirement, Grid modulated Class C amplifier, Plate modulated Class C Amplifier, Modulated transistor amplifier

Text book: Electronic Communication Systems - Kennedy and Davis, pp 35-52

## Module

SSB Techniques • Evolution and description of SSB, Separation of Carrier, Separation of unwanted side band- Filter system, Phase shift method, Third method, Extensions of SSB-Pilot carrier systems, ISB and VSB

Text book: Electronic Communication Systems - Kennedy and Davis , pp 57-75

Unit II

## Module

Frequency Modulation Theory of Frequency and Phase modulation, Description of system, Mathematical representation of FM, Phase Modulation-inter system comparison, Noise and FM-Noise Triangle, De-emphasis, Pre-emphasis, Forms of interference, Comparison of Wide band and Narrow band FM, Stereo-phonic FM multiplex system

Text book: Electronic Communication Systems • - Kennedy and Davis, pp • 79-84,89-100

## Module

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#### 12 Hours

FM Generation and Detection-Generation of FM • Direct method, Varactor diode modulator- Stabilized reactance modulator- Indirect method, Slope detection, Balanced Slope detector, Phase discriminator, Ratio detector

Text book: Electronic Communication Systems - Kennedy and Davis, pp 100-112, 162-171

## Module VI

Radio receivers- Reciever types, TRF superheterodyne receiver, Sensitivity, Selectivity, Image frequency and its rejection, double spotting, Separately excited mixer, Self excited mixer, local oscillator, image frequency and IF amplifiers, AGC- diode detector, AFC

FM receivers • Amplitude limiting, Stereo FM multiplex reception

Text book: Electronic Communication Systems - Kennedy and Davis, pp 118-131,133-141, 149, 158-162, 173-174

Reference Book: Electronic Communication A Roody and Coolen-PHI

## EC3B12 ANALOG ELECTRONICS

Aim of the course:

To get a thorough knowledge of analog ICs

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Contact hours: 72

Course Outline

Unit 1

Module 1:

Integrated Circuits, Types of ICs, Development of ICs � SSI, MSI, LSI, VLSI packages, IC package types, Pin identification and temperature ranges , Device identification, Power supplies for ICs.

Differential amplifier circuit configurations � DC and AC analysis of Dual input balanced output and Dual input unbalanced output Differential amplifiers.

Block diagram representation of a typical op-amp schematic symbol - A general purpose IC op amp 10 IC 741 and its features, Op-Amp parameters - input offset voltage and current, input bias current, differential input resistance, output voltage swing, common mode rejection ratio (CMMR), slew rate and gain-bandwidth product. ideal and practical op-amps Equivalent circuit of an op-amp, Open-loop op-amp configurations. Frequency response of an op-amp.

## 14 Hours

Closed-loop non-inverting and inverting amplifiers • measurement of closed-loop voltage gain, differential input voltage, input resistance, output resistance, bandwidth and total output offset voltage, Voltage follower, Differential amplifier with one op-amp, two op-amps and three op-amps • measurement of voltage gain, Instrumentation amplifier, Summing, Scaling and averaging amplifiers • output voltage, Current to voltage and Voltage to current converters, Integrator, Differentiator, Comparators • Basic comparator, Zero-crossing detector, Schmitt trigger.

Introduction, Advantages of active filters over passive filters, Types of filters, Frequency response characteristics • Butterworth, Chebychev and Cauer, Order of filters, • First order Butterworth filters - low pass, high pass, band pass - wide band-pass and narrow band-pass filters, band reject • wide band-reject and narrow band-reject filters, all pass filters, Design of filters.

Oscillators Principles Types Frequency stability, Sine wave oscillators - Phase shift oscillator and Wien bridge oscillator, Design of sine wave oscillators, Square wave generator, Triangular wave generator, Sawtooth wave generator, Voltage controlled oscillator - IC 566

## Module 6: Timers, Phase locked loops and Voltage Regulators

- 1. Integrated Circuits by Botkar
- 2. Integrated Electronics by Jacob Millman & C C Halkias (Tata McGraw Hill).
- 3. Electronic Devices and Circuits by Allan Mottershed PHI

COMPLEMENTARY • 4

## EC3C04 NUMERICAL METHODS

Aim of the Course: To equip the student with the computer based numerical and statistical methods

Contact Hours: 72

Course Outline

UNIT � I

**Approximations and errors in computing** significant digits Inherent errors Numerical errors Truncation errors Modelling errors Blunders Absolute and Relative errors.

Error Propagation - conditioning and Stability � Convergence of an iterative process � Error estimation � Minimizing the total error.

#### Module � 2

Roots of non **\diamonum** Linear equations **\diamonum** methods of solution **\diamonum** Iterative methods **\diamonum** Starting and stopping an iterative process. **\diamonum** Bisection Method **\diamonum** Convergence of bisection method **\diamonum** False position method **\diamonum** convergence **\diamonum** Newton **\diamonum\$** Raphson method **\diamonum\$** convergence **\diamonum\$** Limitations - Secant Method **\diamonum\$** convergence.

## Module 3

Solutions to simultaneous linear equations Existence of solution Solution by elimination Basic Gauss Elimination Method Gauss Elimination with Pivoting - Guass Jordan method Triangular Factorization Methods Matrix Inversion method.

Iterative solutions of Linear Equations - Gauss Jocobi Iteration method • Gauss - Seidal iterative method • Method of Relaxation • convergence of iteration methods

## UNIT � II

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Curve Fitting: Interpolation � Polynomial forms � Linear Interpolation � Lagrange Interpolation polynomial � Newton Interpolation polynomial � Divided difference table � Interpolation with equidistant points � Forward and Backward difference table �

Curve Fitting: Regression & Fitting Linear equations & Least squares regression & Fitting Transcendental Equations & Fitting a polynomial function

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Numerical Differentiation � Differentiating Continuous functions � Forward and central difference quotient � Error Analysis � Differentiating Tabulated functions - Higher � order derivatives.

♦ Numerical Integration ♦ Newton ♦ Cotes methods ♦ Trapezoidal Rule ♦ Error analysis ♦ Composite Trapezoidal rule - Simpsons 1/3 rule ♦ Error analysis ♦ Composite Simpsons 1/3 rule ♦ Error analysis ♦ Simpsons 3/8 rule ♦ Boole♦s rule

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Numerical Solution of Ordinary Differential equations Taylor Series method Picards method Eulers Method Accuracy of Eulers method Polygon method Runge Kutta Methods.

## TEXT BOOKS:

- 1. Treatment as in Numerical methods � E. Balagurusamy Tata McGraw Hill.
- 2. Numerical methods P. Kandasamy K. Thilagavathy and K. Gunavathy S. Chand and Company Ltd

## REFERENCE BOOKS:

- 1. Numerical methods in Science and Engineering &M.K. Venkataraman National Publishing company 1990 edition.
- 2. M.K Jain, R.K Iyengar, R.K Jain 🄣 Numerical Methods for Scientific and Engineering Computation 🚱. Wiley Eastern Ltd, New Delhi-1997.
- 3. COMPUTER ORIENTED NUMERICAL METHODS V. Rajaraman, PHI Pub.

| EC3B08 | Core 6 • Microprocessors             | 4 | - | 4 |
|--------|--------------------------------------|---|---|---|
| EC3B09 | Core 6 Practical-Analog Circuits Lab | 1 | 5 | 2 |
| EC3B10 | Core 7 • Electromagnetic Theory      | 4 | - | 4 |
| EC3B11 | Core 8- Analog Communication         | 4 | - | 4 |
| EC3B12 | Core 9 Analog Electronics            | 4 | - | 4 |
| EC3C04 | Complementary 4 • Numerical Methods  | 4 | - | 3 |

## **SEMESTER-IV**

## EC4B13 PROGRAMMING IN C

#### Aim of the course:

This course introduces and equips the student with software programming concepts. Enable student to develop soft skills.

Contact hours : 72

Course outline

UNIT I

## Module I

Introduction

Concept of programming language- High level, low level, assembly language, concept of system software- operating system, compilers, interpreters, assembles, concept of application software, concept of algorithms and flow charts

#### Module

Variables-constants-basic data types- int, float, double and char-Qualifiers � long, short and unsigned- declarations.

Arithmetic expressions-operators-arithmetics, logical, bitwise, increment, decrement assignment- precedence and oreder of evaluation � conditional expressions

## Module

Control flow- if statements- if-else and else- if constructs, nested if statements- switch statement � looping � for loop � nested loops � while and do-while statements, break and continuous statements.

Arrays • initializing array elements- Multi dimensional arrays • sorting using arrays

Functions- arguments and local variables- declaration- returns values 💠 global variables 💠 auto, static and register variables 💠 recursive functions

## Module

Structures and Unions • Types of statement • Data type conversion • type casting • character strings- escape characters. Pointers and structures pointers and functions • pointers and arrays • operation on pointers.

## Module

Input and output � character I/O � formatted I/O � printf and scanf functions � File I/O- fopen, fclose and eof functions- stdln, stdout and stderr.

## Module

♦ The preprocessor- define, include, if and undef statements- command line arguments ♦ exit function ♦ goto statement ♦ Null statement ♦ Dynamic memory allocation ♦ size of operator.

Text book: Programming in C- Balaguruswamy
Reference Text: Programming in C- Schaum & Series

## EC4B14 PRACTICAL - MICROPROCESSORS

## Aim of the course:

To equip the student with a practical knowledge of 8085 programming, its interfacing and applications

Contact hours: 72

## List of Experiments

## UNIT I **\*\*\*\*\*\*\*\*\*\*\*** ������� 1. Data transfer using direct and indirect addressing ��������� 2. Block data transfer �������� 3. Addition and subtraction of two signed numbers. �������� 4. Addition and subtraction of two unsigned numbers. **\$\$\$\$\$\$\$**\$\$**\$**\$\$**\$**\$\$**\$**\$\$5. 16 bit addition. �������� 6. Multiplication of two numbers. �������� 7. Multiplication by shift rotate and add method. ��������� 9. Checking specific bits. �������� 11. Finding smallest number in a data. �������� 14. BCD addition and subtraction

## UNIT II

 ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ 1. Waveform generation.

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All the experiments of Unit I are to be carried out compulsorily and from Unit II at least 3 experiments are to be carried out compulsorily.

## **EC4B15** MICROWAVE ELECTRONICS

## Aim of the course:

To equip the student with the theory of wave guides, transmission lines, microwave components, microwave tubes and devices

#### **Prerequisite:**

Knowledge on Maxwell s equation, Electromagnetic radiation

Contact hours: 72 hours

Course Outline

## Unit I

Introduction- Frequency spectrum- microwave bands • applications of Microwaves • different fields.

Guided waves • Introduction • rectangular wave guides • TE, TM and TEM waves

Text book (1) pages 311-331

#### Module

Transmission media

Review of transmission lines �� Transmission line equation (derivation required) Impedance matching � input impedance, standing wave ratio, power� � applications-strip transmission lines-cavity resonators-� Coaxial cable, twisted pair cable

Text book (2) pages 501-517, 533-536, 552-554.� Text book (1) pages 353-357, 569-571,

## Module

**Microwave Components** 

Introduction-wave guide corners, twists, and bends- wave guide coupling, E-H tuner- wave guide tees- directional couplers- isolators and circulators Text book (1) pages 340-347, 357-364

Unit II

#### Module

**Microwave Tubes** 

Introduction • Multicavity Klystron • Velocity modulation and beam bunching • reflex Klystron- magnetrons • working of magnetrons • Traveling wave tube- other microwave tubes

Text book (1) pages 377-411

## Module

## **Microwave Semiconductor Devices**

Schottky diodes, Point Contact diodes, Varactor diodes- applications- concept of parametric amplifiers • microwave transistors and integrated circuits- IMPATT, TRAPATT and GUNN devices • Applications.

Text book (1) pages 417-424, 427-436, 440-444, 448-451, 454-465

Text Books: 1 Electronic communication- Fourth Edition-Kennedy

- 2 Elements of Electromagnetics- Fourth Edition- Matthew N O Sadiku
- 3 Electromagnetic Waves and Radiating Systems \* Jordan and Balmain

## EC4B16 OPTOELECTRONICS

## Aim of the course:

This course aims to give an in-depth knowledge in the field of lasers, optical semiconductor devices, optical display devices and optical wave guides

Contact hours: 72 hours

Credits **\*\*\* \*\*\*** 

Course Outline

## UNIT I

## MODULE I

Nature of light, wave nature of light, elliptical polarization, birefringence, optical activity, electro-optic effect, Kerr modulators, magneto-optic devices, Acousto-optic effect (Text book 2 pp 1-11, 76-87, & 94-104)

## MODULE II

������ Lasers- emission and absorption of radiation, population inversion, attainment, optical feedback, threshold condition, Doped insulator lasers, gas lasers, Q switching (Text book 2 pp 155-157, 161-168, 181-187, 201-209� & 226-230)

#### MODULE II

Semiconductor optical sources- optical emission from semiconductors, heterojunctions, semiconductor injection laser, single frequency injection lasers, distributed feedback lasers, LED power and efficiency, double heterojunction LED, LED structures, LED characteristics (text book 3 pp 296-336, 394-410)

## UNIT II

## MODULE IV

Photodetectors- Thermal detectors, junction photodiodes, APD, phototransistor, Solar cells- I-V characteristics and spectral response. Materials and design considerations of solar cells (text book 2 pp 254-261, text book 3 pp 430-453, 455-458, text book 1 pp 430-432, 435-438, 442-445)

## MODULE V

Display devices • PL, EL and CL displays, displays based on LED, Plasma panel and LCD • (text book 2• pp 113-153)

## MODULE VI

Optical fibre waveguides, step index and graded index fibres, attenuation, modes in step index fibre, modes in graded index fibre, pulse Distortion and information rate in optic fibres, construction of optic fibres, optic fibre cables(text book 4� pp 102-138)

## **TEXT BOOKS**

- 1 🍫 🌣 🌣 🌣 🏕 🏕 Semiconductor Optoelectronics devices 💠 Pallab Bhattacharya, PHI
- 2000000 Wilson & Hawkes, PHI
- 4000000 Palais, Pearson Education, Asia

## **ŘEFERENCES**

## EC4B17 INSTRUMENTATION ELECTRONICS

#### Aim of the course:

Contact hours: 72 hours

Credits **\*\*\* \*\*\*** 

This course aims to impart an in-depth knowledge in the field of transducers, bridges, and electronic instruments.

Unit- I Module 6 Hours Generalized Static and dynamic characteristics units and standards ofMeasurement systems measurements error Module II-18 Hours Classification of transducers - Selecting a transducer- Resistive, inductive and capacitive transducers - strain gauge and gauge factor, Temperature transducers -Thermistor, Thermo couples, LVDT, Displacement Transducers, Piezo-Electric transducers III-Signal Bridge measurements & Wheatstone Bridge, Maxwell, Hay, Schering, and Wien bridge, Amplifiers - Chopper amplifiers, Module IV- Data Acquisition and conversion Hours O O O O O O Principle of operation of DAC- Weighted resistor network- Binary Ladder • resolution- linearity offset-principle of operation of ADC- counter method, successive approximation, single slope and dual slope integration DC Voltmeter-DC Ammeter, Analog Multimeter, Digital Multimeter & Block reperesentation- Simple frequency Counter, Q meter & Basic Q meter circuit & Cathode rav Oscilloscopes block schematic special oscilloscopes Storage oscilloscope, Graphic Signal generators, RF signal generators, Sweep Frequency generators, Pulse generators, Simple frequency counter, Wave analyzer, Harmonic distortion analyzer, analyzer. Spectrum <del></del> Text Books 1. Albert D.Helfrick and William D.Cooper - Modern Electronic Instrumentation ♦♦♦ and Measurement Techniques, Prentice Hall of India, 2003. 2. Electronic Instrumentation �HS Kalsi - TMH Reference Text Books: 1. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice ♦♦♦ Hall of India, 2<sup>nd</sup> edn., 2003.

# EC4B18� PRACTICAL- PROGRAMMING LAB� IN C

## Aim of the course:

To develop logical and syntactical expertise in programming language C and to develop software skills.

Contact Hours: 72

## List of Programs

- 1. Sum of odd and even nos. less than N
- 2. Generation of fibonacci series
- 3. checking of a prime
- 4. Prime number series generation
- 5. Checking of palindrome
- 6. Reversing a given number
- 7. Addition of all the digits of a given number
- 8. Roots of quadratic equation
- 9. Finding largest and smallest among a list of numbers
- 10. Sorting a set of numbers and names in ascending and descending order
- 11. Matrices addition, subtraction, multiplication(write separate functions for inputting, outputting and matrix operation)
- 12. Transpose of a matrix(use function for each operation)
- 13. Checking a matrix symmetric or not
- 14. Process students record using a structure
- 15. Finding factorial using recursive function
- 16. Print Pascal s triangle
- 17. Find the binary equivalent of a given decimal and vice versa
- 18. Find the number of vowels of a given string
- 19. Checking whether a number is Armstrong or not
- 20. Linear searching
- 21. Calculation of  $nC_r$
- 22. Manage a file which contains marks of various students
- 23. File program for payroll processing
- 24. Program using pointers to calculate the area and circumference of a circle
- 25. Sorting using pointers
- 26. Swapping (Call by value & call by reference)

20 experiments are to be carried out compulsorily

| EC4B13 | Core 10 Programming in C                   | 4 | - | 4 |
|--------|--|---|---|---|
| EC4B14 | Core 11 Practical - Microprocessors        | - | 5 | 2 |
| EC4B15 | Core 12 - Microwave Electronics            | 4 | - | 4 |
| EC4B16 | Core 13 • Optoelectronics                  | 3 | - | 4 |
| EC4B17 | Core 14 • Instrumentation Electronics      | 4 | - | 4 |
| EC4B18 | Core 15 • Practical • Programming Lab in C | - | 5 | 2 |