# El Paso Community College
# Syllabus
# Part II
# Official Course Description

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| **SUBJECT AREA** | **Emergency Medical Services** |
| **COURSE RUBRIC AND NUMBER** | **EMSP 2444** |
| **COURSE TITLE** | **Cardiology** |
| **COURSE CREDIT HOURS** | **4 3 : 3** |
| | **Credits Lec Lab** |

## I. Catalog Description

Studies in detail the knowledge and skills in the assessment and management of patients with cardiac emergencies. Includes single and multi-lead ECG interpretation. Either EMSP 2348 or RNSG 1301 must be taken prior to or at the same time as this course. A grade of "C" or better is required in this course to take the next course and/or for this course to be eligible for "course completion" credit or eligibility to take licensing exam. **Prerequisites: EMSP 1160 and EMSP 1161 and EMSP 1162 and EMSP 1355 and EMSP 1356 and EMSP 1438 and EMSP 2305. (3:3). Lab fee. Professional Practice Insurance required.**

## II. Course Objectives

A. Unit I – Anatomy and Physiology of the Cardiovascular System

At the completion of this course, the paramedic student will be able to:

1. Describe the incidence, morbidity, and mortality of cardiovascular disease.
2. Discuss prevention strategies that may reduce the morbidity and mortality of cardiovascular disease.
3. Identify the risk factors most predisposing to coronary artery disease.
4. Describe the anatomy of the heart, including the position in the thoracic cavity, layers of the heart, chambers of the heart, and location and function of cardiac valves.
5. Identify the major structures of the vascular system, the factors affecting venous return, the components of cardiac output, and the phases of the cardiac cycle.
6. Define preload, afterload, and left ventricular end-diastolic pressure and relate each to the pathophysiology of heart failure.
7. Identify the arterial blood supply to any given area of the myocardium.
8. Compare and contrast the coronary arterial distribution to the major portions of the cardiac conduction system.
9. Identify the structure and course of all divisions and subdivisions of the cardiac conduction system.
10. Identify and describe how the heart's pacemaking control, rate, and rhythm are determined.
11. Explain the physiological basis of conduction delay in the AV node.
12. Define the functional properties of cardiac muscle.
13. Define the events comprising electrical potential.
14. List the most important ions involved in myocardial action potential and their primary function in this process.
15. Describe the events involved in the steps from excitation to contraction of cardiac muscle fibers.

16. Describe the clinical significance of Starling's law.
17. Identify the structures of the autonomic nervous system and their effect on heart rate, rhythm, and contractility.
18. Define and give examples of positive and negative inotropism, chronotropism, and dromotropism.
19. Discuss the pathophysiology of cardiac disease and injury.
20. Explain the purpose of ECG monitoring and its limitations.
21. Define the following types of pressures:
    - Intravascular pressure.
    - Transmural pressure.
    - Driving pressure.
22. Describe how the following relate to the cardiac cycle and blood pressure:
    - Ventricular systole.
    - Ventricular diastole.
23. List the intraluminal blood pressures throughout the pulmonary and systemic vascular systems.
24. Describe how blood volume affects blood pressure, and include the following:
    - Stroke volume.
    - Heart rate.
    - Cardiac output.
25. Identify the percentage of blood found throughout the various parts of the pulmonary and systemic systems.
26. Describe the influence of gravity on blood flow, and include how it relates to:
    - Zone 1
    - Zone 2
    - Zone 3
27. Define the following determinants of Cardiac output:
    - Ventricular preload.
    - Ventricular afterload.
    - Myocardial contractility.
28. Define vascular resistance.
29. Describe how the following affect the pulmonary vascular resistance:
    - Active mechanisms.
        - Abnormal blood gas values.
        - Pharmacologic stimulation.
        - Pathologic conditions.
    - Passive Mechanisms.
        - Increased pulmonary arterial pressure.
        - Increased left arterial pressure.
        - Lung volume and transpulmonary pressure changes.
        - Blood volume changes.
        - Blood viscosity changes.
30. List the abbreviations and normal ranges of the following hemodynamic values directly measured by means of the pulmonary artery catheter:
    - Central Venous Pressure.
    - Right Atrial Pressure.
    - Mean Pulmonary artery pressure.
    - Pulmonary capillary wedge pressure.
    - Cardiac Output.
31. List the abbreviations and normal ranges of the following computed hemodynamic values:
    - Stroke volume.
    - Stroke volume index.
    - Cardiac index.
    - Right ventricular stroke work index.
    - Left ventricular stroke work index.
    - Pulmonary vascular resistance.
    - Systemic vascular resistance.
32. List factors that increase and decrease the following:

- Stroke volume.
- Stroke volume index.
- Cardiac output.
- Cardiac index.
- Right ventricular stroke work index.
- Left ventricular stroke work index.

33. List the factors that increase and decrease the pulmonary vascular resistance.
34. List the factors that increase and decrease the systemic vascular resistance.

B. Unit II – ECG Monitoring and Cardiac Dysrhythmias

1. Explain the purpose of ECG monitoring and its limitations.
2. Correlate the electrophysiology and hemodynamic events occurring throughout the entire cardiac cycle with the various ECG waveforms, segments, and intervals.
3. Identify how the heart rates, durations, and amplitudes may be determined from ECG recordings.
4. Relate the cardiac surfaces or areas represented by the ECG leads.
5. Differentiate among the primary mechanisms responsible for producing cardiac dysrhythmias.
6. Describe a systematic approach to the analysis and interpretation of cardiac dysrhythmias.
7. Describe the dysrhythmias originating in the sinus node, the AV junction, the atria, and the ventricles.
8. Describe the process and pitfalls of differentiating wide QRS complex tachycardias.
9. Describe the conditions of pulseless electrical activity.
10. Describe the phenomena of reentry, aberration, and accessory pathways.
11. Identify the ECG changes characteristically produced by electrolyte imbalances and specify their clinical implications.
12. Identify patient situations where ECG rhythm analysis is indicated.
13. Recognize the ECG changes that may reflect evidence of myocardial ischemia and injury and their limitations.
14. Correlate abnormal ECG findings with clinical interpretation.
15. Identify the major mechanical, pharmacological, and electrical therapeutic objectives in the treatment of the patient with any dysrhythmia.
16. Describe artifacts that may cause confusion when evaluating the ECG of a patient with a pacemaker.
17. List the possible complications of pacing.
18. List the causes and implications of pacemaker failure.
19. Identify additional hazards that interfere with artificial pacemaker function.
20. Recognize the complications of artificial pacemakers as evidence on an ECG.

C. Unit III – Assessment of the Cardiovascular Patient

1. Describe the appropriate approach for assessing cardiovascular patients of different ages, gender, and cultural background.
2. Describe the epidemiology, morbidity, mortality, and pathophysiology of angina pectoris.
3. List and describe the assessment parameters to be evaluated in a patient with angina pectoris.
4. Identify what is meant by the OPQRST of chest pain assessment.
5. List other clinical conditions that may mimic signs and symptoms of coronary artery disease and angina pectoris.
6. Identify ECG findings in patients with angina pectoris.
7. Identify the paramedic responsibilities associated with management of the patient with angina pectoris.
8. Based on the pathophysiology and clinical evaluation of the patient with chest pain, list the anticipated clinical problems according to their life-threatening potential.
9. Describe the epidemiology, morbidity and mortality of myocardial infarction.
10. List the mechanisms by which an MI may be produced by traumatic and non-traumatic events.
11. Identify the primary hemodynamic changes produced in myocardial infarction.

12. List and describe the assessment parameters to be evaluated in a patient with a suspected myocardial infarction.
13. Identify the anticipated clinical presentation of a patient with a suspected acute myocardial infarction.
14. Differentiate the characteristics of the pain/discomfort occurring in angina pectoris and acute myocardial infarction.
15. Identify the ECG changes characteristically seen during evolution of an acute myocardial infarction.
16. Identify the most common complications of an acute myocardial infarction.
17. List the characteristics of a patient eligible for thrombolytic therapy.
18. Describe the "window of opportunity" as it pertains to reperfusion of a myocardial injury or infarction.
19. Based on the pathophysiology and clinical evaluation of the patient with a suspected acute myocardial infarction, list the anticipated clinical problems according to their life-threatening potential.
20. Specify the measures that may be taken to prevent or minimize complications in the patient suspected of myocardial infarction.
21. Describe the most commonly used cardiac drugs in terms of therapeutic effect and dosages, routes of administration, side effects and toxic effects.
22. Describe the epidemiology, morbidity and mortality of heart failure.
23. Define the principal causes and terminology associated with heart failure.
24. Identify the factors that may precipitate or aggravate heart failure.
25. Describe the physiological effects of heart failure.
26. Define the term "acute pulmonary edema" and describe its relationship to left ventricular failure.
27. Define preload, afterload and left ventricular end-diastolic pressure and relate each to the pathophysiology of heart failure.
28. Differentiate between early and late signs and symptoms of left ventricular failure and those of right ventricular failure.
29. Explain the clinical significance of paroxysmal nocturnal dyspnea.
30. Explain the clinical significance of edema of the extremities and sacrum.
31. List the interventions prescribed for the patient in acute congestive heart failure.
32. Describe the most commonly used pharmacological agents in the management of congestive heart failure in terms of therapeutic effect, dosages, routes of administration, side effects and toxic effects.
33. Define the term "cardiac tamponade".
34. List the mechanisms by which cardiac tamponade may be produced by traumatic and non-traumatic events.
35. Identify the limiting factor of pericardial anatomy that determines intrapericardiac pressure.
36. Identify the clinical criteria specific to cardiac tamponade.
37. Describe how to determine if pulsus paradoxus, pulsus alternans or electrical alternans is present.
38. Identify the paramedic responsibilities associated with management of a patient with cardiac tamponade.
39. Describe the incidence, morbidity and mortality of hypertensive emergencies.
40. Define the term "hypertensive emergency".
41. Identify the characteristics of the patient population at risk for developing a hypertensive emergency.
42. Explain the essential pathophysiological defect of hypertension in terms of Starling's Law of the heart.
43. Identify the progressive vascular changes associated with sustained hypertension.
44. Describe the clinical features of the patient in a hypertensive emergency.
45. Rank the clinical problems of patients in hypertensive emergencies according to their sense of urgency.
46. From the priority of clinical problems identified, state the management responsibilities for the patient with a hypertensive emergency.
47. Identify he drugs of choice for hypertensive emergencies, rationale for use, clinical precautions and disadvantages of selected antihypertensive agents.

48. Correlate abnormal findings with clinical interpretation of the patient with a hypertensive emergency.
49. Define the term "cardiogenic shock".
50. Describe the major systemic effects of reduced tissue perfusion caused by cardiogenic shock.
51. Explain the primary mechanisms by which the heart may compensate for a diminished cardiac output and describe their efficiency in cardiogenic shock.
52. Differentiate progressive stages of cardiogenic shock.
53. Identify the clinical criteria for cardiogenic shock.
54. Describe the characteristics of patients most likely to develop cardiogenic shock.
55. Describe the most commonly used pharmacological agents in the management of cardiogenic shock in terms of therapeutic effects, dosages, routes of administration, side effects and toxic effects.
56. Correlate abnormal findings with clinical assessment of the patient in cardiogenic shock.
57. Identify the paramedic responsibilities associated with management of a patient in cardiogenic shock.
58. Define the term "cardiac arrest".
59. Identify the characteristics of patient population at risk for developing cardiac arrest from cardiac causes.
60. Identify non-cardiac causes of cardiac arrest.
61. Describe the arrhythmias seen in cardiac arrest.
62. Identify the critical actions necessary in caring for the patient with cardiac arrest.
63. Explain how to confirm asystole using the 3-lead ECG.
64. Define the terms defibrillation and synchronized cardioversion.
65. Specify the methods of supporting the patient with a suspected ineffective implanted defibrillation device.
66. Describe the most commonly used pharmacological agents in the managements of cardiac arrest in terms of therapeutic effects.
67. Identify resuscitation.
68. Identify circumstances and situations where resuscitation effort would not be initiated.
69. Identify and list the inclusion and exclusion criteria for termination of resuscitation efforts.
70. Identify communication and documentation protocols with medical direction and law enforcement used for termination of resuscitation efforts.
71. Describe the incidence, morbidity and mortality of vascular disorders.
72. Describe the pathophysiology of vascular disorders.
73. List the traumatic and non-traumatic causes of vascular disorders.
74. Define the terms "aneurysm", "claudication" and "phlebitis".
75. Identify the peripheral arteries most commonly affected by occlusive disease.
76. Identify the major factors involved in the pathophysiology of aortic aneurysm.
77. Recognize the usual order of signs and symptoms that develop following peripheral artery occlusion.
78. Identify the clinical significance of claudication and presence of arterial bruits in a patient with peripheral vascular disorders.
79. Describe the clinical significance of unequal arterial blood pressure readings in the arms.
80. Recognize and describe the signs and symptoms of dissecting thoracic or abdominal aneurysm.
81. Describe the significant elements of the patient history in a patient with vascular disease.
82. Identify hemodynamic effects of vascular disorders.
83. Identify the complications of vascular disorders.

D. Unit IV – Managing Cardiovascular Emergencies

1. Identify the Paramedic's responsibilities associated with management of patients with vascular disorders.
2. Develop, execute and evaluate a treatment plan based on the field impression for the patient with vascular disorders.
3. Differentiate between signs and symptoms of cardiac tamponade, hypertensive emergencies, cardiogenic shock, and cardiac arrest.

4. Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential.
5. Apply knowledge of the epidemiology of cardiovascular disease to develop prevention strategies.
6. Integrate pathophysiology principles into the assessment of a patient with cardiovascular disease.
7. Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with cardiovascular disease.
8. Integrate pathophysiology principles to the assessment of a patient in need of a pacemaker.
9. Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient in need of a pacemaker.
10. Develop, execute, and evaluate a treatment plan based on field impression for the patient in need of a pacemaker.
11. Based on the pathophysiology and clinical evaluation of the patient with chest pain, characterize the clinical problems according to their life-threatening potential.
12. Integrate pathophysiological principles to the assessment of a patient with chest pain.
13. Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with angina pectoris.
14. Develop, execute and evaluate a treatment plan based on the field impression for the patient with chest pain.
15. Integrate pathophysiological principles to the assessment of a patient with suspected myocardial infarction.
16. Synthesize patient history, assessment findings and ECG analysis to form a field impression for the patient with a suspected myocardial infarction.
17. Develop, execute and evaluate a treatment plan based on the field impression for the suspected myocardial infarction patient.
18. Integrate pathophysiological principles to the assessment of the patient with heart failure.
19. Synthesize assessment findings and patient history information to form a field impression of the patient with heart failure.
20. Develop, execute, and evaluate a treatment plan based on the field impression for the heart failure patient.
21. Integrate pathophysiological principles to the assessment of a patient with cardiac tamponade.
22. Synthesize assessment findings and patient history information to form a field impression of the patient with cardiac tamponade.
23. Develop, execute and evaluate a treatment plan based on the field impression for the patient with cardiac tamponade.
24. Integrate pathophysiological principles to the assessment of a patient with hypertensive emergency.
25. Synthesize assessment findings and patient history information to form a field impression of the patient with a hypertensive emergency.
26. Develop, execute and evaluate a treatment plan based on the field impression for the patient with a hypertensive emergency.
27. Integrate pathophysiological principles to the assessment of a patient with cardiogenic shock.
28. Synthesize assessment findings and patient history information to form a field impression of the patient with cardiogenic shock.
29. Develop, execute and evaluate a treatment plan based on the field impression for the patient with cardiogenic shock.
30. Integrate pathophysiological principles to the assessment of a patient with cardiac arrest.
31. Synthesize assessment findings and patient history information to form a field impression of the patient with cardiac arrest.
32. Develop, execute and evaluate a treatment plan based on the field impression for the patient with cardiac arrest.
33. Integrate pathophysiological principles to the assessment of a patient with vascular disorders.
34. Synthesize assessment findings and patient history information to form a field impression of the patient with vascular disorders.
35. Develop, execute and evaluate a treatment plan based on the field impression for the patient with vascular disorders.

36. Integrate pathophysiological principles to the assessment and field management of a patient with chest pain.

E. Unit V – 12-Lead ECG monitoring

1. Identify the location and function of the following:
   - SA node
   - Internodal pathways
   - AV node
   - Bundle of His
   - AV junction
   - Bundle branches
   - Purkinje network
2. Relate the normal path of an impulse traveling through the electrical conduction system.
3. Describe the types of EKG leads.
4. Identify and explain the grids and markings on a representative strip on EKG graph paper.
5. Discuss the electrical basis of the electrocardiogram.
6. Describe the relationship of the following EKG waveforms to the electrical events in the heart:
   - P wave.
   - PR interval.
   - QRS complex.
   - J point.
   - ST segment.
   - T wave.
7. Identify the standard 12-Lead EKG wave forms.
8. Identify the electrocardiographic leads and their axes.
9. Discuss EKG changes in:
   - Myocardial ischemia
   - Myocardial injury
   - Myocardial infarction (Necrosis)
10. Identify the lead-specific ST elevation parameters.
11. Recognize the EKG changes related to an inferior infarction.
12. Describe the clinical significance of inferior myocardial infarctions (MIs).
13. Identify the lead-specific ST segment elevation relative to anterior myocardial infarctions (MIs), as well as anterolateral and anteroseptal myocardial infarctions.
14. Describe other EKG changes commonly associated with anterior MIs, as well as anterolateral and anteroseptal myocardial infarctions.
15. Identify the clinical significance of anterior myocardial infarctions.
16. Identify the lead-specific ST segment elevation relative to posterior myocardial infarctions.
17. Describe other EKG changes commonly associated with posterior myocardial infarctions.
18. Identify the clinical significance of posterior myocardial infarctions.
19. Define the following terms:
   - Vector
   - Normal axis
   - Right axis deviation
   - Left axis deviation
20. Identify the causes of right axis deviation.
21. Determine the causes of left axis deviation.
22. Explain the methodology utilized to determine axis deviation.
23. Identify the characteristics of a right bundle branch block.
24. Identify the characteristics of left bundle branch block.
25. List causes of bundle branch blocks.
26. Identify the locations of myocardial infarctions (MIs) that may result in new onset right and left bundle branch blocks.
27. Discuss the clinical significance of bundle branch blocks.
28. Discuss the purpose of thrombolytics in the treatment of myocardial infarction (MI).

29. Describe and list the indications for thrombolytic therapy.
30. Describe and list contraindications for thrombolytic therapy.
31. Review the various thrombolytic agents and the correct dosage of each agent.
32. Describe the indications for pacing in the emergency situation.
33. Discuss the purpose of transcutaneous pacing.
34. Define cardioversion and defibrillation.
35. Describe the indications for cardioversion.
36. Describe the indications for defibrillation.
37. Review the techniques for cardioversion and defibrillation.

F. Unit VI – Advanced Cardiac Life Support (ACLS)

1. Identify the components of advanced cardiac life support.
2. Identify and describe the components of the sequence of survival.
3. Discuss the medical-legal aspects of advanced cardiac life support, including when it is appropriate to begin, withhold, and discontinue resuscitation efforts.
4. List the purpose and components of the primary ABCD survey.
5. List the purpose and components of the secondary ABCD survey.
6. Describe the role of each member of the resuscitation team.
7. Identify the current classification of therapeutic interventions.
8. Describe the indications for intravenous therapy.
9. Describe the sites of first choice for cannulation if no IV is in place at the time of cardiac arrest.
10. Name four dysrhythmias that may be observed during an adult cardiac arrest.
11. Discuss the primary differences between monophasic and biphasic defibrillation.
12. Describe four factors affecting transthoracic resistance.
13. Describe the critical actions necessary in caring for the adult patient in cardiac arrest.
14. Identify the immediate goals of postresuscitation care.
15. Given a patient situation, describe the management steps (including mechanical, pharmacologic, and electrical interventions where applicable) in each of the following situations:
    - Cardiac Arrest rhythms
        - Pulseless ventricular tachycardia (VT)
        - Ventricular Fibrillation (VF)
        - Asystole
        - Pulseless electrical activity
    - Peri-arrest rhythms
        - Brady dysrhythmias
        - Narrow QRS tachycardia
        - Atrial Fibrillation and atrial flutter with a rapid ventricular response
        - Monomorphic ventricular tachycardia
        - Polymorphic ventricular tachycardia
        - Wide QRS tachycardia of unknown origin
    - Acute coronary syndromes
        - ST-segment elevation MI
        - Unstable angina/non-ST-elevation MI
        - Nondiagnostic/normal ECG
    - Acute pulmonary edema
    - Hypotension/shock: 1. Suspected pump failure, 2. Suspected volume problem, 3. Suspected rate problem.

## III. THECB Learning Outcomes (WECM)

1. Integrate pathophysiological principles and assessment findings to formulate a field impression.
2. Implement a treatment plan for the cardiac patient.

## IV. Evaluation

The following is the grade percentage breakdown for written materials/examinations by specific activity.

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|---|---|
| Quizzes/Simulations | 15% toward final grade |
| Homework | 5% toward final grade |
| Block Exam I | 10% toward final grade |
| Block Exam II | 10% toward final grade |
| Block Exam III | 10% toward final grade |
| Block Exam IV | 10% toward final grade |
| Block Exam V | 10% toward final grade |
| Block Exam VI | 10 %toward final grade |
| Final Written Exam | 20% toward final grade |
| TOTAL | 100% GRADE (Theory) |

Grading Scale

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| 90 - | 100 | = A |
| 80 - | 89 | = B |
| 75 - | 79 | = C |
| Below | 75 | = F |
| Incomplete | | = I |
| Withdrawn | | = W |

## V. Disability Statement (Americans with/Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

## VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.