SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: DHYG 104 Department: Dental Hygiene

Course Title: Dental Radiology Semester: Spring Year: 1997

Objectives/Competencies

Course Objective	Competencies
1. Understand the scientific principles that govern radiographic techniques. 2. Understand the means by which those principles are applied. 3. Produce acceptable diagnostic radiographs consistently. 4. Determine common radiographic errors that cause poor radiographs and be able to correct these errors. 5. Appreciate and guard against the dangers of x-radiation. 6. Manage dental patients competently during clinical radiographic procedures.	1. Radiation History a. Define the key words that relate to radiation. b. Appreciate the x-ray technology today. c. Summarize the importance of dental radiographs. d. Summarize the discovery of x-radiation. e. Recognize the pioneers in dental x-radiation and their contributions and discoveries. f. List the highlights in the history of x-ray equipment and film. 2. Radiation Physics a. Define the key words that relate to radiation physics. b. Identify the structure of the atom. c. Describe the process of ionization. d. Discuss the difference between radiation and radioactivity. e. List the two types of ionizing radiation and give examples of each. f. List the characteristics of electromagnetic radiation.

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	g. List the properties of x-radiation. h. Identify the component parts of the x-ray machine. i. Label the parts of the dent x-ray tubehead and the dental x-ray tube, being able to state the function of each. j. Describe in detail how dental x-rays are produced. k. List the describe the possible interaction of x-rays with matter. 3. Radiation Characteristics a. Define the key words that relate to radiation characteristics. b. Describe the effect that the kilovoltage peak has on the quality of the x-ray beam. c. Describe how milliamperage influences the quantity of the x-ray beam. d. Identify the range of kilovoltage and milliamperage required for dental radiography. e. Describe how increasing and decreasing exposure factors affects the density and contrast of the film. f. State the rules governing kilovoltage, mlliamperage, distance and exposure time that are used when changing exposure variables. g. Describe how kilovoltage, mlliamperage, exposure time, and source to film distance influence the intensity of the x-ray beam. h. Calculate an example of radiation intensity using the inverse square law.

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	i. Explain how the half-value layer determines the penetrating quality of the x-ray beam. 4. Radiation Biology a. Define the key words. b. Describe the mechanisms, theories, and sequence of radiation injury. c. Define and discuss the dose-response curve and radiation injury. d. List the determining factors for radiation injury. e. Discuss the short-term and long-term effects and the somatic and genetic effects of radiation exposure. f. Describe the effects of radiation exposure on cells, tissues, and organs. g. Identify the relative sensitivity of a given tissue to x-radiation. h. Define the units of measurement used in radiation exposure. i. List common sources of radiation exposure. j. Discuss risk and risk estimates for radiation exposure. k. Discuss dental radiation and exposure risks. l. Discuss the risk versus benefit of dental radiographs. m. Define stochastic and non-stochastic theories to radiation injury. 5. Radiation Protection a. Define the key words. b. Describe in detail the basics of patient protection prior to x-ray exposure.

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	c. Discuss the different types of filtration and state the recommended total filtration for dental x-ray machines operating above and below 70 kVp. d. Describe the collimator used in dental x-ray machines and state the recommended diameter of the useful beam at the patient's skin. e. List six ways to protect the patient from excess radiation during the x-ray exposure. f. Describe the importance of film handling and processing after patient exposure to x-rays. g. Discuss operator protection in terms of adequate distance, shielding, and avoidance of the useful mean. h. Describe personnel and equipment monitoring devices used to detect radiation. i. Discuss radiation exposure guidelines, including radiation safety legislation, MPD, MAD, and ALARA. j. Discuss with the dental patient what radiation protection steps will be used before, during, and after x-ray exposure. 6. Dental X-ray Film a. Define the key words. b. Describe in detail film composition and latent image formation. c. List and describe the different types of x-ray film used in dentistry. d. Define intraoral film and describe intraoral film packaging

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	e. Identify the types of sizes of intraoral film available. f. Discuss film speed. g. Discuss the differences between intraoral film and extraoral film. h. Describe the difference between screen and nonscreen films. i. Describe the use of intensifying screens and cassette holders. j. Describe duplicating film. k. Discuss proper film storage and protection. 7. Dental X-ray Image Characteristics a. Define the key words. b. Differentiate between radiolucent and radiopaque areas on a dental radiograph. c. Describe a diagnostic dental radiograph. d. List the two visual characteristics of the radiographic image. e. List the factors that influence film density and contrast. f. Discuss the difference between high and low contrast. g. Describe film contrast and subject contrast. h. Describe the difference between short-scale and long-scale contrast. i. Identify images of high contrast, low contract, no contrast, short scale contrast, and long scale contrast. j. Describe a stepwedge. k. List the three geometric characteristics of the radiographic image.

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	l. List the factors that influence sharpness, magnification, and distortion. m. List the five principles of shadow casting. 8. Dental X-ray film processing a. Describe the differences in the three methods of processing dental radiographic films. b. Define latent image and selective reduction. c. Describe the fundamentals of film processing from the latent image to the visible image stage. d. Explain who the image is created in the developer, fixer, and water bath. e. Describe optimum time and temperature conditions for processing films. f. Define and describe the differences between radiolucent and radiopaque. g. List the necessary equipment for a well-equipped darkroom. h. Differentiate between the various types of safelight filters for intra and extraoral films. i. Describe the recommended minimum distance between the safelight and the workspace. j. Discuss the recommended wattage of safelight bulbs. k. Discuss darkroom illumination including color of walls, safelights and filters, wattage of bulbs, distances between lamps and films, and the length of time that a film can be subjected to safelight exposure. l. Describe the components and care of handprocessing

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	tasks. m. List all of the developer and fixer chemicals and describe the action of each. Describe how the radiographer can recognize developer and fixer exhaustion. n. Describe proper manual processing procedures. o. Define reticulation. p. Describe the components, operation, and care of automatic processing. 9. Quality assurance in the dental office a. List quality control tests and quality administration procedures that should be included in the quality assurance plan. b. Discuss the purpose and frequency of testing dental x-ray machines. c. Describe the tests used to check for fresh film and adequate film-screen contact. d. Discuss the frequency of testing and the interpretation of the test results. e. Describe the test used to check of darkroom light leads and proper safelighting. f. Discuss the frequency of testing and the interpretation of test results. g. Describe the test used to check the automatic processor. h. Discuss the frequency of testing and the interpretation of tests results.

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	i. List three tests used to check the strength of the developer solution. j. Describe the preparation of the reference radiograph and the standard stepwedge radiograph. k. Discuss the use of the radiographs to compare film densities and to monitor the strength of developer solution. l. Describe the test used to check the strength of the fixer. m. Discuss the frequency of testing and the interpretation of test results. n. Discuss the basic elements of a quality administration plan. o. Detail the importance of operator competence in dental radiographic procedures. 10. Dental radiographs and the dental radiographer a. Define the key words. b. Discuss the importance of dental radiographs. c. List the uses of dental radiographs. d. Discuss the benefits of dental radiographs. e. List examples of common dental conditions that may be evident on a dental radiograph. f. Discuss the knowledge and skill requirements of the dental radiographer. g. List the responsibilities that may be assigned to the dental radiographer. h. Discuss the professional goals of the dental

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	radiographer. 11. Patient relations and the dental radiographer a. Define the key words. b. Discuss verbal, nonverbal, and listening skills and explain how each can be used to enhance communication. c. Discuss how facilitative skills can be used to enhance patient trust. d. Define a relationship of trust between the dental professional and the patient. e. Discuss the importance of first impressions, chairside manner, and attitude and explain how each can enhance patient relations. 12. Patient education and the dental radiographer a. Summarize the importance of educating paitents about dental radiographs. b. List three methods that can be used by the dental radiographer to educate paitents about dental radiographs. c. Answer common patient questions about the need for dental radiographs, x-ray exposure, the safety of dental x-rays, and other miscellaneous concerns. 13. Legal issues and the dental radiographer a. Define key words. b. List the federal and state regulations affecting the use of dental x-ray equipment. c. Describe the genreal application of these federal and

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	state regulations as they affect the dental auxiliary. d. Describe the licensure requirements for exposing dental radiographs. e. Define the legal concept of informed consent. f. Describe how to obtain informed consent from a patient. g. Discuss the legal significance of the dental record. h. Describe the legal implications of patient refusal to have dental radiographs exposed. i. Discuss how confidentiality laws affect the information in the dental record. j. Describe the patient rights with regard to the dental record. 14. Infection control and the dental radiographer a. Describe the rationale for infection control. b. Describe three possible routes of disease transmission. c. Describe the conditions that must be present for disease transmission to occur. d. Discuss protective attire and barrier techniques, handwashing and care of hands, sterilization or disinfection of instruments, and the cleaning and disinfection of the dental unit and environmental surfaces. e. Detail infection control procedures necessary prior to, during, and following x-ray exposure. f. Detail infection control procedures necessary for processing.

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	g. Discuss film handling in the darkroom with and without barrier envelopes. h. Discuss film handling without barrier envelopes using the automatic processor. 15. Introduction to radiographic examinations a. List the three types of introral radiographic examinations. b. Describe the purpose and the type of film and technique used for each of the three types of intraoral radiographic examinations. c. List the films that comprise a CMRS or FMX. d. List the general diagnostic criteria for intraoral radiographs. e. List examples of extraoral examinations. f. Discuss the prescribing of dental radiographs. g. Describe when prescribing a CMRS for a new patient is warranted. 16. Paralleling Technique a. State the basic principle of the paralleling technique and illustrate the placement of the film, film holder, PID, and central ray. b. Discuss how object-film distance affects the radiographic image and how target-film distance is used to compensate for such changes. c. List the film holders that can be used with the paralleling technique. d. Describe why a film holder is necessary with the

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	paralleling technique. e. Describe the different sizes of film used with the paralleling technique and how each film is placed in the bite-block. f. State the five basic rules of the paralleling technique. g. Describe the patient and equipment preparations that are necessary prior to using the paralleling technique. h. Discuss the exposure sequence of sixteen periapical film placements using the paralleling technique. i. Describe each of the sixteen periapical film placements recommended for use with the stabe or Precision instrument. j. Summarize the guidelines for periapical film positioning. k. Explain the modifications in the paralleling technique that are used for a patient with a shallow palate, bony growths, or a sensitive premolar region. l. List the advantages and disadvantages of the paralleling technique. 17. Bite-wing technique a. Describe the purpose and use of the bite-wing film. b. Describe the appearance of the opened and overlapped contact areas on a dental radiograph. c. State the basic principles of the bite-wing technique. d. List the two ways a film can be stabilized in the bite-wing technique and identify which one is recommended for bite-wing exposures.

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	e. List the four film sizes that can be used in the bite-wing technique and identify which film size is recommended for exposures in the adult patient. f. Describe correct and incorrect horizontal angulation. g. Describe the difference between positive and negative vertical angulation. h. State the recommended vertical angulation for all bite-wing exposures. i. State the basic rules for the bite-wing techniques. j. Describe the patient and equipment preparations that are necessary before using the bite-wing techniques. k. Discuss the exposure sequence for a complete mouth radiographic series that includes both periapical and bite-wing exposures. l. Describe the premolar and molar bite-wing film placements. m. Describe the purpose and use of vertical bite-wings. n. List the number of exposures and the size of film used in the vertical bite-wing technique. 18. Extraoral radiography a. Describe the purpose and uses of extraoral radiography. b. Describe the equipment used in extraoral radiography. c. Detail the equipment and patient preparations necessary prior to exposing an extraoral film. d. Identify the specific purpose of each of the extraoral film projections.

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	e. Describe the head position, film placement, and beam alignment for each of the following extraoral films: lateral jaw projection - body of the mandible, lateral jaw projection - ramus of the mandible, lateral cephalometric projection, posteroanterior projection, Waters projections, submentovertex projection, reverse Towne projection, and transcranial projection. 19. Exposure and technique errors a. Identify and describe the appearance of the following film exposure errors: unexposed film, film exposed to light, underexposed film, and overexposed film. b. Describe horizontal and vertical angulation. c. Identify and describe the appearance of the following periapical technique errors: incorrect horizontal angulations, incorrect vertical angulation (foreshortened images and elongated images), and incorrect beam alignment (cone-cut images). d. Describe and identify proper film placement for bite-wing radiographs. e. Identify and describe the appearance of the following bite-wing technique errors: incorrect horizontal angulation, incorrect vertical angulation, and incorrect PID alignment (cone-cut images). f. Identify and describe the appearance of the following miscellaneous technique errors: film bending, film creasing, double exposure, movement, static, and reversed film, and fog.

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	20. Occlusals a. Describe the purpose of the occlusal examination. b. List the uses of the occlusal examination. c. Describe the patient and equipment preparations necessary prior to using the occlusal technique. d. State the recommended vertical angulations for the following maxillary occlusal projections: topographic, lateral (right or left), and pediatric. e. State the recommended vertical angulations for the following mandibular occlusal projections: Topographic, cross-sectional, and pediatric. 21. Panoramic radiography a. Describe the purpose and uses of panoramic radiography. b. Describe the fundamentals of panoramic radiography. c. Describe the equipment used in panoramic radiography and be able to state which type is used at STCC. d. Describe the patient preparations, equipment preparations, and patient positioning procedures needed before exposing a panormaic film. e. Identify the patient preparation and positioning errors seen on panoramic radiographs. f. Discuss the causes of patient preparation and positioning errors and the necessary measurers needed to correct such errors. g. Discuss the advantages and disadvantages of panoramic radiography.

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	22. Normal Radiographic Anatomy a. Define the general terms that describe prominences, spaces, and depressions in bone. b. Identify and describe the normal anatomic landmarks of the maxilla and mandible on dental radiographs. c. Identify and describe the radiographic appearance of tooth anatomy. d. Identify each normal radiographic landmark of the maxilla and mandible as either radiolucent of radiopaque. 23. Introduction to Radiographic Interpretation a. Define the key words b. Summarize the importance of radiographic interpretation. c. Define the roles of the dentist and dental auxiliary in the interpretation of dental radiographs. d. Discuss the difference between interpretation and diagnosis. e. Describe who is able to interpret dental radiographs. f. Describe when and where dental radiographs are interpreted. g. Describe how radiographic interpretation can be used to educate the dental patient about the importance and use of dental radiographs.

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